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1.5 backports-abc 0.5

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
Foundation (PSF, see http://www.python.org/psf/) was formed, a
non-profit organization created specifically to own Python-related
Intellectual Property. Zope Corporation is a sponsoring member
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the PSF.

All Python releases are Open Source (see http://www.opensource.org for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

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1.40 react-loading-overlay 1.0.1

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1.41 azure-mgmt-rdbms 10.1.0

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1.44 react-router-dom 5.3.4

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1.50 robotframework-sshlibrary 3.8.0

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1.52 python-crontab 2.7.1

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1.53 supervisor 4.2.5

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Marios Zindilis (github.com/marios-zindilis)
keysona (github.com/keysona)
nkanaev (github.com/nkanaev)
liguangsheng (github.com/liguangsheng)
ewankirk (github.com/ewankirk)
Oz N
 Tiram (github.com/oz123)
Alan Hamlett (github.com/alanhamlett)
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rox (github.com/roxma)
Matthew Howle (github.com/mdhowle)
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Andr Nasturas (github.com/andrenasturas)

Denis Kasak (github.com/dkasak)

Maximilian Hils (github.com/mhils)

BarkeH (github.com/BarkeH)

cav71

 (github.com/cav71)

Crozzers (github.com/Crozzers)

Bastian Venthur (https://github.com/venthur), removed Python2 support

gitbra (github.com/gitbra)

ukasz Langa (github.com/ambv)

Max Omdal (github.com/momja)

Kishore (github.com/jk6521)

Ircama (github.com/Ircama)

1.57 installer 0.7.0

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1.68 babel-jest 29.7.0

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1.69 fasteners 0.19

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1.70 pydantic 1.10.13

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1.73 immer 9.0.21

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1.74 jquery 3.7.1

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1.75 @tanstack/react-query-devtools 4.36.1

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1.76 @tanstack/react-query 4.36.1

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1.77 html5lib 1.1

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1.78 psutil 5.9.5

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```
# Execute tests on *BSD platforms. Does not produce wheels.
# Useful URLs:
# https://github.com/vmactions/freebsd-vm
# https://github.com/vmactions/openbsd-vm
# https://github.com/vmactions/netbsd-vm


on: [push, pull_request]
name: bsd-tests
concurrency:
 group: ${{ github.ref }}-${{ github.workflow }}-${{ github.event_name }}-${{ github.ref ==
format('refs/heads/{0}', github.event.repository.default_branch) && github.sha || '' }}
 cancel-in-progress: true
jobs:
 freebsd:
  runs-on: macos-12
  steps:
   - uses: actions/checkout@v3
   - name: Run tests
     uses: vmactions/freebsd-vm@v0
     with:
      usesh: true
      prepare: |
        pkg install -y gcc python3
      run: |
        set -e -x
        make install-pip
        python3 -m pip install --user setuptools
        make install
        make test
        make test-memleaks
 openbsd:
  runs-on: macos-12
  steps:
   - uses: actions/checkout@v3
   - name: Run tests
     uses: vmactions/openbsd-vm@v0
     with:
      usesh: true
      prepare: |
        set -e
        pkg_add gcc python3
      run: |
        set -e
```

```
            make install-pip
            python3 -m pip install --user setuptools
            make install
            make test
            make test-memleaks
  netbsd:
    runs-on: macos-12
    steps:
      - uses: actions/checkout@v3
      - name: Run tests
        uses: vmactions/netbsd-vm@v0
        with:
          usesh: true
          prepare: |
            set -e
            pkg_add -v pkgin
            pkgin update
            pkgin -y install python311-* py311-setuptools-* gcc12-*
          run: |
            set -e
            make install-pip PYTHON=python3.11
            python3.11 -m pip install --user setuptools
            make install PYTHON=python3.11
            make test PYTHON=python3.11
            make test-memleaks PYTHON=python3.11
```

1.79 enum34 1.1.10

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1.80 numpy 1.25.1

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1.81 xstate 4.38.3

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1.84 lodash 4.17.21

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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations, which became
Zope Corporation. In 2001, the Python Software Foundation (PSF, see
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Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now		

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{
  "compilerOptions": {
    "module": "node16",
    "lib": [
      "es6"
    ],
    "noImplicitAny": true,
    "noImplicitThis": true,
    "strictNullChecks": true,
    "strictFunctionTypes": true,
    "types": [],
    "noEmit": true,
    "forceConsistentCasingInFileNames": true
  },
  "files": [
    "index.d.ts",
    "npm-license-crawler-tests.ts"
  ]
}
```

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```
{
  "compilerOptions": {
    "module": "node16",
    "lib": [
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    "noImplicitAny": true,
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    "oslicense-tests.ts"
  ]
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    "module": "node16",
    "lib": [
      "es6"
    ],
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    "strictNullChecks": true,
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    "lib": [
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  "files": [
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    "zpl-image-tests.ts"
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}
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```json
{
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    "license-checker-tests.ts"
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    "strictFunctionTypes": true,
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    },
  "files": [
      "index.d.ts",
      "validate-npm-package-license-tests.ts"
    ]
}
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      "lib": [
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      ],
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      "noImplicitThis": true,
      "strictNullChecks": true,
      "strictFunctionTypes": true,
      "types": [],
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      "forceConsistentCasingInFileNames": true
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{
  "files": [
      "index.d.ts",
      "angular-permission-tests.ts"
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        "dom"
      ],
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      "noImplicitThis": true,
      "strictNullChecks": false,
      "strictFunctionTypes": true,
      "types": [],
      "noEmit": true,
      "forceConsistentCasingInFileNames": true
    }
  }
  {
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      "lib": [
        "es6"
      ],
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      "noImplicitThis": true,
      "strictFunctionTypes": true,
      "strictNullChecks": true,
      "types": [],
      "noEmit": true,
      "forceConsistentCasingInFileNames": true
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      "license-key-gen-tests.ts"
    ]
  }
  {
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        "es6"
      ],
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      "noImplicitThis": true,
      "strictNullChecks": true,
      "strictFunctionTypes": true,
      "types": [],
      "noEmit": true,
      "forceConsistentCasingInFileNames": true

```
        },
      "files": [
        "index.d.ts",
        "license-checker-webpack-plugin-tests.ts"
      ]
    }
    {
      "rules": {
        "@definitelytyped/dt-header": "off",
        "@definitelytyped/no-any-union": "off",
        "@definitelytyped/no-declare-current-package": "off",
        "@definitelytyped/strict-export-declare-modifiers": "off",
        "@typescript-eslint/triple-slash-reference": "off",
        "@typescript-eslint/naming-convention": "off"
      }
    }
```

1.97 asgiref 3.8.1

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1.98 react-markdown 8.0.7

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1.99 gitpython 3.1.43

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1.100 distro 1.8.0

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1.103 react-dom 18.3.1

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1.104 react 18.3.1

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1.105 keyring 24.3.1

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1.106 react-bootstrap 1.6.8

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1.107 python3-asn1crypto 1.5.1
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dateutil - Extensions to the standard Python datetime module.

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1.109 events 3.3.0

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1.110 pygments 2.18.0

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---input---
!%$^*__--__._+++===-crazy-symbol

---tokens---
'!%$^*__--__._+++===-crazy-symbol' Name.Variable
'\n'   Text.Whitespace
'# New ports collection makefile for: python25\n' Comment

'# Date created: 3 July 2003\n' Comment

'# Whom: Hye-Shik Chang <perky@FreeBSD.org>\n' Comment

'#\n'   Comment

'# $FreeBSD: ports/lang/python25/Makefile,v 1.145 2007/10/03 23:22:04 edwin Exp $\n' Comment

'\n'   Text.Whitespace

'PORTNAME'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python25'   Text
'\n'   Text.Whitespace

'PORTVERSION' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'2'   Literal.Number
'.5.1'   Text
'\n'   Text.Whitespace

'CATEGORIES' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'lang'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'ipv6'   Text
'\n'   Text.Whitespace

'MASTER_SITES' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_MASTER_SITES' Name.Variable
'}'
           Literal.String.Interpol
'\n'   Text.Whitespace

'MASTER_SITE_SUBDIR' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_MASTER_SITE_SUBDIR' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'DISTFILES'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_DISTFILE' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'MAINTAINER' Name.Variable
'='   Operator
'\t'   Text.Whitespace

'python@FreeBSD.org' Text
'\n'   Text.Whitespace

'COMMENT'   Name.Variable
'?='   Operator
'\t'   Text.Whitespace
'An'   Text
' '   Text.Whitespace
'interpreted' Text
' '   Text.Whitespace
'object-oriented' Text
' '   Text.Whitespace
'programming' Text
' '   Text.Whitespace
'language'   Text
'\n'
        Text.Whitespace

'\n'   Text.Whitespace

'DIST_SUBDIR' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python'   Text
'\n'   Text.Whitespace

'WRKSRC'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/portbld.static' Text
'\n'   Text.Whitespace

'PATCH_WRKSRC' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'GNU_CONFIGURE' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'CONFIGURE_TARGET' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'--build'   Text
'='   Operator
'${'   Literal.String.Interpol
'MACHINE_ARCH' Name.Variable
'}'   Literal.String.Interpol
'-portbld-freebsd'
 Text
'${'   Literal.String.Interpol
'OSREL'   Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'CONFIGURE_SCRIPT' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'../configure' Text
' '   Text.Whitespace
'# must be relative\n' Comment.Single

'CONFIGURE_ENV' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'OPT'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'CFLAGS'   Name.Variable
'}'   Literal.String.Interpol
'"'   Literal.String.Double
' '   Text.Whitespace
'SVNVERSION' Name.Variable
'='   Operator
'"echo freebsd"' Literal.String.Double
'\n'   Text.Whitespace

'MAKE_ENV'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'VPATH'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'PYTHON_WRKSRC'

```
         Name.Variable
'}'         Literal.String.Interpol
'"'         Literal.String.Double
'\n'        Text.Whitespace

'INSTALLS_SHLIB' Name.Variable
'='         Operator
'\t'        Text.Whitespace
'yes'       Text
'\n'        Text.Whitespace

'INSTALL_TARGET' Name.Variable
'='         Operator
'\t'        Text.Whitespace
'altinstall' Text
'\n'        Text.Whitespace

'MAN1'      Name.Variable
'='         Operator
'\t\t'      Text.Whitespace
'${'        Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'         Literal.String.Interpol
'.1'        Text
'\n'        Text.Whitespace

'\n'        Text.Whitespace

'USE_PYTHON' Name.Variable
'='         Operator
'\t'        Text.Whitespace
'yes'       Text
'\n'        Text.Whitespace

'PYTHON_VERSION' Name.Variable
'='         Operator
'\t'        Text.Whitespace
'python2.5' Text
'\n'        Text.Whitespace

'PYTHON_NO_DEPENDS' Name.Variable
'='
       Operator
'\t'        Text.Whitespace
'yes'       Text
'\n'        Text.Whitespace

'\n'        Text.Whitespace
```

'SHARED_WRKSRC' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/portbld.shared' Text
'\n'   Text.Whitespace

'PLIST'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/PLIST'   Text
'\n'   Text.Whitespace

'PLIST_TEMPLATE' Name.Variable
'?='   Operator
'${'   Literal.String.Interpol
'PKGDIR'   Name.Variable
'}'   Literal.String.Interpol
'/pkg-plist' Text
'\n'   Text.Whitespace

'PLIST_SUB' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'PYVER'   Name.Variable
'='   Operator
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'
           Punctuation
'S'   Name.Variable
'/python//' Punctuation
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'PYVER_WITHPAT' Name.Variable
'='   Operator
'${'   Literal.String.Interpol
'PORTVERSION' Name.Variable
':'   Punctuation

'S'   Name.Variable
'/.c/c/'   Punctuation
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'DEMODIR'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/share/examples/' Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'TOOLSDIR'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'
    Literal.String.Interpol
'/share/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'BIN_SCRIPTS' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'idle'   Text
' '   Text.Whitespace
'pydoc'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'python-shared' Text
' '   Text.Whitespace
'smtpd.py'   Text
' '   Text.Whitespace
'python-config' Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'python-shared-config' Text
'\n'   Text.Whitespace

'BINLINKS_SUB' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,smtpd,smtpd${PYTHON_VER},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'
        Text
' '   Text.Whitespace
"'s,(idle|pydoc|python-shared|python),\\1${PYTHON_VER},'" Literal.String.Single
'\n\n'   Text.Whitespace

'OPTIONS'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'THREADS'   Text
' '   Text.Whitespace
'"Enable thread support"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'HUGE_STACK_SIZE' Text
' '   Text.Whitespace
'"Use a larger thread stack"' Literal.String.Double
' '   Text.Whitespace
'off'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'UCS4'   Text
' '   Text.Whitespace
'"Use UCS4 for unicode support"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace

'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'PYMALLOC'
   Text
' '   Text.Whitespace
'"Use python\'s internal malloc"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'IPV6'   Text
' '   Text.Whitespace
'"Enable IPv6 support"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'FPECTL'   Text
' '   Text.Whitespace
'"Enable floating point exception handling"' Literal.String.Double
' '   Text.Whitespace
'off'   Text
'\n\n'   Text.Whitespace

'.include <bsd.port.pre.mk>\n' Comment.Preproc

'\n'   Text.Whitespace

'.if ${PYTHON_VERSION} == ${PYTHON_DEFAULT_VERSION}\n' Comment.Preproc

'MLINKS'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.1'
      Text
' '   Text.Whitespace
'python.1'   Text
'\n'   Text.Whitespace

'PLIST_SUB'   Name.Variable

'+='   Operator
'\t'   Text.Whitespace
'IF_DEFAULT' Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'IF_DEFAULT' Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'# workaround for a bug in base curses.h.\n' Comment

'CFLAGS'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'-D__wchar_t' Text
'='   Operator
'wchar_t'   Text
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'.if !defined(WITHOUT_THREADS)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--with-threads'
 Text
'\n'   Text.Whitespace

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PTHREAD_CFLAGS' Name.Variable
'}'   Literal.String.Interpol

'\n'   Text.Whitespace

'.if defined(WITHOUT_HUGE_STACK_SIZE)\n' Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'-DTHREAD_STACK_SIZE' Text
'='   Operator
'0x20000'   Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'-DTHREAD_STACK_SIZE' Text
'='   Operator
'0x100000' Text
'\n'   Text.Whitespace

'.endif # defined(WITHOUT_HUGE_STACK_SIZE)\n' Comment.Preproc

'CONFIGURE_ENV' Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'LDFLAGS'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'PTHREAD_LIBS'
 Name.Variable
'}'   Literal.String.Interpol
' '   Literal.String.Double
'${'   Literal.String.Interpol
'LDFLAGS'   Name.Variable
'}'   Literal.String.Interpol
'"'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--without-threads' Text
'\n'   Text.Whitespace

'.if defined(LDFLAGS)\n' Comment.Preproc

'CONFIGURE_ENV' Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'LDFLAGS'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'LDFLAGS'   Name.Variable
'}'   Literal.String.Interpol
'"'   Literal.String.Double
'\n'   Text.Whitespace

'.endif # defined(LDFLAGS)\n' Comment.Preproc

'.endif # !defined(WITHOUT_THREADS)\n' Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(WITHOUT_UCS4) && !defined(WITH_UCS2)\n'
 Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--enable-unicode' Text
'='   Operator
'ucs4'   Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if defined(WITHOUT_PYMALLOC)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'   ' Text.Whitespace
'--without-pymalloc' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if ${ARCH} == i386\n' Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'X86_ONLY'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'X86_ONLY'   Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'
    Comment.Preproc

'.if ${ARCH} == amd64 || ${ARCH} == ia64 || ${ARCH} == sparc64 || ${ARCH} == alpha\n' Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'   '   Text.Whitespace
'32BIT_ONLY' Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'   '   Text.Whitespace
'32BIT_ONLY' Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'.if ${ARCH} == sparc64\n' Comment.Preproc

'CFLAGS'   Name.Variable

'+='   Operator
'   '   Text.Whitespace
'-DPYTHON_DEFAULT_RECURSION_LIMIT' Text
'='   Operator
'900'   Literal.Number
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if !exists(/usr/bin/ypcat) # the world with NO_NIS\n' Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='
          Operator
'\t'   Text.Whitespace
'NO_NIS'   Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'NO_NIS'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(WITHOUT_IPV6)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--enable-ipv6' Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator

' '   Text.Whitespace
'--disable-ipv6' Text
'\n'   Text.Whitespace

'.endif\n' Comment.Preproc

'\n'   Text.Whitespace

'.if defined(WITH_FPECTL)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--with-fpectl'
 Text
'\n'   Text.Whitespace

'.endif\n' Comment.Preproc

'\n'   Text.Whitespace

'.if ${OSVERSION} >= 700000\n' Comment.Preproc

'PLATFORMS' Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace
'plat-freebsd5' Text
' '   Text.Whitespace
'plat-freebsd6' Text
'\n'   Text.Whitespace

'.elif ${OSVERSION} >= 600000\n' Comment.Preproc

'PLATFORMS' Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace
'plat-freebsd5' Text
' '   Text.Whitespace
'plat-freebsd7' Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLATFORMS' Name.Variable
'='   Operator
'plat-freebsd4' Text

```
' '        Text.Whitespace
'plat-freebsd6' Text
' '        Text.Whitespace
'plat-freebsd7' Text
'\n'        Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'        Text.Whitespace

'pre-patch'  Name.Function
':'         Operator
'\n'        Text.Whitespace

'\t'
        Text.Whitespace
'${'        Literal.String.Interpol
'MKDIR'      Name.Variable
'}'         Literal.String.Interpol
' '        Text.Whitespace
'${'        Literal.String.Interpol
'WRKSRC'     Name.Variable
'}'         Literal.String.Interpol
' '        Text.Whitespace
'${'        Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'         Literal.String.Interpol
'/Modules'   Text
'\n\t'       Text.Whitespace
'${'        Literal.String.Interpol
'SED'        Name.Variable
'}'         Literal.String.Interpol
' '        Text.Whitespace
'-e'        Text
' '        Text.Whitespace
"'1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},'" Literal.String.Single
' '        Text.Whitespace
'\\\n'       Literal.String.Escape

'\t\t'       Text.Whitespace
'${'         Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'         Literal.String.Interpol
'/Tools/scripts/pydoc' Text
' '        Text.Whitespace
'>'         Text
' '
```

Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/pydoc2.5' Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Tools/scripts/idle' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/idle2.5'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '
           Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Lib/smtpd.py' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace

'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/smtpd2.5.py' Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
"'s,/usr/doc/python-docs-,${PREFIX}/share/doc/python,g'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'
      Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Lib/pydoc.py' Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'\'s|^\\(*prefixes = .*\\)\\]$$|\\1, "${X11BASE}"]|g\"' Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Lib/site.py' Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace

'-e'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'
 Text.Whitespace
"'s|^\t\\(..ASDLGEN.*\\)$$|\t${TRUE}|g'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile.pre.in' Text
'\n\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
"'s|*\\(..INSTALL_SCRIPT.*\\)python-config$$|#port \\1|'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile.pre.in' Text
'\n\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'
   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s|^#!.*|#!${PREFIX}/bin/${PYTHON_VERSION}|'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol

'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python-config.in' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'-config'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s|^#!.*|#!${PREFIX}/bin/${PYTHON_VERSION:S/thon/thon-shared/}|'"
 Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python-config.in' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'-config'   Text
'\n\n'   Text.Whitespace

'.if defined(WITH_FPECTL) && ${ARCH} == i386\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'
        Literal.String.Interpol
'/Modules'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'ECHO'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'"fpectl fpectlmodule.c"' Literal.String.Double
' '   Text.Whitespace
'>>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
'/Modules/Setup.dist' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'post-configure' Name.Function
':'   Operator
'\n'   Text.Whitespace

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-C'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-cf'
        Text
' '   Text.Whitespace

'-'   Text
' '   Text.Whitespace
'.'   Text
' '   Text.Whitespace
'|'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-C'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-xf'   Text
' '   Text.Whitespace
'-'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-sf'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Lib'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'
    Name.Variable
'}'   Literal.String.Interpol
'/Lib'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(LDLIBRARY=\\).*$$,\\1libpython$$(VERSION).so,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace

'-e'   Text
' '   Text.Whitespace
"'s,^\\(BLDLIBRARY=\\).*$$,\\1-L. -lpython$$(VERSION),'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(CFLAGSFORSHARED=\\).*$$,\\1$$(CCSHARED),'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(Makefile Modules/config.c:.*\\)Makefile.pre,\\1,'"
Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(.(BUILDPYTHON)\\: .*\\).(LIBRARY),\\1,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(.(BUILDPYTHON):.*\\).(LIBRARY),\\1,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
'/Makefile' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile' Text
'\n\n'   Text.Whitespace

'pre-build' Name.Function
':'   Operator
'\n'
       Text.Whitespace

'\t'   Text.Whitespace
'cd'   Name.Builtin
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SETENV'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'MAKE_ENV'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'MAKE'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
' '   Text.Whitespace
'python'   Text
';'   Punctuation
' '   Text.Whitespace
'\\\n'
       Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-f'   Text
' '   Text.Whitespace

'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
';'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-f'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'
 Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'\n\n'   Text.Whitespace

'pre-su-install' Name.Function
':'   Operator
'\n'   Text.Whitespace

'.for platform in ${PLATFORMS}\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/'   Text

'${'   Literal.String.Interpol
'platform'   Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'.for file in IN.py regen\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_DATA' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'
 Literal.String.Interpol
'/Lib/'   Text
'${'   Literal.String.Interpol
'platform'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'file'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'platform'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'\n'   Text.Whitespace

'.endfor\n' Comment.Preproc

'.endfor\n' Comment.Preproc

'\n'   Text.Whitespace

'pre-install' Name.Function
':'   Operator
'\n'   Text.Whitespace

```
'\t'        Text.Whitespace
'${'        Literal.String.Interpol
'CAT'       Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'${'
            Literal.String.Interpol
'PLIST_TEMPLATE' Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'|'         Punctuation
' '         Text.Whitespace
'${'        Literal.String.Interpol
'AWK'       Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'\'{ print $$0; } \\\n\t/LIBDIR.*\\.py$$/ && !/\/bad/ { print $$0 "o"; print $$0 "c"; }\"' Literal.String.Single
'\t'        Text.Whitespace
'>'         Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'PLIST'     Name.Variable
'}'         Literal.String.Interpol
'\n\n'      Text.Whitespace

"\t@# if openssl 0.9.8 is detected, _sha{256,512} module won't be installed\n" Comment

'\t'        Text.Whitespace
'('         Operator
'['         Operator
' '         Text.Whitespace
'-f'        Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'WRKSRC'    Name.Variable
'}'         Literal.String.Interpol
'/.without_own_sha'
 Text
' '         Text.Whitespace
']'         Operator
' '         Text.Whitespace
'&&'        Operator
' '         Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'      Text.Whitespace
'${'        Literal.String.Interpol
'GREP'      Name.Variable
```

'}'   Literal.String.Interpol

' '   Text.Whitespace

'-v'   Text

' '   Text.Whitespace

"'lib-dynload/_sha'" Literal.String.Single

' '   Text.Whitespace

'${'   Literal.String.Interpol

'PLIST'   Name.Variable

'}'   Literal.String.Interpol

' '   Text.Whitespace

'>'   Text

' '   Text.Whitespace

'${'   Literal.String.Interpol

'PLIST'   Name.Variable

'}'   Literal.String.Interpol

'.tmp'   Text

' '   Text.Whitespace

'&&'   Operator

' '   Text.Whitespace

'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace

'${'   Literal.String.Interpol

'CAT'   Name.Variable

'}'

           Literal.String.Interpol

' '   Text.Whitespace

'${'   Literal.String.Interpol

'PLIST'   Name.Variable

'}'   Literal.String.Interpol

'.tmp'   Text

' '   Text.Whitespace

'>'   Text

' '   Text.Whitespace

'${'   Literal.String.Interpol

'PLIST'   Name.Variable

'}'   Literal.String.Interpol

')'   Operator

' '   Text.Whitespace

'||'   Operator

' '   Text.Whitespace

'${'   Literal.String.Interpol

'TRUE'   Name.Variable

'}'   Literal.String.Interpol

'\n\n'   Text.Whitespace

'post-install' Name.Function

':'   Operator

'\n'   Text.Whitespace

'\t@# install config providers\n' Comment

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'
         Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'-config'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'-config'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\n'   Text.Whitespace

'\t@#

'\t@# install config providers\n' Comment

shared version of executable and library\n' Comment

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_PROGRAM' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
'\n\t'   Text.Whitespace
'cd'   Name.Builtin
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'LN'
      Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-sf'   Text
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace

'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-sf'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib/lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
' '

    Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/config'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_PROGRAM' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace

```
'${'            Literal.String.Interpol
'PREFIX'        Name.Variable
'}'             Literal.String.Interpol
'/bin'          Text
'\n\n'          Text.Whitespace

'\t@# additional files installing by ports\n'
                Comment

'\t'            Text.Whitespace
'${'            Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'             Literal.String.Interpol
' '             Text.Whitespace
'${'            Literal.String.Interpol
'WRKDIR'        Name.Variable
'}'             Literal.String.Interpol
'/pydoc2.5'     Text
' '             Text.Whitespace
'${'            Literal.String.Interpol
'WRKDIR'        Name.Variable
'}'             Literal.String.Interpol
'/idle2.5'      Text
' '             Text.Whitespace
'\\\n'          Literal.String.Escape

'\t\t'          Text.Whitespace
'${'            Literal.String.Interpol
'WRKDIR'        Name.Variable
'}'             Literal.String.Interpol
'/smtpd2.5.py'  Text
' '             Text.Whitespace
'${'            Literal.String.Interpol
'PREFIX'        Name.Variable
'}'             Literal.String.Interpol
'/bin'          Text
'\n\t'          Text.Whitespace
'@'             Text
'${'            Literal.String.Interpol
'MKDIR'         Name.Variable
'}'             Literal.String.Interpol
' '             Text.Whitespace
'${'
                Literal.String.Interpol
'MANPREFIX'     Name.Variable
'}'             Literal.String.Interpol
'/man/man1'     Text
'\n\t'          Text.Whitespace
```

'${'   Literal.String.Interpol
'INSTALL_MAN' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python.man' Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MANPREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/man/man1/' Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.1'   Text
'\n\n'   Text.Whitespace

'.if ${PYTHON_VERSION} == ${PYTHON_DEFAULT_VERSION}\n' Comment.Preproc

'\t'   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'f'   Text
' '   Text.Whitespace
'in'
        Keyword
' '   Text.Whitespace
'${'   Literal.String.Interpol
'BIN_SCRIPTS' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'do'   Keyword
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'TARGET'   Name.Variable
'='   Operator
'`'   Literal.String.Backtick
'${'   Literal.String.Interpol
'ECHO_CMD'   Name.Variable
'}'   Literal.String.Interpol

```
' '         Text.Whitespace
'$$'        Name.Variable
'f'         Text
' '         Text.Whitespace
'|'         Punctuation
' '         Text.Whitespace
'${'        Literal.String.Interpol
'SED'       Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-E'        Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'BINLINKS_SUB' Name.Variable
'}'         Literal.String.Interpol
'`'         Literal.String.Backtick
';'
            Punctuation
' '         Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'      Text.Whitespace
'cd'        Name.Builtin
' '         Text.Whitespace
'${'        Literal.String.Interpol
'PREFIX'    Name.Variable
'}'         Literal.String.Interpol
'/bin'      Text
' '         Text.Whitespace
'&&'        Operator
' '         Text.Whitespace
'${'        Literal.String.Interpol
'LN'        Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-f'        Text
' '         Text.Whitespace
'$$'        Name.Variable
'TARGET'    Text
' '         Text.Whitespace
'$$'        Name.Variable
'f'         Text
';'         Punctuation
' '         Text.Whitespace
'\\\n'      Literal.String.Escape

'\t'        Text.Whitespace
'done'      Keyword
```

'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(NOPORTDOCS)\n' Comment.Preproc

'\t'
        Text.Whitespace
'@'   Text
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TOOLSDIR'   Name.Variable
'}'   Literal.String.Interpol
'\n\t'   Text.Whitespace
'@cd'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-cf'   Text
' '   Text.Whitespace
'-'   Text
' '   Text.Whitespace
'Tools'   Text
' '   Text.Whitespace
'|'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'('   Operator
'cd'   Name.Builtin
' '   Text.Whitespace
'${'
        Literal.String.Interpol
'TOOLSDIR'   Name.Variable
'}'   Literal.String.Interpol

';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-xf'   Text
' '   Text.Whitespace
'-'   Text
')'   Operator
'\n\t'   Text.Whitespace
'@'   Text
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'DEMODIR'   Name.Variable
'}'   Literal.String.Interpol
'\n\t'   Text.Whitespace
'@cd'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Demo'   Text
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'
            Literal.String.Interpol
' '   Text.Whitespace
'-cf'   Text
' '   Text.Whitespace
'-'   Text
' '   Text.Whitespace
'*'   Text
' '   Text.Whitespace
'|'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'('   Operator
'cd'   Name.Builtin
' '   Text.Whitespace
'${'   Literal.String.Interpol

'DEMODIR'   Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-xf'   Text
' '   Text.Whitespace
'-'   Text
')'   Operator
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n\t'   Text.Whitespace
'@'   Text
'${'   Literal.String.Interpol
'CAT'   Name.Variable
'}'
             Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PKGMESSAGE' Name.Variable
'}'   Literal.String.Interpol
'\n\n'   Text.Whitespace

'.include <bsd.port.post.mk>\n' Comment.Preproc

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1.112 python-requests 2.32.3
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1.113 uwsgitop 0.12

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1.114 hvac 2.3.0

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1.115 loader-utils 3.3.1

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1.116 poetry-plugin-export 1.8.0

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1.117 robotframework 7.0.1

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1.118 redux-saga 1.3.0

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1.119 urllib3 1.26.19

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1.120 semver 7.6.3

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1.122 parse 1.20.2

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1.123 robotframework-requests 0.9.7

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1.125 python-certifi 2024.7.4
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1.126 configparser 7.1.0

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is invoked, then you must make a good faith effort to ensure that,
in the event an application does not supply such function or
table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)

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it with the complete corresponding machine-readable source code, which
must be distributed
 under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

 If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
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compelled to copy the source along with the object code.

 5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

 However, linking a "work that uses the Library" with the Library
creates an executable that is a derivative of the Library (because it
contains portions of the Library), rather than a "work that uses the
library". The executable is therefore covered by
 this License.
Section 6 states terms for distribution of such executables.

 When a "work that uses the Library" uses material from a header file
that is part of the Library, the object code for the work may be a
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Whether this is true is especially significant if the work can be
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 If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative

work. (Executables containing this object code plus portions of the
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 Otherwise, if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any
 executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also combine or
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  machine-readable
 source code for the Library including whatever
   changes were used in the work (which must be distributed under
   Sections 1 and 2 above); and, if the work is an executable linked
   with the Library, with the complete machine-readable "work that
   uses the Library", as object code and/or source code, so that the
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   that the user who changes the contents of definitions files in the
   Library will not necessarily be able to recompile the application
   to use the modified definitions.)

  b) Use a suitable shared library mechanism for linking with the
   Library. A suitable mechanism is one that (1) uses at run time a
   copy of the library already present on the user's computer system,
   rather than copying library functions into the executable, and (2)
   will operate properly with a modified version of the library, if
   the
 user installs one, as long as the modified version is
   interface-compatible with the version that the work was made with.

  c) Accompany the work with a written offer, valid for at
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specified in Subsection 6a, above, for a charge no more
than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy
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e) Verify that the user has already received a copy of these
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1.136 zustand 4.5.5

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1.137 treq 24.9.1

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1.138 distlib 0.3.9

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
Foundation (PSF, see http://www.python.org/psf/) was formed, a
non-profit organization created specifically to own Python-related
Intellectual Property. Zope Corporation is a sponsoring member

of
the PSF.

All Python releases are Open Source (see http://www.opensource.org for
the Open Source Definition). Historically, most, but not all, Python
releases have also been GPL-compatible; the table below summarizes
the various releases.

Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
2.2.3	2.2.2	2003	PSF	yes
2.3	2.2.2	2002-2003	PSF	yes
2.3.1	2.3	2002-2003	PSF	yes
2.3.2	2.3.1	2002-2003	PSF	yes
2.3.3	2.3.2	2002-2003	PSF	yes
2.3.4	2.3.3	2004	PSF	yes
2.3.5	2.3.4	2005	PSF	yes
2.4	2.3	2004	PSF	yes
2.4.1	2.4	2005	PSF	yes
2.4.2	2.4.1	2005	PSF	yes
2.4.3	2.4.2	2006	PSF	yes
2.4.4	2.4.3	2006	PSF	yes
2.5	2.4	2006	PSF	yes
2.5.1	2.5	2007	PSF	yes
2.5.2	2.5.1	2008	PSF	yes
2.5.3	2.5.2	2008	PSF	yes
2.6	2.5	2008	PSF	yes
2.6.1	2.6	2008	PSF	yes
2.6.2	2.6.1	2009	PSF	yes
2.6.3	2.6.2	2009	PSF	yes
2.6.4	2.6.3	2009	PSF	yes
2.6.5	2.6.4	2010	PSF	yes
3.0	2.6	2008	PSF	yes

3.0.1	3.0	2009	PSF	yes
3.1	3.0.1	2009	PSF	yes
3.1.1	3.1	2009	PSF	yes
3.1.2	3.1	2010	PSF	yes
3.2	3.1	2010	PSF	yes

Footnotes:

(1) GPL-compatible doesn't mean that we're distributing Python under
  the GPL. All Python licenses, unlike the GPL, let you distribute
  a
 modified version without making your changes open source. The
  GPL-compatible licenses make it possible to combine Python with
  other software that is released under the GPL; the others don't.

(2) According to Richard Stallman, 1.6.1 is not GPL-compatible,
  because its license has a choice of law clause. According to
  CNRI, however, Stallman's lawyer has told CNRI's lawyer that 1.6.1
  is "not incompatible" with the GPL.

Thanks to the many outside volunteers who have worked under Guido's
direction to make these releases possible.

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===

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1.139 humanize 4.11.0

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1.148 pyjwt 2.10.1
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ASN.1 library for Python

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This is a free and open source implementation of ASN.1 types and codecs
as a Python package. It has been first written to support particular
protocol (SNMP) but then generalized to be suitable for a wide range
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NOTE:
 The package is now maintained by *Christian Heimes* and
Simon Pichugin in project https://github.com/pyasn1/pyasn1.

Features
----

* Generic implementation of ASN.1 types (X.208)
* Standards compliant BER/CER/DER codecs
* Can operate on streams of serialized data
* Dumps/loads ASN.1 structures from Python types
* 100% Python, works with Python 3.8+
* MT-safe
* Contributed ASN.1 compiler [Asn1ate](https://github.com/kimgr/asn1ate)

Why using pyasn1

ASN.1 solves the data serialisation problem. This solution was
designed long ago by the wise Ancients. Back then, they did not
have the luxury of wasting bits. That is why ASN.1 is designed

to serialise data structures of unbounded complexity into
something compact and efficient when it comes to processing
the data.

That probably explains why many network protocols and file formats
still rely on the 30+ years old technology.
 Including a number of
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Quite a number of books cover the topic of ASN.1.
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complicated ASN.1 system and to represent it on the Python terms.

How to use pyasn1

With pyasn1 you can build Python objects from ASN.1 data structures.
For example, the following ASN.1 data structure:

```bash
Record ::= SEQUENCE {
 id      INTEGER,
 room  [0] INTEGER OPTIONAL,
 house [1] INTEGER DEFAULT 0
}
```

Could be expressed in pyasn1 like this:

```python
class Record(Sequence):
  componentType = NamedTypes(
    NamedType('id', Integer()),
    OptionalNamedType(
       'room', Integer().subtype(
          implicitTag=Tag(tagClassContext, tagFormatSimple, 0)
       )
    ),
    DefaultedNamedType(
       'house', Integer(0).subtype(
          implicitTag=Tag(tagClassContext, tagFormatSimple, 1)
       )
```

```
    )
  )
```

It is in the spirit of ASN.1 to take abstract data description
and turn it into a programming language specific form.
Once you have your ASN.1 data structure expressed in Python, you
can use it along the lines of similar Python type (e.g. ASN.1
`SET` is similar to Python `dict`, `SET OF` to `list`):

```python
>>> record = Record()
>>> record['id'] = 123
>>> record['room'] = 321
>>> str(record)
Record:
id=123
room=321
>>>
```

Part of the power of ASN.1 comes from its serialisation features. You
can serialise your data structure and send it over the network.

```python
>>> from pyasn1.codec.der.encoder import encode
>>> substrate = encode(record)
>>> hexdump(substrate)
00000:
 30 07 02 01 7B 80 02 01 41
```

Conversely, you can turn serialised ASN.1 content, as received from
network or read from a file, into a Python object which you can
introspect, modify, encode and send back.

```python
>>> from pyasn1.codec.der.decoder import decode
>>> received_record, rest_of_substrate = decode(substrate, asn1Spec=Record())
>>>
>>> for field in received_record:
>>>    print('{} is {}'.format(field, received_record[field]))
id is 123
room is 321
house is 0
>>>
>>> record == received_record
True
```

```
>>> received_record.update(room=123)
>>> substrate = encode(received_record)
>>> hexdump(substrate)
00000: 30 06 02 01 7B 80 01 7B
```

The pyasn1 classes struggle to emulate their Python prototypes (e.g. int,
list, dict etc.). But ASN.1 types exhibit more complicated behaviour.
To make life easier for a Pythonista, they can turn their pyasn1
classes into Python built-ins:

```python
>>> from pyasn1.codec.native.encoder import encode
>>> encode(record)
{'id': 123, 'room': 321,
 'house': 0}
```

Or vice-versa -- you can initialize an ASN.1 structure from a tree of
Python objects:

```python
>>> from pyasn1.codec.native.decoder import decode
>>> record = decode({'id': 123, 'room': 321, 'house': 0}, asn1Spec=Record())
>>> str(record)
Record:
id=123
room=321
>>>
```

With ASN.1 design, serialisation codecs are decoupled from data objects,
so you could turn every single ASN.1 object into many different
serialised forms. As of this moment, pyasn1 supports BER, DER, CER and
Python built-ins codecs. The extremely compact PER encoding is expected
to be introduced in the upcoming pyasn1 release.

More information on pyasn1 APIs can be found in the
[documentation](https://pyasn1.readthedocs.io/en/latest/pyasn1/contents.html),
compiled ASN.1 modules for different protocols and file formats
could be found in the pyasn1-modules
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Name: pyasn1
Version: 0.6.1
Summary: Pure-Python implementation of ASN.1 types and DER/BER/CER codecs (X.208)
Home-page: https://github.com/pyasn1/pyasn1
Author: Ilya Etingof
Author-email: etingof@gmail.com
Maintainer: pyasn1 maintenance organization
Maintainer-email: Christian Heimes <christian@python.org>
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Platform: any
Classifier: Development Status :: 5 - Production/Stable
Classifier: Environment :: Console
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```python
>>> from pyasn1.codec.native.decoder import decode
>>> record = decode({'id': 123, 'room':
 321, 'house': 0}, asn1Spec=Record())
>>> str(record)
Record:
id=123
room=321
>>>
```

With ASN.1 design, serialisation codecs are decoupled from data objects,
so you could turn every single ASN.1 object into many different
serialised forms. As of this moment, pyasn1 supports BER, DER, CER and
Python built-ins codecs. The extremely compact PER encoding is expected
to be introduced in the upcoming pyasn1 release.

More information on pyasn1 APIs can be found in the
[documentation](https://pyasn1.readthedocs.io/en/latest/pyasn1/contents.html),
compiled ASN.1 modules for different protocols and file formats
could be found in the pyasn1-modules
[repo](https://github.com/pyasn1/pyasn1-modules).

How to get pyasn1

The pyasn1 package is distributed under terms and conditions of 2-clause
BSD [license](https://pyasn1.readthedocs.io/en/latest/license.html). Source code is freely
available as a GitHub [repo](https://github.com/pyasn1/pyasn1).

You could `pip install pyasn1`
 or download it from [PyPI](https://pypi.org/project/pyasn1).

If something does not work as expected,
[open an issue](https://github.com/epyasn1/pyasn1/issues) at GitHub or
post your question [on Stack Overflow](https://stackoverflow.com/questions/ask)
or try browsing pyasn1
[mailing list archives](https://sourceforge.net/p/pyasn1/mailman/pyasn1-users/).

Found in path(s):
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/PKG-INFO
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1.egg-info/PKG-INFO
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Found in path(s):
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/docs/source/contents.rst
No license file was found, but licenses were detected in source scan.

[metadata]
name = pyasn1
version = attr: pyasn1.__version__
description = Pure-Python implementation of ASN.1 types and DER/BER/CER codecs (X.208)
long_description = file: README.md
long_description_content_type = text/markdown

```
license = BSD-2-Clause
license_files = LICENSE.rst
url = https://github.com/pyasn1/pyasn1
author = Ilya Etingof
author_email = etingof@gmail.com
maintainer = pyasn1 maintenance organization
maintainer_email = Christian Heimes <christian@python.org>
project_urls =
 Documentation=https://pyasn1.readthedocs.io
 Source=https://github.com/pyasn1/pyasn1
 Issues=https://github.com/pyasn1/pyasn1/issues
 Changelog=https://pyasn1.readthedocs.io/en/latest/changelog.html
platforms = any
classifiers =
 Development Status :: 5 - Production/Stable
 Environment :: Console
 Intended Audience :: Developers
 Intended Audience :: Education
 Intended Audience :: Information Technology
 Intended Audience :: System
 Administrators
 Intended Audience :: Telecommunications Industry
 License :: OSI Approved :: BSD License
 Natural Language :: English
 Operating System :: OS Independent
 Programming Language :: Python :: 3
 Programming Language :: Python :: 3.8
 Programming Language :: Python :: 3.9
 Programming Language :: Python :: 3.10
 Programming Language :: Python :: 3.11
 Programming Language :: Python :: 3.12
 Programming Language :: Python :: 3.13
 Programming Language :: Python :: Implementation :: CPython
 Programming Language :: Python :: Implementation :: PyPy
 Topic :: Communications
 Topic :: Software Development :: Libraries :: Python Modules

[options]
python_requires = >=3.8
zip_safe = True
setup_requires = setuptools
packages =
 pyasn1
 pyasn1.type
 pyasn1.compat
 pyasn1.codec
 pyasn1.codec.ber
 pyasn1.codec.cer
```

pyasn1.codec.der
pyasn1.codec.native

[egg_info]
tag_build =
tag_date = 0

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Found in path(s):
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/cer/__main__.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/cer/test_decoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/__main__.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/compat/__main__.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_namedval.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/debug.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/base.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/ber/decoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_opentype.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/__main__.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/useful.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/der/__main__.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/der/decoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/namedval.py
*
 /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/base.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/cer/decoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_univ.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/ber/test_encoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/native/__main__.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/test_debug.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/native/encoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/ber/encoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/native/test_decoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/univ.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_char.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_namedtype.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/__main__.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/cer/test_encoder.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/native/test_encoder.py
*
 /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/setup.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_useful.py
* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/constraint.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/error.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/tag.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/ber/__main__.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/native/decoder.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_tag.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/namedtype.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/opentype.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/error.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/ber/eoo.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/der/test_decoder.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/char.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/ber/test_decoder.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/type/tagmap.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/test_streaming.py

*

 /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/streaming.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/codec/der/test_encoder.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/cer/encoder.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/compat/integer.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/tests/type/test_constraint.py

* /pyasn1-0-6-1-1-tar-gz/pyasn1-0.6.1/pyasn1/codec/der/encoder.py

1.156 pyasn1-modules 0.4.1

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1.157 charset-normalizer 3.4.1

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1.158 oauthlib 3.2.2

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1.159 pycparser 2.22

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1.160 zipp 3.21.0

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1.161 dill 0.3.9

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1.162 wcwidth 0.2.13

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Markus Kuhn -- 2007-05-26 (Unicode 5.0)

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1.163 pynacl 1.5.0

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 /azure-core-1-32-0-sources-1-jar/com/azure/core/http/policy/BearerTokenAuthenticationPolicy.java
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* Indicates functionality that is in preview and as such is subject to change in non-backwards compatible ways in

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*

* Examples:

*

* {@literal @}Beta

* {@literal @}Beta(since="v1.0.0")

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1.174 @types/react 17.0.83

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1.175 pyjwt 2.4.0

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1.177 pyyaml 6.0.2
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1.178 poetry-core 1.9.1

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1.179 shellingham 1.5.4

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1.180 build 1.2.2.post1

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1.181 lazy-object-proxy 1.10.0

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1.182 billiard 4.2.1

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1.185 python-magic 0.4.27

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====

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1.186 pygments 2.19.1

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---input---
!%$^*__--__._+++===-crazy-symbol

---tokens---
'!%$^*__--__._+++===-crazy-symbol' Name.Variable
'\n'   Text.Whitespace
'# Step 1 of 3: from Hakaru to Maple LO (linear operator)\n' Comment.Single

'\n'   Text.Whitespace

'toLO'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'module'   Keyword
'()'   Punctuation
'\n '   Text.Whitespace
'export'   Keyword
'\n '   Text.Whitespace
'ModuleApply' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'm'   Name
','   Operator

```
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n    '      Text.Whitespace
'local'      Keyword
' '          Text.Whitespace
'h'          Name
';'          Punctuation
'\n    '      Text.Whitespace
'h'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'gensym'     Name
'('          Punctuation
'"'          Punctuation
'h'          Name
'"'          Punctuation
');'         Punctuation
'\n

    '        Text.Whitespace
'_Env_HakaruSolve' Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'false'      Name
';'          Punctuation
'\n    '      Text.Whitespace
'LO'         Name
'('          Punctuation
'h'          Name
','          Operator
' '          Text.Whitespace
'integrate'  Name
'('          Punctuation
'm'          Name
','          Operator
' '          Text.Whitespace
'h'          Name
','          Operator
' '          Text.Whitespace
'[]))'       Punctuation
'\n '        Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'proc'       Keyword
';'          Punctuation
'\n\n '      Text.Whitespace
```

```
'export'     Keyword
'\n '        Text.Whitespace
'integrate'  Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'proc'       Keyword
'('          Punctuation
'm'          Name
','          Operator
' '          Text.Whitespace
'h'
   Name
','          Operator
' '          Text.Whitespace
'loops'      Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'list'       Name
'('          Punctuation
'name'       Name
' '          Text.Whitespace
'='          Operator
' '          Text.Whitespace
'range'      Name
')'          Punctuation
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'[]'         Punctuation
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n   '      Text.Whitespace
'local'      Keyword
' '          Text.Whitespace
'x'          Name
','          Operator
' '          Text.Whitespace
'n'          Name
','          Operator
' '          Text.Whitespace
'i'          Name
','          Operator
' '          Text.Whitespace
'res'        Name
```

```
','            Operator
' '           Text.Whitespace
'l'           Name
','           Operator
' '           Text.Whitespace
'br'
              Name
','           Operator
' '           Text.Whitespace
'm0'          Name
';'           Punctuation
'\n\n   '     Text.Whitespace
'if'          Keyword
' '           Text.Whitespace
'm'           Name
' '           Text.Whitespace
'::'          Operator
' '           Text.Whitespace
'known_continuous' Name
' '           Text.Whitespace
'then'        Keyword
'\n      '    Text.Whitespace
'integrate_known' Name
'('           Punctuation
'Int'         Name
','           Operator
' '           Text.Whitespace
'Ints'        Name
','           Operator
' '           Text.Whitespace
'"""'         Punctuation
'xx'          Name
'"""'         Punctuation
','           Operator
' '           Text.Whitespace
'm'           Name
','           Operator
' '           Text.Whitespace
'h'           Name
','           Operator
' '           Text.Whitespace
'loops'       Name
')'           Punctuation
'\n   '       Text.Whitespace
'elif'        Keyword
' '           Text.Whitespace
'm'
```

```
          Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'known_discrete' Name
' '          Text.Whitespace
'then'       Keyword
'\n   '      Text.Whitespace
'integrate_known' Name
'('          Punctuation
'Sum'        Name
','          Operator
' '          Text.Whitespace
'Sums'       Name
','          Operator
' '          Text.Whitespace
'"'          Punctuation
'kk'         Name
'"'          Punctuation
','          Operator
' '          Text.Whitespace
'm'          Name
','          Operator
' '          Text.Whitespace
'h'          Name
','          Operator
' '          Text.Whitespace
'loops'      Name
')'          Punctuation
'\n   '      Text.Whitespace
'elif'       Keyword
' '          Text.Whitespace
'm'          Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'"'          Punctuation
'Ret'        Name
'('          Punctuation
'anything'   Name
')'
   Punctuation
'"'          Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n   '      Text.Whitespace
'applyintegrand' Name
'('          Punctuation
```

```
'h'          Name
','          Operator
' '          Text.Whitespace
'mk_ary'     Name
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'm'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'loops'      Name
'))'         Punctuation
'\n    '     Text.Whitespace
'elif'       Keyword
' '          Text.Whitespace
'm'          Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'"""'        Punctuation
'Bind'       Name
'('          Punctuation
'anything'   Name
','          Operator
' '          Text.Whitespace
'name'       Name
','          Operator
' '          Text.Whitespace
'anything'   Name
')'          Punctuation
'"""
```
  Punctuation
```
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'res'        Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'eval'       Name.Builtin
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'3'          Literal.Number.Integer
','          Operator
```

```
'm'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'op'         Name.Builtin
'('          Punctuation
'2'          Literal.Number.Integer
','          Operator
'm'          Name
')'          Punctuation
' '          Text.Whitespace
'='          Operator
' '          Text.Whitespace
'mk_idx'     Name
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'2'          Literal.Number.Integer
','          Operator
'm'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'loops'      Name
'));'        Punctuation
'\n
    '        Text.Whitespace
'res'        Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'eval'       Name.Builtin
'('          Punctuation
'Integrand'  Name
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'2'          Literal.Number.Integer
','          Operator
'm'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'"'          Punctuation
'integrate'  Name
'"'          Punctuation
'('          Punctuation
'res'        Name
```

```
','          Operator
' '          Text.Whitespace
'x'          Name
','          Operator
' '          Text.Whitespace
'loops'      Name
'))'         Punctuation
','          Operator
' '          Text.Whitespace
'x'          Name
'='          Operator
'h'          Name
');'         Punctuation
'\n    '     Text.Whitespace
'integrate'  Name
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'1'
             Literal.Number.Integer
','          Operator
'm'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'res'        Name
','          Operator
' '          Text.Whitespace
'loops'      Name
');'         Punctuation
'\n  '       Text.Whitespace
'elif'       Keyword
' '          Text.Whitespace
'm'          Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'"'          Punctuation
'specfunc'   Name
'('          Punctuation
'Msum'       Name
')'          Punctuation
'"'          Punctuation
' '          Text.Whitespace
'and'        Keyword
' '          Text.Whitespace
'('          Punctuation
'nops'       Name.Builtin
```

'('   Punctuation
'loops'   Name
')'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
' '   Text.Whitespace
'or'   Keyword
' '   Text.Whitespace
'nops'

          Name.Builtin
'('   Punctuation
'm'   Name
')'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'`+`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'map'   Name.Builtin
'('   Punctuation
'integrate' Name
','   Operator
' '   Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'm'   Name
')]'   Punctuation
','   Operator
' '   Text.Whitespace
'h'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
')))'   Punctuation
'\n   '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'm'   Name

```
' '         Text.Whitespace
'::'         Operator
'
'           Text.Whitespace
'"'         Punctuation
'Weight'     Name
'('         Punctuation
'anything'   Name
','         Operator
' '         Text.Whitespace
'anything'   Name
')'         Punctuation
'"'         Punctuation
' '         Text.Whitespace
'then'       Keyword
'\n   '     Text.Whitespace
'foldl'      Name
'('         Punctuation
'product'    Name
','         Operator
' '         Text.Whitespace
'op'         Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'op'         Name.Builtin
'('         Punctuation
'loops'      Name
'))'         Punctuation
' '         Text.Whitespace
'*'         Operator
' '         Text.Whitespace
'integrate'  Name
'('         Punctuation
'op'         Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'm'
            Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'h'         Name
```

','	Operator
' '	Text.Whitespace
'loops'	Name
')'	Punctuation
'\n '	Text.Whitespace
'elif'	Keyword
' '	Text.Whitespace
'm'	Name
' '	Text.Whitespace
'::'	Operator
' '	Text.Whitespace
't_pw_or_part'	Name
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'Partition'	Name
':'	Operator
'-'	Operator
'AppPartOrPw'	Name
'\n '	Text.Whitespace
'('	Punctuation
' '	Text.Whitespace
'proc'	Keyword
'('	Punctuation
'p'	Name
')'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'not'	Keyword
' '	Text.Whitespace
'Partition'	Name
':'	Operator
'-'	Operator
'ConditionsDepend'	
' Name	
'('	Punctuation
'p'	Name
','	Operator
' '	Text.Whitespace
'lhs'	Name.Builtin
'~'	Operator
'('	Punctuation
'loops'	Name
'))'	Punctuation
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace

```
'Partition'   Name
':'           Operator
'-'           Operator
'Pmap'        Name
'('           Punctuation
'z'           Name
'->'          Operator
'integrate'   Name
'('           Punctuation
'z'           Name
','           Operator
'h'           Name
','           Operator
'loops'       Name
')'           Punctuation
','           Operator
'p'           Name
')'           Punctuation
'\n                  ' Text.Whitespace
'end'         Keyword
' '           Text.Whitespace
'if'          Keyword
';'           Punctuation
'\n                ' Text.Whitespace
'end'         Keyword
' '           Text.Whitespace
'proc'        Keyword
'\n              '
 Text.Whitespace
','           Operator
' '           Text.Whitespace
'm'           Name
','           Operator
' '           Text.Whitespace
'['           Punctuation
'"'           Punctuation
'no_split_disj' Name
'"'           Punctuation
']);'         Punctuation
'\n   '       Text.Whitespace
'elif'        Keyword
' '           Text.Whitespace
'm'           Name
' '           Text.Whitespace
'::'          Operator
' '           Text.Whitespace
't_case'      Name
' '           Text.Whitespace
```

'and'   Keyword
' '   Text.Whitespace
'not'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'map'   Name.Builtin
'('   Punctuation
'lhs'   Name.Builtin
','   Operator
' '   Text.Whitespace
'loops'
      Name
'))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'subsop'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
'='   Operator
'map'   Name.Builtin
'('   Punctuation
'proc'   Keyword
'('   Punctuation
'b'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'Branch'   Name
'('   Punctuation
'anything'   Name
','   Operator
' '   Text.Whitespace
'anything'   Name
'))'   Punctuation
'\n   ' Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'subsop'   Name.Builtin

'('   Punctuation
'2'   Literal.Number.Integer
'='   Operator
'"'   Punctuation
'integrate' Name
'"'   Punctuation
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','

       Operator
'b'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
')'   Punctuation
','   Operator
'b'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator
'h'   Name
')'   Punctuation
\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
\n   ' Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'm'   Name
'))'   Punctuation
','   Operator
\n   ' Text.Whitespace
'm'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'elif'   Keyword

```
' '         Text.Whitespace
'm'         Name
' '         Text.Whitespace
'::'
        Operator
' '         Text.Whitespace
'"'         Punctuation
'LO'        Name
'('         Punctuation
'name'      Name
','         Operator
' '         Text.Whitespace
'anything'  Name
')'         Punctuation
'"'         Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'eval'      Name.Builtin
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'h'         Name
')'         Punctuation
'\n   '     Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'm'
 Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'"'         Punctuation
```

```
'Plate'      Name
'('          Punctuation
'nonnegint'  Name
','          Operator
' '          Text.Whitespace
'name'       Name
','          Operator
' '          Text.Whitespace
'anything'   Name
')'          Punctuation
'"'          Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n   '      Text.Whitespace
'# Unroll Plate when the bound is known. We unroll Plate here (instead\n' Comment.Single

'    '       Text.Whitespace
'# of unrolling Ints in reduce, for example) because we have no other\n' Comment.Single

'    '       Text.Whitespace
"# way to integrate certain Plates, namely those whose bodies' control\n" Comment.Single

'    '       Text.Whitespace
'# flows depend on the index.\n' Comment.Single

'    '       Text.Whitespace
'x'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'mk_sym'
    Name
'('          Punctuation
'"'          Punctuation
'pp'         Name
'"'          Punctuation
','          Operator
' '          Text.Whitespace
'h'          Name
');'         Punctuation
'\n   '      Text.Whitespace
'x'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'['          Punctuation
'seq'        Name.Builtin
'('          Punctuation
```

'cat'   Name.Builtin
'('   Punctuation
'x'   Name
','   Operator
'i'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'i'   Name
'='   Operator
'0'   Literal.Number.Integer
'..'   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
')];'   Punctuation
'\n   '   Text.Whitespace
'if'

        Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'undefined' Name
';'   Punctuation
'\n   '   Text.Whitespace
'else'   Keyword
'\n   '   Text.Whitespace
'if'   Keyword

```
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
' '         Text.Whitespace
'then'
            Keyword
'\n      '  Text.Whitespace
'res'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'x'         Name
');'        Punctuation
'\n    '    Text.Whitespace
'else'      Keyword
'\n    '    Text.Whitespace
'res'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'idx'       Name
'('         Punctuation
'x'         Name
','         Operator
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'm'         Name
'));'       Punctuation
'\n'        Text.Whitespace

'#      res := piecewise(seq(op([op(2,m)=i-1, op(i,x)]), i=2..op(1,m)),\n' Comment.Single

'#               op(1,x));\n' Comment.Single
```

```
'    '    Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'if'
          Keyword
';'        Punctuation
'\n    '  Text.Whitespace
'res'      Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'mk_idx'   Name
'('        Punctuation
'res'      Name
','        Operator
' '        Text.Whitespace
'loops'    Name
');'       Punctuation
'\n    '  Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'if'       Keyword
';'        Punctuation
'\n    '  Text.Whitespace
'res'      Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'applyintegrand' Name
'('        Punctuation
'h'        Name
','        Operator
' '        Text.Whitespace
'mk_ary'   Name
'('        Punctuation
'"'        Punctuation
'ary'      Name
'"'        Punctuation
'('        Punctuation
'op'       Name.Builtin
'('        Punctuation
'1'        Literal.Number.Integer
','        Operator
'm'        Name
')'
          Punctuation
','        Operator
' '        Text.Whitespace
```

```
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'res'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'loops'     Name
'));'       Punctuation
'\n    '    Text.Whitespace
'for'       Keyword
' '         Text.Whitespace
'i'         Name
' '         Text.Whitespace
'from'      Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
' '         Text.Whitespace
'to'        Keyword
' '         Text.Whitespace
'1'         Literal.Number.Integer
' '         Text.Whitespace
'by'        Keyword
' '         Text.Whitespace
'-'         Operator
'1'
            Literal.Number.Integer
' '         Text.Whitespace
'do'        Keyword
'\n    '    Text.Whitespace
'res'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'integrate' Name
'('         Punctuation
'eval'      Name.Builtin
'('         Punctuation
```

'op'   Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
'='   Operator
'i'   Name
'-'   Operator
'1'   Literal.Number.Integer
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'Integrand'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name
','

        Operator
'x'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'res'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'loops'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'res'   Name
'\n   '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace

'm'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'Plate'   Name
'('   Punctuation
'anything'   Name
','   Operator
' '   Text.Whitespace
'name'   Name
','   Operator
' '   Text.Whitespace
'anything'   Name
')'   Punctuation
'"'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'integrate'
  Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'h'   Name
','   Operator
' '   Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
'='   Operator
'0'   Literal.Number.Integer
'..'   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'm'   Name

')'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'loops'   Name
')])'   Punctuation
'\n   '   Text.Whitespace
'elif'

        Keyword
' '   Text.Whitespace
'm'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"""'   Punctuation
'Context'   Name
'('   Punctuation
'anything' Name
','   Operator
' '   Text.Whitespace
'anything' Name
')'   Punctuation
'"""'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'applyop'   Name
'('   Punctuation
'integrate' Name
','   Operator
' '   Text.Whitespace
'2'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'm'   Name
','   Operator
' '   Text.Whitespace
'h'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace

```
'h'         Name
' '         Text.Whitespace
'::'        Operator
' '

        Text.Whitespace
'appliable'  Name
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'x'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'gensym'    Name
'('         Punctuation
'"'         Punctuation
'xa'        Name
'"'         Punctuation
');'        Punctuation
'\n    '    Text.Whitespace
'"'         Punctuation
'integrate' Name
'"'         Punctuation
'('         Punctuation
'm'         Name
','         Operator
' '         Text.Whitespace
'Integrand' Name
'('         Punctuation
'x'         Name
','         Operator
' '         Text.Whitespace
'h'         Name
'('         Punctuation
'x'         Name
'))'        Punctuation
','         Operator
' '         Text.Whitespace
'loops'     Name
')'         Punctuation
'\n    '    Text.Whitespace
'else'      Keyword
'\n    '    Text.Whitespace
'"'         Punctuation
'procname'  Name
'(_'

        Punctuation
'passed'    Name
```

')'	Punctuation
'"'	Punctuation
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'proc'	Keyword
';'	Punctuation
'\n\n\n '	Text.Whitespace
'local'	Keyword
'\n '	Text.Whitespace
'integrate_known'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'proc'	Keyword
'('	Punctuation
'make'	Name
','	Operator
' '	Text.Whitespace
'makes'	Name
','	Operator
' '	Text.Whitespace
'var'	Name
','	Operator
' '	Text.Whitespace
'm'	Name
','	Operator
' '	Text.Whitespace
'h'	Name
','	Operator
' '	Text.Whitespace
'loops'	Name
' '	Text.Whitespace
'::'	Operator
'	
'	Text.Whitespace
'list'	Name
'('	Punctuation
'name'	Name
'='	Operator
'range'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace

'$'   Operator

')'   Punctuation

\n   '   Text.Whitespace

'local'   Keyword

' '   Text.Whitespace

'x'   Name

','   Operator

' '   Text.Whitespace

'dens'   Name

','   Operator

' '   Text.Whitespace

'bds'   Name

';'   Punctuation

\n   '   Text.Whitespace

'x'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'mk_sym'   Name

'('   Punctuation

'var'   Name

','   Operator

' '   Text.Whitespace

'h'   Name

');'   Punctuation

\n   '   Text.Whitespace

'dens'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'density'   Name

'['   Punctuation

'op'

       Name.Builtin

'('   Punctuation

'0'   Literal.Number.Integer

','   Operator

'm'   Name

')]('   Punctuation

'op'   Name.Builtin

'('   Punctuation

'm'   Name

'));'   Punctuation

\n   '   Text.Whitespace

'bds'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'bounds'   Name
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'm'   Name
')]('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'm'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'loops'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'[]'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'make'   Name
'('

            Punctuation
'dens'   Name
'('   Punctuation
'x'   Name
')'   Punctuation
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'applyintegrand' Name
'('   Punctuation
'h'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'x'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'bds'   Name
');'   Punctuation

'\n   '   Text.Whitespace
'else'   Keyword
'\n   '   Text.Whitespace
'makes'   Name
'('   Punctuation
'foldl'   Name
'('   Punctuation
'product'   Name
','   Operator
' '   Text.Whitespace
'dens'   Name
'('   Punctuation
'mk_idx'   Name
'('   Punctuation
'x'   Name
','   Operator
'loops'   Name
'))'   Punctuation
','

    Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'loops'   Name
'))'   Punctuation
'\n   ' Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'applyintegrand' Name
'('   Punctuation
'h'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace
'bds'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace

'if'   Keyword

';'   Punctuation

'\n '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'proc'   Keyword

';'   Punctuation

'\n'   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'module'   Keyword

';'

        Punctuation

' '   Text.Whitespace

'#toLO\n'   Comment.Single

```
# Teach Maple (through depends and eval) about our new binding forms.
# forall bind from 1st arg to 2nd arg.
# Ints,Sums,ints,sums bind from 2nd arg to 1st arg, and also from each element
#   of the 4th arg to the other elements on the left and to the 3rd arg.

`depends/forall` := proc(bvar, pred, x, $)
 depends(pred, x minus convert(bvar, 'set'))
end proc:

`depends/Ints` := proc(body, bvar, rng, loops, x, y, $)
 local xx, i;
 if nargs = 5 then
   xx := x; # y is ununsed and x lists the variables to look for
 else
   xx := y; # x is some KB and y lists the variables to look for
   if depends(x, y) then return true end if;
 end if;
 # don't remove bvar from xx!
 if depends(body, xx minus {bvar}) then return true end if;
 for i from nops(loops) to 1 by -1 do
   if depends(op([i,2],loops), xx) then return true end if;
   xx := xx minus {op([i,1],loops)};
 end do;
 depends(rng, xx)
end proc:
`depends/Sums` := eval(`depends/Ints`):
`depends/ints` := eval(`depends/Ints`):
`depends/sums`
 := eval(`depends/Ints`):

`eval/forall` := proc(e, eqs, $)
 local bvar, pred;
```

```
  bvar, pred := op(e);
  eval(op(0,e), eqs)(BindingTools:-generic_evalat(bvar, pred, eqs))
end proc:


`eval/Ints` := proc(e, eqs, $)
 local body, bvar, rng, loops, n, i;
 body, bvar, rng, loops := op(1..4, e);
 bvar, body := BindingTools:-generic_evalat(bvar, body, eqs);
 eval(op(0,e), eqs)(body, bvar,
                BindingTools:-generic_evalatstar(rng, loops, eqs),
                op(5..-1,e))
end proc:
`eval/Sums` := eval(`eval/Ints`):
`eval/ints` := eval(`eval/Ints`):
`eval/sums` := eval(`eval/Ints`):


`eval/Int` := proc(e, eqs, $)
 local body, bound, bvar;
 body, bound := op(1..2, e);
 if bound :: name then
   bound, body := BindingTools:-generic_evalat(bound, body, eqs);
 elif bound :: `=` then
   bvar := lhs(bound);
   bvar, body := BindingTools:-generic_evalat(bvar, body, eqs);
   bound := bvar = eval(rhs(bound), eqs);
 else
   body, bound := BindingTools:-generic_evalatstar(body,
 bound, eqs);
 end if;
 eval(op(0,e), eqs)(body, bound, op(eval([op(3..-1,e)], eqs)))
end proc:
`eval/Sum`    := eval(`eval/Int`):
`eval/Product` := eval(`eval/Int`):
`eval/int`    := eval(`eval/Int`):
`eval/sum`     := eval(`eval/Int`):
`eval/product` := eval(`eval/Int`):


#############################################################################


Loop := module ()
 option package;
 local intssums, enter_piecewise, wrap,
      t_peel, do_peel, do_split, do_graft, do_rebase_lower, do_rebase_upper,
      Binder, Stmt, t_binder, t_stmt, t_exp,
      ModuleLoad;
 export
   # These first few are smart constructors (for themselves):
     ints, sums,
```

```
      # while these are "proper functions"
        mk_HArray, genLoop, unproducts, unproduct,
        peel, split, graft, rebase_lower, rebase_upper, Print;
# these names are not assigned (and should not be).  But they are
# used as global names, so document that here.
global Ints, Sums, csgn, sum, signum;
 uses Hakaru, KB, Utilities;


t_binder := 'Binder(identical(product, Product, sum, Sum), t_kb)';
t_stmt  := 'Stmt(anything, list, list)';
t_exp   := '{Stmt(identical(exp), [], []),
          Stmt(identical(`^`), [anything], [])}';


ints := proc() intssums('ints', 'int', _passed) end proc;
sums := proc() intssums('sums', 'sum', _passed) end proc;


Print := proc(kind::identical(Ints,Sums,ints,sums),e,v::name,r0::range,rs::list(name=range),$)
  local k;
  k := StringTools[Capitalize](StringTools[Chop](convert(kind,string)));
  k := parse(cat("`print/",eval(k),"`"));
  eval(k)(e,v[op(rs)]=r0);
end proc;


intssums := proc(makes::name, make::name,
            e::anything, x::name, rr::range, ll::list(name=range),
            kb::t_kb:=empty, $)
  local t, r, l, kb2, w0, pp, i;
  t := `if`(make=int, HReal(open_bounds(rr)), HInt(closed_bounds(rr)));
  r, l, kb2 := genLoop(rr, ll, kb, 'Integrand'(x,e));
  w0, pp := unproducts(e, x, l,
kb2);
  if depends(w0, x) then
    'makes(e, x, rr, ll)'
  else
    pp := 'make'(pp, x=r);
    for i in l do pp := 'product'(pp, i) end do;
    NewSLO:-simplify_factor_assuming(w0 * pp, kb);
  end if
end proc;


mk_HArray := proc(t::t_type, loops::list(name=range), $)
  local res, i;
  res := t;
  for i in loops do res := HArray(res) end do;
  res
end proc;


genLoop := proc(e, loops::list(name=range), kb::t_kb)
```

```
  local kb1, rng, ind, do_subst, i;
 kb1 := kb;
 rng := table();
 ind := table();
 do_subst := e -> foldl((((e,eq) -> eval(e, op([lhs(eq),1],loops)=rhs(eq))),
                 e, entries(ind, 'pairs'));
 for i from nops(loops) to 1 by -1 do
   rng[i] := do_subst(op([i,2],loops));
   ind[i], kb1 := genType(op([i,1],loops), HInt(closed_bounds(rng[i])),
                    kb1, _rest);
 end do;
 do_subst(e), zip(`=`, [entries(ind, 'nolist')],
                 [entries(rng, 'nolist')]), kb1
end
proc;


unproducts := proc(w, x::name, loops::list(name=range), kb::t_kb, $)
 local w0, pp, j, w1, w2, loop;
 w0 := 1;
 pp := w;
 for j from nops(loops) to 1 by -1 do
   w1, pp := op(unproduct(pp, x, op(j,loops), [], `*`, kb, kb));
   # separate out each of the factors in w1, as they might have different
   # variable dependencies, which can be exploited by other routines
   w2 := convert(w1, 'list', `*`);
   for loop in [op(j+1..-1, loops)] do
     w2 := map((w -> product(eval(w, x=idx(x,lhs(loop))), loop)), w2);
   end do;
   w0 := w0 * `*`(op(w2));
   # w0 := w0 * foldl(product, w1, op(j+1..-1, loops));
 end do;
 # Rewrite ... * piecewise(i<=kk-1, xs^2, 1)
 #     to ... * xs ^ (2*piecewise(i<=kk-1, 1))
 # because the latter is easier to integrate and recognize with respect to xs
 pp := for_poly(pp, # TODO: move this rewrite into eval_factor (then remove for_poly?)?
   proc (p)
     local n, s, r;
     if p :: 'And(specfunc(piecewise),
anyfunc(freeof(x), anything, 1))' then
       n := indets(op(1,p),name);
       if op(2,p) :: {'exp(anything)', `^`('(freeof'(n),'anything')} then
         s, r := selectremove(depends, convert(op([2,-1],p),'list',`*`), n);
         subsop(-1 = `*`(piecewise(op(1,p), `*`(op(s))), op(r)), op(2,p))
       else
         s, r := selectremove(depends, convert(op(2,p),'list',`*`), n);
         `*`(op(r)) ^ piecewise(op(1,p), 1)
           * `if`(nops(s) > 0, piecewise(op(1,p), `*`(op(s)), 1), 1)
       end if
```

```
        else
          p
        end if
      end proc);
  w0, pp
end proc;


# Find [w1,pp] so that
#   wrap(heap,w,mode,kb1,kb0)
#   = w1*product(eval(pp,var=idx(var,lhs(loop))),loop)
# making w1 depend on var as little as possible.
# The flag "mode" should be `+` if "heap" contains an entry of the form
# t_exp, or `*` otherwise.
unproduct := proc(w, var::name, loop::(name=range),
                heap::list, mode::identical(`*`,`+`),
                  kb1::t_kb, kb0::t_kb, $)
  local ind, res, dummy, kb, kbThen, i, w1, pp, s, r, x;
  if not depends(w, var) then
    return [wrap(heap, w, mode, kb1, kb0), 1]
  end if;
  # The `..' (indices) of all occurences of `idx(var,..)'
  ind := map2(op, 2, indets(w, 'idx(identical(var), anything)'));
  if nops(ind) = 1 then
    ind := op(ind);
    # Make sure ind contains no bound variables before lifting it!
    # So, check that "extract using indets" and "rename using eval" commute.
    s := indets(ind, 'name');
    s := map(proc(x,$) local y; `if`(depends(ind,x), x=y, NULL) end proc, s);
    if indets(eval(w, s), 'idx(identical(var), anything)')
          = {idx(var, eval(ind, s))} then
      # use kb as a local context, and 'solve' for the innermost bound var
      #   used in ind.
      kb  := assert(lhs(loop)=ind, kb1); # BUG! bijectivity assumed!
      # if the assertion makes the KB false, it isn't needed(?)
        ASSERT(type(kb, t_kb),
         sprintf("assert(%a,%a) produced a false KB!\n", lhs(loop)=ind,kb1)):
      res := subs(idx(var,ind) = idx(var,lhs(loop)), w);
      res := wrap(heap, res, mode, kb, kb0);
      res := subs(idx(var,lhs(loop))=dummy, res);
      if not depends(res, var) then
        return [1, subs(dummy=var, res)]
      end if
    end if
  end if;
  # distribute the unproduct over each part
  if w :: mode then
    res := map(unproduct, `if`(mode=`*`, list_of_mul(w), [op(w)]),
          var, loop, heap, mode, kb1, kb0);
```

```
      return [`*`(op(map2(op,1,res))), `*`(op(map2(op,2,res)))]
    end if;
    # for piecewise, just map right in (using KB for context tracking)
    if w :: 'specfunc(piecewise)' then
      kb := kb1;
      for i from 1 to nops(w) do
        if i :: even then
          kbThen := assert(    op(i-1,w) , kb);
          # accumulate the rest, regardless
          kb     := assert(Not(op(i-1,w)), kb);

          # if kbThen
is invalid, deal appropriately
          if not type(kbThen,t_kb) then next end if;

          w1[i], pp[i] := op(unproduct(op(i,w),var,loop,heap,mode,kbThen,kb0));
          # if kb is inconsistent, we're done
          if not type(kb,t_kb) then break end if;
        elif i = nops(w) then
          if not type(kb,t_kb) then next end if;
          w1[i], pp[i] := op(unproduct(op(i,w),var,loop,heap,mode,kb    ,kb0))
        end if
      end do;
      return [`*`(entries(w1,'nolist')), `*`(entries(pp,'nolist'))]
    end if;
    if mode = `*` then
      if w :: (anything^freeof(var)) then
        return unproduct(op(1,w), var, loop,
                  [op(heap), Stmt(`^`, [], [op(2,w)])], `*`, kb1, kb0)
      elif w :: exp(anything) then
        return unproduct(op(1,w), var, loop,
                  [op(heap), Stmt(exp, [], [])], `+`, kb1, kb0)
      elif w :: (freeof(var)^anything) then
        return unproduct(op(2,w), var, loop,
                  [op(heap), Stmt(`^`,
[op(1,w)], [])], `+`, kb1, kb0)
      end if
    end if;
    if mode = `+` and w :: `*` then
      s, r := selectremove(depends, w, var);
      if s :: `*` then
        # Nonlinear %1 (time to reread kiselyov-lifted?)
      else
        return unproduct(s, var, loop,
                  [op(heap), Stmt(`*`, [], [r])], `+`, kb1, kb0)
      end if
    end if;
    if w :: And(specfunc(`if`(mode = `*`, {product, Product}, {sum, Sum})),
```

```
           anyfunc(anything, name=range(freeof(var)))) then
      x, kb := genType(op([2,1],w), HInt(closed_bounds(op([2,2],w)))), kb1,
                w, var, loop, heap);
      return unproduct(eval(op(1,w), op([2,1],w)=x), var, loop,
                [op(heap), Binder(op(0,w), kb1)], mode, kb, kb0)
    end if;
    if mode = `*` and w :: '{`+`, specfunc({sum, Sum})}' then
      # Maybe this w is one of those big sums involving products that are
      # always equal to 1, left behind by the density of Categorical
      w1 := graft(split(peel(w)));
       w1 := combine(rebase_upper(w1));
      w1 := combine(rebase_lower(w1));
      return [wrap(heap, w1, mode, kb1, kb0), 1]
    end if;
    return [wrap(heap, w, mode, kb1, kb0), 1]
  end proc;

  enter_piecewise := proc(ee, kb0::t_kb, mode::identical(`*`,`+`), $)
    local e, kb, mo;
    e  := ee;
    kb := kb0;
    mo := mode();
    while e :: 'specfunc(piecewise)' and nops(e) = 3 do
      if op(3,e) = mo then
        kb := assert(op(1,e), kb);
        e := op(2,e);
      elif op(2,e) = mo then
        kb := assert(Not(op(1,e)), kb);
        e := op(3,e);
      else
        break;
      end if;
    end do;
    ASSERT(type(kb,t_kb), "enter_piecewise: KB of piecewise conditions is not valid, so the input piecewise must
not be valid.");
    e, kb
  end proc;


  # heap is a list of t_binder and t_stmt
  # one invariant to maintain:
  #  wrap(heap, mode(a,b)) = wrap(heap,a) * wrap(heap,b)

  # Also, a t_binder is a Product/product/Sum/sum.
  # And, a t_stmt is a 1-hole
  context of a (multiplicative) AST,
  #   used for [a ^ hole, hole ^ b, exp(hole), c * hole].

  wrap := proc(heap::list, e1, mode1::identical(`*`,`+`),
```

```
        kb1::t_kb, kb0::t_kb, $)
  local e, kb, mode, i, entry, rest, var, new_rng, make, logmake,
     dom_spec, w, wPow, wExp, arrrgs;
  e    := e1;
  kb   := kb1;
  mode := mode1;
  for i from nops(heap) to 1 by -1 do
    entry := op(i,heap);
    if entry :: t_binder then
      if not (op(1,entry) in `if`(mode=`+`, {sum,Sum},
                                   {product,Product})) then
        print("Warning: heap mode inconsistency", heap, mode1)
      end if;
      e, kb := enter_piecewise(e, kb, mode);
      rest := kb_subtract(kb, op(2,entry));
      new_rng, rest := selectremove(type, rest,
        {[identical(genType), name, specfunc(HInt)],
         [identical(genLet), name, anything]});
      if not (new_rng :: [list]) then
        error "kb_subtract should return exactly
one gen*"
      end if;
      new_rng := op(new_rng);
      var     := op(2,new_rng);
      if op(1,new_rng) = genType then
        make    := op(1,entry);
        new_rng := range_of_HInt(op(3,new_rng));
      else # op(1,new_rng) = genLet
        make    := eval;
        new_rng := op(3,new_rng);
      end if;
      dom_spec, rest := selectremove(depends,
        map(proc(a::[identical(assert),anything],$) op(2,a) end proc, rest),
        var);

      # Like e := make(piecewise(And(op(dom_spec)), e, mode()), var=new_rng);
      # but try to simplify by pushing the make and the piecewise into e
      (e, w) := selectremove(depends, convert(e, 'list', `*`), var);
      w := `*`(op(w));
      if mode = `*` then
        (wPow, e) := selectremove(type, e, `^`('freeof'(var), 'anything'));
        (wExp, e) := selectremove(type, e, 'exp(anything)');
        wExp := `+`(op(map2(op, 1, wExp)));
        wExp := expand(wExp, op(indets(wExp, function)));
        logmake := proc(t)
         local s, r;
         s, r := selectremove(depends, convert(t, 'list', `*`), var);
         `*`(op(r),
```

```
             `if`(make=eval,eval,Sum)
                 (piecewise_And(dom_spec, `*`(op(s)), 0), var=new_rng));
            end proc;
           w := `*`( `if`(w = 1, 1, w ^ logmake(1))
                 , op(map((f -> op(1,f) ^ logmake(op(2,f))), wPow))
                 , `if`(wExp = 0, 1, exp(maptype(`+`,logmake,wExp))) );
         end if;
         e := w * make(piecewise_And(dom_spec, `*`(op(e)), mode()), var=new_rng);

         # `rest' originally comes from `entry', and this reinserts it after some
         # processing. The original KB was valid, so this one should also be valid.
         kb := foldr(assert, op(2,entry), op(rest));
         ASSERT(type(kb,t_kb), "Loop/wrap{t_binder}: rebuilding kb produced contradiction");

     elif entry :: t_stmt then
         # We evaluate arrrgs first, in case op(1,stmt) is an operation (such
as
         # piecewise) that looks ahead at how many arguments it is passed before
         # they are evaluated.
         arrrgs := op(op(2,entry)), e, op(op(3,entry));
         e      := op(1,entry)(arrrgs);
         if entry :: t_exp then
           if mode <> `+` then
             print("Warning: heap mode inconsistency?", heap, mode1)
           end if;
            mode := `*`;
          end if
       else error "Malformed heap entry %1", entry end if
     end do;
     if mode <> `*` then
       print("Warning: heap mode inconsistency??", heap, mode1)
     end if;
     e, kb := enter_piecewise(e, kb, mode);
     rest := kb_subtract(kb, kb0);
     rest := map(proc(a::[identical(assert),anything],$) op(2,a) end proc, rest);
     (wExp, e) := selectremove(type, convert(e, 'list', `*`), 'exp(anything)');
     wExp := `+`(op(map2(op, 1, wExp)));
     wExp := expand(wExp, op(indets(wExp, function)));
     logmake := (t -> t * piecewise_And(rest,1,0));
     `if`(wExp = 0, 1, exp(maptype(`+`,logmake,wExp)))

       * piecewise_And(rest,`*`(op(e)),1);
   end proc;

# Rewrite product(...piecewise(i+42=lo+42,th,el)...,i=lo..hi)
# to eval(...th...,i=lo)*product(...el...,i=lo+1..hi)
t_peel := 'And(specfunc({sum,Sum,product,Product}),
          anyfunc(anything, name=range))';
```

```
peel := proc(e, $)
  subsindets(e, t_peel, do_peel);
end proc;
do_peel := proc(e, $)
  local make, body, x, r, cond, line, test, x0, r0, cond0, here, rest;
  if not (e :: t_peel) then return e end if;
  if  op(0,e) in '{sum    ,Sum    }' then make := `+`;
  elif op(0,e) in '{product,Product}' then make := `*`; end if;
  body, r := op(e);
  x, r    := op(r);
  for cond in indets(body, '{`=`(algebraic),`<`,`<=`}') do
    line := `-`(op(cond));
    if 1 <> degree(line, x) then next end if;
    if cond :: `=` then
      cond0 := true;
      if Testzero(eval(line, x=lhs(r))) then
        x0 := lhs(r); r0 := applyop(`+`, 1, r, 1);
      elif Testzero(eval(line, x=rhs(r))) then

    x0 := rhs(r); r0 := applyop(`-`, 2, r, 1);
      else next end if;
    else
      test := proc(x0, x1, $)
        local res;
        res := evalb(not op(0,cond)(eval(line, x=x1), 0));
        `if`(res in '{true,false}'
            and evalb(op(0,cond)(eval(line, x=x0), 0)) = res,
          res,
          FAIL)
      end proc;
      cond0 := test(lhs(r), lhs(r)+1);
      if cond0 <> FAIL then
        x0 := lhs(r); r0 := applyop(`+`, 1, r, 1);
      else
        cond0 := test(rhs(r), rhs(r)-1);
        if cond0 <> FAIL then
          x0 := rhs(r); r0 := applyop(`-`, 2, r, 1);
        else next end if;
      end if;
    end if;
    here := subs(cond =         cond0 , body);
    rest := subs(cond = evalb(not cond0), body);
    return make(eval(here, x=x0), do_peel(eval(subsop(1=rest, [2,2]=r0, e))));
  end do;
  return e;
end proc;

# Expand sum(a*(b-c),q) to sum(a*b,q)-sum(a*c,q)
```

```
split := proc(e, $)
  subsindets(e, 'And(specfunc({sum,Sum}),
                  anyfunc(And(`*`,Not(`*`(Not(`+`)))),name=anything))',
            do_split);
end proc;
do_split := proc(e, $)
  local terms, x;
  terms := convert(expand(op(1,e), op(indets(op(1,e), function))),
               'list', `+`);
  x := op([2,1],e);
  `+`(op(map(proc(term, $)
    local s, r;
    s, r := selectremove(depends, convert(term, 'list', `*`), x);
    `*`(op(r), subsop(1=`*`(op(s)),e))
  end proc, terms)))
end proc;


# Simplify f(lo-1)*product(f(i),i=lo..hi) to product(f(i),i=lo-1..hi)
graft := proc(e, $)
  subsindets(e, 'Or(And(`*`,Not(`*`(Not(specfunc({product,Product}))))),
              And(`+`,Not(`+`(Not(specfunc({sum  ,Sum  }))))))',
            do_graft);
end proc;
do_graft := proc(e, $)
  local produce, factors, i, j;
  produce := `if`(e::`*`, '{product,Product}',
                  '{sum  ,Sum  }');
  factors := sort(convert(e,'list'),

      key = (factor -> -numboccur(factor,produce)));
  for i from nops(factors) to 2 by -1 do
    for j from i-1 to 1 by -1 do
      if op(j,factors) :: 'And'('specfunc'(produce),
                        'anyfunc(anything,name=range)') then
        if Testzero(op(i,factors) - eval(op([j,1],factors),
            op([j,2,1],factors)=op([j,2,2,1],factors)-1)) then
          factors := subsop(i=NULL,applyop(`-`,[j,2,2,1],factors,1));
          break
        elif Testzero(op(i,factors) - eval(op([j,1],factors),
            op([j,2,1],factors)=op([j,2,2,2],factors)+1)) then
          factors := subsop(i=NULL,applyop(`+`,[j,2,2,2],factors,1));
          break
        end if
      end if
    end do
  end do;
  op(0,e)(op(factors))
end proc;
```

```
# Normalize sum(f(i),i=2..hi) to sum(f(i+2),i=0..hi-2)
rebase_lower := proc(e, $)
  subsindets(e, 'And(specfunc({sum,Sum,product,Product}),
                anyfunc(anything,

        name=Not({0,SymbolicInfinity,undefined})..anything))',
            do_rebase_lower);
end proc;
do_rebase_lower := proc(e, $)
  subsop([2,2,1]=0,
      applyop(`-`,
            [2,2,2],
            applyop(eval, 1, e, op([2,1],e)=op([2,1],e)+op([2,2,1],e)),
            op([2,2,1],e)))
end proc;


# Normalize sum(f(i),i=lo..2) to sum(f(i+2),i=lo-2..0)
rebase_upper := proc(e, $)
  subsindets(e, 'And(specfunc({sum,Sum,product,Product}),
                anyfunc(anything,
                  name=anything..Not({0,SymbolicInfinity,undefined})))',
            do_rebase_upper);
end proc;
do_rebase_upper := proc(e, $)
  subsop([2,2,2]=0,
      applyop(`-`,
            [2,2,1],
            applyop(eval, 1, e, op([2,1],e)=op([2,1],e)+op([2,2,2],e)),
            op([2,2,2],e)))
end proc;

ModuleLoad := proc($)
  # Override csgn to work a little bit harder on piecewise and sum
  # (to get rid
of csgn(1/2+1/2*sum(piecewise(...,1,0),...))
  #  produced by int on a Gaussian mixture model)
  unprotect(csgn);
  csgn := overload([
    # Handle if the csgn of a piecewise doesn't depend on which branch
    proc(a :: specfunc(piecewise), $)
      option overload;
      local r, i;
      r := {seq(`if`(i::even or i=nops(a), csgn(op(i,a)), NULL),
            i=1..nops(a))};
      if nops(r)=1 then return op(r) end if;
      if not assigned(_Envsignum0) then
        r := r minus {0};
```

```
        if nops(r)=1 then return op(r) end if;
      end if;
      error "invalid input: cannot csgn %1", a;
    end proc,
   # Handle if the csgn of a sum doesn't depend on the bound variable
   proc(a :: And(specfunc({sum, Sum}), anyfunc(anything, name=range)), $)
     option overload;
     local r;
     r := csgn(op(1,a));
     if not depends(r,op([2,1],a)) then
       return signum(op([2,2,2],a)+1-op([2,2,1],a)) * r
     end if;
     error
"invalid input: cannot csgn %1", a;
   end proc,
   csgn]);
  protect(csgn);


  # Do the same to signum.
  unprotect(signum);
  signum := overload([
   # Handle if the signum of a piecewise doesn't depend on which branch
   proc(a :: specfunc(piecewise), $)
     option overload;
     local r, i;
     r := {seq(`if`(i::even or i=nops(a), signum(op(i,a)), NULL),
           i=1..nops(a))};
     if nops(r)=1 then return op(r) end if;
     if not assigned(_Envsignum0) then
       r := r minus {0};
       if nops(r)=1 then return op(r) end if;
     end if;
     error "invalid input: cannot signum %1", a;
   end proc,
   # Handle if the signum of a sum doesn't depend on the bound variable
   proc(a :: And(specfunc({sum, Sum}), anyfunc(anything, name=range)), $)
     option overload;
     local r;
     r := signum(op(1,a));
     if not depends(r,op([2,1],a)) then
       return signum(op([2,2,2],a)+1-op([2,2,1],a))
* r
     end if;
     error "invalid input: cannot signum %1", a;
   end proc,
   signum]);
  protect(signum);
```

```
  # Override sum to fail faster
  unprotect(sum);
  sum := overload([
   proc(f :: Not({`+`,`+`^integer}),
      k :: name=And(range,Not(range(rational))), $)
    option overload;
    if not (`-`(op(rhs(k))) :: 'rational')
      and not (subsindets(f, 'anything^integer', f->op(1,f))
            :: '{`+`,And(`*`,Not(`*`(Not(`+`))))}')
      and depends(indets(f, '{specfunc(idx), specindex(idx)}'), op(1,k))
    then
      'procname(_passed)'
    else
      error "invalid input: cannot fast-fail sum(%1, %2)", _passed
    end if
   end proc,
   sum]);
  protect(sum);

  :-`print/Ints` := curry(thismodule:-Print,Ints);
  :-`print/Sums` := curry(thismodule:-Print,Sums);
  :-`print/ints` := curry(thismodule:-Print,ints);
  :-`print/sums` := curry(thismodule:-Print,sums);

 end proc;
 ModuleLoad():
end
 module; # Loop
'# New ports collection makefile for:   python25\n' Comment

'# Date created:        3 July 2003\n' Comment

'# Whom:              Hye-Shik Chang <perky@FreeBSD.org>\n' Comment

'#\n'        Comment

'# $FreeBSD: ports/lang/python25/Makefile,v 1.145 2007/10/03 23:22:04 edwin Exp $\n' Comment

'\n'        Text.Whitespace

'PORTNAME'   Name.Variable
'='        Operator
'\t'        Text.Whitespace
'python25'   Text
'\n'        Text.Whitespace

'PORTVERSION' Name.Variable
'='        Operator
```

'\t'   Text.Whitespace
'2'   Literal.Number
'.5.1'   Text
'\n'   Text.Whitespace

'CATEGORIES' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'lang'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'ipv6'   Text
'\n'   Text.Whitespace

'MASTER_SITES' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_MASTER_SITES' Name.Variable
'}'
         Literal.String.Interpol
'\n'   Text.Whitespace

'MASTER_SITE_SUBDIR' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_MASTER_SITE_SUBDIR' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'DISTFILES'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_DISTFILE' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'MAINTAINER' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python@FreeBSD.org' Text
'\n'   Text.Whitespace

```
'COMMENT'    Name.Variable
'?='         Operator
'\t'         Text.Whitespace
'An'         Text
' '          Text.Whitespace
'interpreted' Text
' '          Text.Whitespace
'object-oriented' Text
' '          Text.Whitespace
'programming' Text
' '          Text.Whitespace
'language'   Text
'\n'
             Text.Whitespace

'\n'         Text.Whitespace

'DIST_SUBDIR' Name.Variable
'='          Operator
'\t'         Text.Whitespace
'python'     Text
'\n'         Text.Whitespace

'WRKSRC'     Name.Variable
'='          Operator
'\t\t'       Text.Whitespace
'${'         Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'          Literal.String.Interpol
'/portbld.static' Text
'\n'         Text.Whitespace

'PATCH_WRKSRC' Name.Variable
'='          Operator
'\t'         Text.Whitespace
'${'         Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'          Literal.String.Interpol
'\n'         Text.Whitespace

'GNU_CONFIGURE' Name.Variable
'='          Operator
'\t'         Text.Whitespace
'yes'        Text
'\n'         Text.Whitespace

'CONFIGURE_TARGET' Name.Variable
'='          Operator
```

```
'\t'        Text.Whitespace
'--build'    Text
'='          Operator
'${'          Literal.String.Interpol
'MACHINE_ARCH' Name.Variable
'}'           Literal.String.Interpol
'-portbld-freebsd'
 Text
'${'          Literal.String.Interpol
'OSREL'       Name.Variable
'}'           Literal.String.Interpol
'\n'         Text.Whitespace

'CONFIGURE_SCRIPT' Name.Variable
'='          Operator
'\t'        Text.Whitespace
'../configure' Text
' '          Text.Whitespace
'# must be relative\n' Comment.Single

'CONFIGURE_ENV' Name.Variable
'='          Operator
'\t'        Text.Whitespace
'OPT'         Name.Variable
'='          Operator
'"'           Literal.String.Double
'${'          Literal.String.Interpol
'CFLAGS'      Name.Variable
'}'           Literal.String.Interpol
'"'           Literal.String.Double
' '          Text.Whitespace
'SVNVERSION'  Name.Variable
'='          Operator
'"echo freebsd"' Literal.String.Double
'\n'         Text.Whitespace

'MAKE_ENV'    Name.Variable
'='          Operator
'\t'        Text.Whitespace
'VPATH'       Name.Variable
'='          Operator
'"'           Literal.String.Double
'${'          Literal.String.Interpol
'PYTHON_WRKSRC'
 Name.Variable
'}'           Literal.String.Interpol
'"'           Literal.String.Double
'\n'         Text.Whitespace
```

'INSTALLS_SHLIB' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'INSTALL_TARGET' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'altinstall' Text
'\n'   Text.Whitespace

'MAN1'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.1'   Text
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'USE_PYTHON' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'PYTHON_VERSION' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python2.5' Text
'\n'   Text.Whitespace

'PYTHON_NO_DEPENDS' Name.Variable
'='
     Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'SHARED_WRKSRC' Name.Variable
'='   Operator
'\t'   Text.Whitespace

```
'${'        Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'         Literal.String.Interpol
'/portbld.shared' Text
'\n'        Text.Whitespace

'PLIST'     Name.Variable
'='         Operator
'\t\t'      Text.Whitespace
'${'        Literal.String.Interpol
'WRKDIR'    Name.Variable
'}'         Literal.String.Interpol
'/PLIST'    Text
'\n'        Text.Whitespace

'PLIST_TEMPLATE' Name.Variable
'?='        Operator
'${'        Literal.String.Interpol
'PKGDIR'    Name.Variable
'}'         Literal.String.Interpol
'/pkg-plist' Text
'\n'        Text.Whitespace

'PLIST_SUB'  Name.Variable
'='         Operator
'\t'        Text.Whitespace
'PYVER'     Name.Variable
'='         Operator
'${'        Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'
            Punctuation
'S'         Name.Variable
'/python//'  Punctuation
'}'         Literal.String.Interpol
' '         Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'      Text.Whitespace
'PYVER_WITHPAT' Name.Variable
'='         Operator
'${'        Literal.String.Interpol
'PORTVERSION' Name.Variable
':'         Punctuation
'S'         Name.Variable
'/.c/c/'     Punctuation
'}'         Literal.String.Interpol
'\n'        Text.Whitespace
```

'DEMODIR'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/share/examples/' Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'TOOLSDIR'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'
    Literal.String.Interpol
'/share/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'BIN_SCRIPTS' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'idle'   Text
' '   Text.Whitespace
'pydoc'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'python-shared' Text
' '   Text.Whitespace
'smtpd.py' Text
' '   Text.Whitespace
'python-config' Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'python-shared-config' Text
'\n'   Text.Whitespace

'BINLINKS_SUB' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,smtpd,smtpd${PYTHON_VER},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'
          Text
' '   Text.Whitespace
"'s,(idle|pydoc|python-shared|python),\\1${PYTHON_VER},'" Literal.String.Single
'\n\n'   Text.Whitespace

'OPTIONS'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'THREADS'   Text
' '   Text.Whitespace
'"Enable thread support"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'HUGE_STACK_SIZE' Text
' '   Text.Whitespace
'"Use a larger thread stack"' Literal.String.Double
' '   Text.Whitespace
'off'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'UCS4'   Text
' '   Text.Whitespace
'"Use UCS4 for unicode support"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'PYMALLOC'

```
 Text
' '         Text.Whitespace
'"Use python\'s internal malloc"' Literal.String.Double
' '         Text.Whitespace
'on'        Text
' '         Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'      Text.Whitespace
'IPV6'      Text
' '         Text.Whitespace
'"Enable IPv6 support"' Literal.String.Double
' '         Text.Whitespace
'on'        Text
' '         Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'      Text.Whitespace
'FPECTL'    Text
' '         Text.Whitespace
'"Enable floating point exception handling"' Literal.String.Double
' '         Text.Whitespace
'off'       Text
'\n\n'      Text.Whitespace

'.include <bsd.port.pre.mk>\n' Comment.Preproc

'\n'        Text.Whitespace

'.if ${PYTHON_VERSION} == ${PYTHON_DEFAULT_VERSION}\n' Comment.Preproc

'MLINKS'    Name.Variable
'='         Operator
'\t\t'      Text.Whitespace
'${'        Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'         Literal.String.Interpol
'.1'
      Text
' '         Text.Whitespace
'python.1'  Text
'\n'        Text.Whitespace

'PLIST_SUB'  Name.Variable
'+='        Operator
'\t'        Text.Whitespace
'IF_DEFAULT'  Name.Variable
'='         Operator
```

'"""'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'IF_DEFAULT' Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'# workaround for a bug in base curses.h.\n' Comment

'CFLAGS'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'-D__wchar_t' Text
'='   Operator
'wchar_t'   Text
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'.if !defined(WITHOUT_THREADS)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--with-threads'
 Text
'\n'   Text.Whitespace

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PTHREAD_CFLAGS' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'.if defined(WITHOUT_HUGE_STACK_SIZE)\n' Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'-DTHREAD_STACK_SIZE' Text
'='   Operator
'0x20000'   Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'-DTHREAD_STACK_SIZE' Text
'='   Operator
'0x100000'   Text
'\n'   Text.Whitespace

'.endif # defined(WITHOUT_HUGE_STACK_SIZE)\n' Comment.Preproc

'CONFIGURE_ENV' Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'LDFLAGS'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'PTHREAD_LIBS'
 Name.Variable
'}'   Literal.String.Interpol
' '   Literal.String.Double
'${'   Literal.String.Interpol
'LDFLAGS'   Name.Variable
'}'   Literal.String.Interpol
'"'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--without-threads' Text
'\n'   Text.Whitespace

'.if defined(LDFLAGS)\n' Comment.Preproc

'CONFIGURE_ENV' Name.Variable

'+='   Operator
'\t\t'   Text.Whitespace
'LDFLAGS'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'LDFLAGS'   Name.Variable
'}'   Literal.String.Interpol
'"'   Literal.String.Double
'\n'   Text.Whitespace

'.endif # defined(LDFLAGS)\n' Comment.Preproc

'.endif # !defined(WITHOUT_THREADS)\n' Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(WITHOUT_UCS4) && !defined(WITH_UCS2)\n'
 Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--enable-unicode' Text
'='   Operator
'ucs4'   Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if defined(WITHOUT_PYMALLOC)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'   '   Text.Whitespace
'--without-pymalloc' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if ${ARCH} == i386\n' Comment.Preproc

'PLIST_SUB' Name.Variable
'+='   Operator

'\t'   Text.Whitespace
'X86_ONLY'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'X86_ONLY'   Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'
   Comment.Preproc

'.if ${ARCH} == amd64 || ${ARCH} == ia64 || ${ARCH} == sparc64 || ${ARCH} == alpha\n' Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'   '   Text.Whitespace
'32BIT_ONLY' Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'   '   Text.Whitespace
'32BIT_ONLY' Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'.if ${ARCH} == sparc64\n' Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'   '   Text.Whitespace
'-DPYTHON_DEFAULT_RECURSION_LIMIT' Text
'='   Operator

'900'   Literal.Number
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if !exists(/usr/bin/ypcat) # the world with NO_NIS\n' Comment.Preproc

'PLIST_SUB' Name.Variable
'+='
          Operator
'\t'   Text.Whitespace
'NO_NIS'   Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'NO_NIS'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(WITHOUT_IPV6)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--enable-ipv6' Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--disable-ipv6' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if defined(WITH_FPECTL)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--with-fpectl'
 Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if ${OSVERSION} >= 700000\n' Comment.Preproc

'PLATFORMS'   Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace
'plat-freebsd5' Text
' '   Text.Whitespace
'plat-freebsd6' Text
'\n'   Text.Whitespace

'.elif ${OSVERSION} >= 600000\n' Comment.Preproc

'PLATFORMS'   Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace
'plat-freebsd5' Text
' '   Text.Whitespace
'plat-freebsd7' Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLATFORMS'   Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace
'plat-freebsd6' Text
' '   Text.Whitespace
'plat-freebsd7' Text

'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'pre-patch' Name.Function
':'   Operator
'\n'   Text.Whitespace

'\t'
        Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Modules'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Tools/scripts/pydoc' Text
' '   Text.Whitespace
'>'   Text
' '
    Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/pydoc2.5'   Text

'\n\t'   Text.Whitespace

'${'   Literal.String.Interpol

'SED'   Name.Variable

'}'   Literal.String.Interpol

' '   Text.Whitespace

'-e'   Text

' '   Text.Whitespace

'"1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},"' Literal.String.Single

' '   Text.Whitespace

'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace

'${'   Literal.String.Interpol

'PATCH_WRKSRC' Name.Variable

'}'   Literal.String.Interpol

'/Tools/scripts/idle' Text

' '   Text.Whitespace

'>'   Text

' '   Text.Whitespace

'${'   Literal.String.Interpol

'WRKDIR'   Name.Variable

'}'   Literal.String.Interpol

'/idle2.5'   Text

'\n\t'   Text.Whitespace

'${'   Literal.String.Interpol

'SED'   Name.Variable

'}'   Literal.String.Interpol

' '

    Text.Whitespace

'-e'   Text

' '   Text.Whitespace

'"1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},"' Literal.String.Single

' '   Text.Whitespace

'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace

'${'   Literal.String.Interpol

'PATCH_WRKSRC' Name.Variable

'}'   Literal.String.Interpol

'/Lib/smtpd.py' Text

' '   Text.Whitespace

'>'   Text

' '   Text.Whitespace

'${'   Literal.String.Interpol

'WRKDIR'   Name.Variable

'}'   Literal.String.Interpol

'/smtpd2.5.py' Text

'\n\t'   Text.Whitespace

```
'${'       Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'        Literal.String.Interpol
' '        Text.Whitespace
'-e'       Text
' '        Text.Whitespace
'\\\n'     Literal.String.Escape

'\t\t'     Text.Whitespace
"'s,/usr/doc/python-docs-,${PREFIX}/share/doc/python,g'" Literal.String.Single
' '        Text.Whitespace
'\\\n'     Literal.String.Escape

'\t\t'
           Text.Whitespace
'${'       Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'        Literal.String.Interpol
'/Lib/pydoc.py' Text
'\n\t'     Text.Whitespace
'${'       Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'        Literal.String.Interpol
' '        Text.Whitespace
'-e'       Text
' '        Text.Whitespace
'\\\n'     Literal.String.Escape

'\t\t'     Text.Whitespace
'\'s|^\\( *prefixes = .*\\)\\]$$|\\1, "${X11BASE}"]|g\'' Literal.String.Single
' '        Text.Whitespace
'\\\n'     Literal.String.Escape

'\t\t'     Text.Whitespace
'${'       Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'        Literal.String.Interpol
'/Lib/site.py' Text
'\n\t'     Text.Whitespace
'${'       Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'        Literal.String.Interpol
' '        Text.Whitespace
'-e'       Text
' '        Text.Whitespace
'\\\n'     Literal.String.Escape

'\t\t'
```

Text.Whitespace
"'s|^\t\\(..ASDLGEN.*\\)$$|\t${TRUE}|g'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile.pre.in' Text
'\n\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
"'s|*\\(..INSTALL_SCRIPT.*\\)python-config$$|#port \\1|'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile.pre.in' Text
'\n\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'
   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s|^#!.*|#!${PREFIX}/bin/${PYTHON_VERSION}|'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python-config.in' Text
' '   Text.Whitespace
'>'   Text

' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'-config'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s|^#!.*|#!${PREFIX}/bin/${PYTHON_VERSION:S/thon/thon-shared/}|'"
 Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python-config.in' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'-config'   Text
'\n\n'   Text.Whitespace

'.if defined(WITH_FPECTL) && ${ARCH} == i386\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol

```
' '         Text.Whitespace
'${'        Literal.String.Interpol
'WRKSRC'    Name.Variable
'}'
            Literal.String.Interpol
'/Modules'  Text
'\n\t'      Text.Whitespace
'${'        Literal.String.Interpol
'ECHO'      Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'"fpectl fpectlmodule.c"' Literal.String.Double
' '         Text.Whitespace
'>>'        Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'WRKSRC'    Name.Variable
'}'         Literal.String.Interpol
'/Modules/Setup.dist' Text
'\n'        Text.Whitespace

'.endif\n'  Comment.Preproc

'\n'        Text.Whitespace

'post-configure' Name.Function
':'         Operator
'\n'        Text.Whitespace

'\t'        Text.Whitespace
'${'        Literal.String.Interpol
'TAR'       Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-C'        Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'WRKSRC'    Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-cf'
            Text
' '         Text.Whitespace
'-'         Text
' '         Text.Whitespace
'.'         Text
' '         Text.Whitespace
'|'         Punctuation
```

```
' '          Text.Whitespace
'${'         Literal.String.Interpol
'TAR'        Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-C'         Text
' '          Text.Whitespace
'${'         Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-xf'        Text
' '          Text.Whitespace
'-'          Text
'\n\t'       Text.Whitespace
'${'         Literal.String.Interpol
'LN'         Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-sf'        Text
' '          Text.Whitespace
'${'         Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'          Literal.String.Interpol
'/Lib'       Text
' '          Text.Whitespace
'${'         Literal.String.Interpol
'WRKSRC'
    Name.Variable
'}'          Literal.String.Interpol
'/Lib'       Text
'\n\t'       Text.Whitespace
'${'         Literal.String.Interpol
'SED'        Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-e'         Text
' '          Text.Whitespace
"'s,^\\(LDLIBRARY=\\).*$$,\\1libpython$$(VERSION).so,'" Literal.String.Single
' '          Text.Whitespace
'\\\n'       Literal.String.Escape

'\t\t'       Text.Whitespace
'-e'         Text
' '          Text.Whitespace
"'s,^\\(BLDLIBRARY=\\).*$$,\\1-L. -lpython$$(VERSION),'" Literal.String.Single
' '          Text.Whitespace
'\\\n'       Literal.String.Escape
```

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(CFLAGSFORSHARED=\\).*$$,\\1$$(CCSHARED),'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(Makefile Modules/config.c:.*\\)Makefile.pre,\\1,'"
 Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(.(BUILDPYTHON)\\: .*\\).(LIBRARY),\\1,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(.(BUILDPYTHON):.*\\).(LIBRARY),\\1,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
'/Makefile' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile' Text
'\n\n'   Text.Whitespace

'pre-build' Name.Function
':'   Operator
'\n'

Text.Whitespace

'\t'   Text.Whitespace
'cd'   Name.Builtin
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SETENV'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'MAKE_ENV' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'MAKE'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
' '   Text.Whitespace
'python'   Text
';'   Punctuation
' '   Text.Whitespace
'\\\n'
        Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-f'   Text
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol

'.so'   Text
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
';'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-f'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'
 Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'\n\n'   Text.Whitespace

'pre-su-install' Name.Function
':'   Operator
'\n'   Text.Whitespace

'.for platform in ${PLATFORMS}\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'platform'   Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'.for file in IN.py regen\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_DATA' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'
 Literal.String.Interpol
'/Lib/'   Text
'${'   Literal.String.Interpol
'platform' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'file'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'platform' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'\n'   Text.Whitespace

'.endfor\n' Comment.Preproc

'.endfor\n' Comment.Preproc

'\n'   Text.Whitespace

'pre-install' Name.Function
':'   Operator
'\n'   Text.Whitespace

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'CAT'   Name.Variable
'}'   Literal.String.Interpol

' '   Text.Whitespace

'${'   Literal.String.Interpol

'PLIST_TEMPLATE' Name.Variable

'}'   Literal.String.Interpol

' '   Text.Whitespace

'|'   Punctuation

' '   Text.Whitespace

'${'   Literal.String.Interpol

'AWK'   Name.Variable

'}'   Literal.String.Interpol

' '   Text.Whitespace

'\'{ print $$0; } \\\n\t/LIBDIR.*\\.py$$/ && !/\\/bad/ { print $$0 "o"; print $$0 "c"; }\"' Literal.String.Single

'\t'   Text.Whitespace

'>'   Text

' '   Text.Whitespace

'${'   Literal.String.Interpol

'PLIST'   Name.Variable

'}'   Literal.String.Interpol

'\n\n'   Text.Whitespace

'"\t@# if openssl 0.9.8 is detected, _sha{256,512} module won\'t be installed\n"' Comment

'\t'   Text.Whitespace

'('   Operator

'['   Operator

' '   Text.Whitespace

'-f'   Text

' '   Text.Whitespace

'${'   Literal.String.Interpol

'WRKSRC'   Name.Variable

'}'   Literal.String.Interpol

'/.without_own_sha'

 Text

' '   Text.Whitespace

']'   Operator

' '   Text.Whitespace

'&&'   Operator

' '   Text.Whitespace

'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace

'${'   Literal.String.Interpol

'GREP'   Name.Variable

'}'   Literal.String.Interpol

' '   Text.Whitespace

'-v'   Text

' '   Text.Whitespace

```
"'lib-dynload/_sha'" Literal.String.Single
' '          Text.Whitespace
'${'         Literal.String.Interpol
'PLIST'      Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'>'          Text
' '          Text.Whitespace
'${'         Literal.String.Interpol
'PLIST'      Name.Variable
'}'          Literal.String.Interpol
'.tmp'       Text
' '          Text.Whitespace
'&&'         Operator
' '          Text.Whitespace
'\\\n'       Literal.String.Escape

'\t\t'       Text.Whitespace
'${'         Literal.String.Interpol
'CAT'        Name.Variable
'}'
             Literal.String.Interpol
' '          Text.Whitespace
'${'         Literal.String.Interpol
'PLIST'      Name.Variable
'}'          Literal.String.Interpol
'.tmp'       Text
' '          Text.Whitespace
'>'          Text
' '          Text.Whitespace
'${'         Literal.String.Interpol
'PLIST'      Name.Variable
'}'          Literal.String.Interpol
')'          Operator
' '          Text.Whitespace
'||'         Operator
' '          Text.Whitespace
'${'         Literal.String.Interpol
'TRUE'       Name.Variable
'}'          Literal.String.Interpol
'\n\n'       Text.Whitespace

'post-install' Name.Function
':'          Operator
'\n'         Text.Whitespace

'\t@# install config providers\n' Comment
```

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'
        Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'-config'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'-config'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\n'   Text.Whitespace

'\t@#
 shared version of executable and library\n' Comment

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_PROGRAM' Name.Variable

'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
'\n\t'   Text.Whitespace
'cd'   Name.Builtin
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'LN'
        Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-sf'   Text
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text

'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-sf'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib/lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
' '

      Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/config'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_PROGRAM' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\n'   Text.Whitespace

'\t@# additional files installing by ports\n'
 Comment

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/pydoc2.5' Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/idle2.5'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/smtpd2.5.py' Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\t'   Text.Whitespace
'@'   Text
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'
         Literal.String.Interpol
'MANPREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/man/man1' Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_MAN' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol

'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python.man' Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MANPREFIX' Name.Variable
'}'   Literal.String.Interpol
'/man/man1/' Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.1'   Text
'\n\n'   Text.Whitespace

'.if ${PYTHON_VERSION} == ${PYTHON_DEFAULT_VERSION}\n' Comment.Preproc

'\t'   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'f'   Text
' '   Text.Whitespace
'in'
             Keyword
' '   Text.Whitespace
'${'   Literal.String.Interpol
'BIN_SCRIPTS' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'do'   Keyword
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'TARGET'   Name.Variable
'='   Operator
'`'   Literal.String.Backtick
'${'   Literal.String.Interpol
'ECHO_CMD'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'$$'   Name.Variable
'f'   Text
' '   Text.Whitespace
'|'   Punctuation

```
' '          Text.Whitespace
'${'         Literal.String.Interpol
'SED'        Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-E'         Text
' '          Text.Whitespace
'${'         Literal.String.Interpol
'BINLINKS_SUB' Name.Variable
'}'          Literal.String.Interpol
'`'          Literal.String.Backtick
';'
             Punctuation
' '          Text.Whitespace
'\\\n'       Literal.String.Escape

'\t\t'       Text.Whitespace
'cd'         Name.Builtin
' '          Text.Whitespace
'${'         Literal.String.Interpol
'PREFIX'     Name.Variable
'}'          Literal.String.Interpol
'/bin'       Text
' '          Text.Whitespace
'&&'         Operator
' '          Text.Whitespace
'${'         Literal.String.Interpol
'LN'         Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-f'         Text
' '          Text.Whitespace
'$$'         Name.Variable
'TARGET'     Text
' '          Text.Whitespace
'$$'         Name.Variable
'f'          Text
';'          Punctuation
' '          Text.Whitespace
'\\\n'       Literal.String.Escape

'\t'         Text.Whitespace
'done'       Keyword
'\n'         Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'         Text.Whitespace
```

'.if !defined(NOPORTDOCS)\n' Comment.Preproc

'\t'
        Text.Whitespace
'@'   Text
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TOOLSDIR'   Name.Variable
'}'   Literal.String.Interpol
'\n\t'   Text.Whitespace
'@cd'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-cf'   Text
' '   Text.Whitespace
'-'   Text
' '   Text.Whitespace
'Tools'   Text
' '   Text.Whitespace
'|'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'('   Operator
'cd'   Name.Builtin
' '   Text.Whitespace
'${'
        Literal.String.Interpol
'TOOLSDIR'   Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol

' '	Text.Whitespace
'-xf'	Text
' '	Text.Whitespace
'-'	Text
')'	Operator
'\n\t'	Text.Whitespace
'@'	Text
'${'	Literal.String.Interpol
'MKDIR'	Name.Variable
'}'	Literal.String.Interpol
' '	Text.Whitespace
'${'	Literal.String.Interpol
'DEMODIR'	Name.Variable
'}'	Literal.String.Interpol
'\n\t'	Text.Whitespace
'@cd'	Text
' '	Text.Whitespace
'${'	Literal.String.Interpol
'PYTHON_WRKSRC'	Name.Variable
'}'	Literal.String.Interpol
'/Demo'	Text
';'	Punctuation
' '	Text.Whitespace
'${'	Literal.String.Interpol
'TAR'	Name.Variable
'}'	
	Literal.String.Interpol
' '	Text.Whitespace
'-cf'	Text
' '	Text.Whitespace
'-'	Text
' '	Text.Whitespace
'*'	Text
' '	Text.Whitespace
'|'	Punctuation
' '	Text.Whitespace
'\\\n'	Literal.String.Escape
'\t\t'	Text.Whitespace
'('	Operator
'cd'	Name.Builtin
' '	Text.Whitespace
'${'	Literal.String.Interpol
'DEMODIR'	Name.Variable
'}'	Literal.String.Interpol
';'	Punctuation
' '	Text.Whitespace
'${'	Literal.String.Interpol

```
'TAR'         Name.Variable
'}'           Literal.String.Interpol
' '           Text.Whitespace
'-xf'         Text
' '           Text.Whitespace
'-'           Text
')'           Operator
'\n'          Text.Whitespace

'.endif\n'    Comment.Preproc

'\n\t'        Text.Whitespace
'@'           Text
'${'          Literal.String.Interpol
'CAT'         Name.Variable
'}'
              Literal.String.Interpol
' '           Text.Whitespace
'${'          Literal.String.Interpol
'PKGMESSAGE'  Name.Variable
'}'           Literal.String.Interpol
'\n\n'        Text.Whitespace

'.include <bsd.port.post.mk>\n' Comment.Preproc
# Step 1 of 3: from Hakaru to Maple LO (linear operator)

toLO := module()
 export
 ModuleApply := proc(m, $)
  local h;
  h := gensym('h');
  _Env_HakaruSolve := false;
  LO(h, integrate(m, h, []))
 end proc;

 export
 integrate := proc(m, h, loops :: list(name = range) := [], $)
  local x, n, i, res, l, br, m0;

  if m :: known_continuous then
    integrate_known(Int, Ints, 'xx', m, h, loops)
  elif m :: known_discrete then
    integrate_known(Sum, Sums, 'kk', m, h, loops)
  elif m :: 'Ret(anything)' then
    applyintegrand(h, mk_ary(op(1,m), loops))
  elif m :: 'Bind(anything, name, anything)' then
   res := eval(op(3,m), op(2,m) = mk_idx(op(2,m), loops));
   res := eval(Integrand(op(2,m), 'integrate'(res, x, loops)), x=h);
```

```
            integrate(op(1,m), res, loops);
        elif m :: 'specfunc(Msum)' and (nops(loops) = 0 or nops(m) = 1) then
          `+`(op(map(integrate, [op(m)], h, loops)))
        elif m :: 'Weight(anything, anything)' then
          foldl(product,
    op(1,m), op(loops)) * integrate(op(2,m), h, loops)
        elif m :: t_pw_or_part then
          Partition:-AppPartOrPw
              ( proc(p)
                    if not Partition:-ConditionsDepend(p, lhs~(loops)) then
                      Partition:-Pmap(z->integrate(z,h,loops),p)
                    end if;
                  end proc
                , m, ['no_split_disj']);
        elif m :: t_case and not depends(op(1,m), map(lhs, loops)) then
          subsop(2=map(proc(b :: Branch(anything, anything))
                  eval(subsop(2='integrate'(op(2,b), x, loops),b), x=h)
                end proc,
                op(2,m)),
            m);
        elif m :: 'LO(name, anything)' then
          eval(op(2,m), op(1,m) = h)
        elif m :: 'Plate(nonnegint, name, anything)' then
          # Unroll Plate when the bound is known. We unroll Plate here (instead
          # of unrolling Ints in reduce, for example) because we have no other
          # way to integrate certain Plates, namely those whose
    bodies' control
          # flows depend on the index.
          x := mk_sym('pp', h);
          x := [seq(cat(x,i), i=0..op(1,m)-1)];
          if op(1,m) = 0 then
            res := undefined;
          else
            if op(1,m) = 1 then
              res := op(1,x);
            else
              res := idx(x,op(2,m));
    #          res := piecewise(seq(op([[op(2,m)=i-1, op(i,x)]]), i=2..op(1,m)),
    #                    op(1,x));
            end if;
            res := mk_idx(res, loops);
          end if;
          res := applyintegrand(h, mk_ary('ary'(op(1,m), op(2,m), res), loops));
          for i from op(1,m) to 1 by -1 do
            res := integrate(eval(op(3,m), op(2,m)=i-1),
                      Integrand(op(i,x), res), loops);
          end do;
          res
```

```
    elif m :: 'Plate(anything, name, anything)' then
      integrate(op(3,m), h, [op(2,m)=0..op(1,m)-1, op(loops)])
    elif m :: 'Context(anything, anything)' then
      applyop(integrate, 2, m, h, loops)
    elif h :: appliable then
      x := gensym('xa');
      'integrate'(m, Integrand(x,
  h(x)), loops)
    else
      'procname(_passed)'
    end if
  end proc;


  local
  integrate_known := proc(make, makes, var, m, h, loops :: list(name=range), $)
    local x, dens, bds;
    x := mk_sym(var, h);
    dens := density[op(0,m)](op(m));
    bds := bounds[op(0,m)](op(m));
    if loops = [] then
      make(dens(x) * applyintegrand(h, x), x = bds);
    else
      makes(foldl(product, dens(mk_idx(x,loops)), op(loops))
          * applyintegrand(h, x),
        x, bds, loops)
    end if;
  end proc;
end module; #toLO
'# Teach Maple (through depends and eval) about our new binding forms.\n' Comment.Single

'# forall bind from 1st arg to 2nd arg.\n' Comment.Single

'# Ints,Sums,ints,sums bind from 2nd arg to 1st arg, and also from each element\n' Comment.Single

'#   of the 4th arg to the other elements on the left and to the 3rd arg.\n' Comment.Single

'\n'        Text.Whitespace

`depends/forall`' Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'bvar'      Name
','         Operator
' '         Text.Whitespace
```

'pred'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n '   Text.Whitespace
'depends'   Name
'('   Punctuation
'pred'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
' '   Text.Whitespace
'minus'
 Keyword
' '   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
'bvar'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'set'   Name
'"'   Punctuation
'))'   Punctuation
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
':'   Operator
'\n\n'   Text.Whitespace

'`depends/Ints`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'body'   Name
','   Operator
' '   Text.Whitespace
'bvar'   Name
','   Operator
' '   Text.Whitespace

'rng'   Name

','   Operator

' '   Text.Whitespace

'loops'   Name

','   Operator

' '   Text.Whitespace

'x'   Name

','   Operator

' '   Text.Whitespace

'y'   Name

','   Operator

' '   Text.Whitespace

'$'

        Operator

')'   Punctuation

'\n '   Text.Whitespace

'local'   Keyword

' '   Text.Whitespace

'xx'   Name

','   Operator

' '   Text.Whitespace

'i'   Name

';'   Punctuation

'\n '   Text.Whitespace

'if'   Keyword

' '   Text.Whitespace

'nargs'   Name

' '   Text.Whitespace

'='   Operator

' '   Text.Whitespace

'5'   Literal.Number.Integer

' '   Text.Whitespace

'then'   Keyword

'\n   '   Text.Whitespace

'xx'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'x'   Name

';'   Punctuation

' '   Text.Whitespace

'# y is ununsed and x lists the variables to look for\n' Comment.Single

' '   Text.Whitespace

'else'   Keyword

'\n   '   Text.Whitespace

'xx'   Name

' '   Text.Whitespace

':='   Operator
' '   Text.Whitespace
'y'
    Name
';'   Punctuation
' '   Text.Whitespace
'# x is some KB and y lists the variables to look for\n' Comment.Single

'   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'x'   Name
','   Operator
' '   Text.Whitespace
'y'   Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'true'   Name
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
"# don't remove bvar from xx!\n" Comment.Single

' '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'body'
    Name
','   Operator
' '   Text.Whitespace
'xx'   Name
' '   Text.Whitespace

'minus'   Keyword
' '   Text.Whitespace
'{'   Punctuation
'bvar'   Name
'})'   Punctuation
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'true'   Name
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'i'   Name
' '   Text.Whitespace
'from'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'loops'   Name
')'   Punctuation
' '   Text.Whitespace
'to'   Keyword
' '   Text.Whitespace
'1'   Literal.Number.Integer
' '   Text.Whitespace
'by'   Keyword
' '   Text.Whitespace
'-'

        Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'do'   Keyword
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'i'   Name
','   Operator

'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'loops'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'xx'   Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'true'   Name
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'xx'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'xx'

  Name
' '   Text.Whitespace
'minus'   Keyword
' '   Text.Whitespace
'{'   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'i'   Name
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'loops'   Name
')};'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'depends' Name
'('   Punctuation

'rng'   Name
','   Operator
' '   Text.Whitespace
'xx'   Name
')'   Punctuation
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
':'   Operator
'\n'   Text.Whitespace

'`depends/Sums`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`depends/Ints`' Name
')'
             Punctuation
':'   Operator
'\n'   Text.Whitespace

'`depends/ints`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`depends/Ints`' Name
')'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'`depends/sums`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`depends/Ints`' Name
')'   Punctuation
':'   Operator
'\n\n'   Text.Whitespace

'`eval/forall`' Name

```
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'eqs'       Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n '       Text.Whitespace
'local'     Keyword
'
'           Text.Whitespace
'bvar'      Name
','         Operator
' '         Text.Whitespace
'pred'      Name
';'         Punctuation
'\n '       Text.Whitespace
'bvar'      Name
','         Operator
' '         Text.Whitespace
'pred'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'e'         Name
');'        Punctuation
'\n '       Text.Whitespace
'eval'      Name.Builtin
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'0'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'eqs'       Name
')('        Punctuation
'BindingTools' Name
```

```
':'          Operator
'-'          Operator
'generic_evalat' Name
'('          Punctuation
'bvar'       Name
','          Operator
' '          Text.Whitespace
'pred'       Name
','
         Operator
' '          Text.Whitespace
'eqs'        Name
'))'         Punctuation
'\n'         Text.Whitespace

'end'        Keyword
' '          Text.Whitespace
'proc'       Keyword
':'          Operator
'\n\n'       Text.Whitespace

'`eval/Ints`' Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'proc'       Keyword
'('          Punctuation
'e'          Name
','          Operator
' '          Text.Whitespace
'eqs'        Name
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n '        Text.Whitespace
'local'      Keyword
' '          Text.Whitespace
'body'       Name
','          Operator
' '          Text.Whitespace
'bvar'       Name
','          Operator
' '          Text.Whitespace
'rng'        Name
','          Operator
' '          Text.Whitespace
'loops'      Name
```

','	Operator
' '	Text.Whitespace
'n'	Name
','	Operator
'	
'	Text.Whitespace
'i'	Name
';'	Punctuation
'\n '	Text.Whitespace
'body'	Name
','	Operator
' '	Text.Whitespace
'bvar'	Name
','	Operator
' '	Text.Whitespace
'rng'	Name
','	Operator
' '	Text.Whitespace
'loops'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'op'	Name.Builtin
'('	Punctuation
'1'	Literal.Number.Integer
'..'	Punctuation
'4'	Literal.Number.Integer
','	Operator
' '	Text.Whitespace
'e'	Name
');'	Punctuation
'\n '	Text.Whitespace
'bvar'	Name
','	Operator
' '	Text.Whitespace
'body'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'BindingTools'	Name
':'	Operator
'-'	Operator
'generic_evalat'	Name
'('	Punctuation
'bvar'	
	Name
','	Operator
' '	Text.Whitespace

'body'   Name
','   Operator
' '   Text.Whitespace
'eqs'   Name
');'   Punctuation
'\n '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'e'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'eqs'   Name
')('   Punctuation
'body'   Name
','   Operator
' '   Text.Whitespace
'bvar'   Name
','   Operator
'\n   ' Text.Whitespace
'BindingTools' Name
':'   Operator
'-'   Operator
'generic_evalatstar' Name
'('   Punctuation
'rng'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
','   Operator
' '   Text.Whitespace
'eqs'   Name
')'   Punctuation
','
 Operator
'\n   ' Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'5'   Literal.Number.Integer
'..'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
'e'   Name

')'   Punctuation

'\n'   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'proc'   Keyword

':'   Operator

'\n'   Text.Whitespace

`` `eval/Sums` `` Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'eval'   Name.Builtin

'('   Punctuation

`` `eval/Ints` `` Name

')'   Punctuation

':'   Operator

'\n'   Text.Whitespace

`` `eval/ints` `` Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'eval'   Name.Builtin

'('   Punctuation

`` `eval/Ints` `` Name

')'   Punctuation

':'   Operator

'\n'   Text.Whitespace

`` `eval/sums` `` Name

' '   Text.Whitespace

':='

      Operator

' '   Text.Whitespace

'eval'   Name.Builtin

'('   Punctuation

`` `eval/Ints` `` Name

')'   Punctuation

':'   Operator

'\n\n'   Text.Whitespace

`` `eval/Int` `` Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'proc'   Keyword

'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'eqs'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'body'   Name
','   Operator
' '   Text.Whitespace
'bound'   Name
','   Operator
' '   Text.Whitespace
'bvar'   Name
';'   Punctuation
'\n '   Text.Whitespace
'body'   Name
','   Operator
' '   Text.Whitespace
'bound'   Name
' '   Text.Whitespace
':='   Operator
'
'   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
'..'   Punctuation
'2'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'e'   Name
');'   Punctuation
'\n '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'bound'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'name'   Name
' '   Text.Whitespace
'then'   Keyword

```
'\n '     Text.Whitespace
'bound'      Name
','          Operator
' '          Text.Whitespace
'body'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'BindingTools' Name
':'          Operator
'-'          Operator
'generic_evalat' Name
'('          Punctuation
'bound'      Name
','          Operator
' '          Text.Whitespace
'body'       Name
','          Operator
' '          Text.Whitespace
'eqs'
        Name
');'         Punctuation
'\n '     Text.Whitespace
'elif'       Keyword
' '          Text.Whitespace
'bound'      Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'`=`'       Name
' '          Text.Whitespace
'then'       Keyword
'\n '     Text.Whitespace
'bvar'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'lhs'        Name.Builtin
'('          Punctuation
'bound'      Name
');'         Punctuation
'\n '     Text.Whitespace
'bvar'       Name
','          Operator
' '          Text.Whitespace
'body'       Name
' '          Text.Whitespace
':='         Operator
```

```
' '         Text.Whitespace
'BindingTools' Name
':'         Operator
'-'         Operator
'generic_evalat' Name
'('         Punctuation
'bvar'      Name
','         Operator
' '         Text.Whitespace
'body'      Name
','         Operator
' '         Text.Whitespace
'eqs'
        Name
');'        Punctuation
'\n    '    Text.Whitespace
'bound'     Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'bvar'      Name
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'eval'      Name.Builtin
'('         Punctuation
'rhs'       Name.Builtin
'('         Punctuation
'bound'     Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'eqs'       Name
');'        Punctuation
'\n '       Text.Whitespace
'else'      Keyword
'\n    '    Text.Whitespace
'body'      Name
','         Operator
' '         Text.Whitespace
'bound'     Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'BindingTools' Name
':'         Operator
'-'         Operator
'generic_evalatstar' Name
```

'('   Punctuation
'body'   Name
','   Operator
' '   Text.Whitespace
'bound'   Name
','

  Operator
' '   Text.Whitespace
'eqs'   Name
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'e'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'eqs'   Name
')('   Punctuation
'body'   Name
','   Operator
' '   Text.Whitespace
'bound'   Name
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'eval'   Name.Builtin
'(['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
'..'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
'e'

        Name
')]'   Punctuation

','   Operator
' '   Text.Whitespace
'eqs'   Name
')))'   Punctuation
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
':'   Operator
'\n'   Text.Whitespace

'`eval/Sum`' Name
'   '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`eval/Int`' Name
')'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'`eval/Product`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`eval/Int`' Name
')'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'`eval/int`' Name
'   '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`eval/Int`' Name
')'
    Punctuation
':'   Operator
'\n'   Text.Whitespace

'`eval/sum`' Name
'   '   Text.Whitespace

':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`eval/Int`' Name
')'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'`eval/product`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`eval/Int`' Name
')'   Punctuation
':'   Operator
'\n\n'   Text.Whitespace

'##\n' Comment.Single

'\n'   Text.Whitespace

'Loop'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'module'   Keyword
' '   Text.Whitespace
'()'   Punctuation
'\n '   Text.Whitespace
'option'   Keyword
' '   Text.Whitespace
'package'   Name
';'
            Punctuation
'\n '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'intssums'   Name
','   Operator
' '   Text.Whitespace
'enter_piecewise' Name
','   Operator
' '   Text.Whitespace
'wrap'   Name
','   Operator

```
'\n      '  Text.Whitespace
't_peel'    Name
','         Operator
' '         Text.Whitespace
'do_peel'   Name
','         Operator
' '         Text.Whitespace
'do_split'  Name
','         Operator
' '         Text.Whitespace
'do_graft'  Name
','         Operator
' '         Text.Whitespace
'do_rebase_lower' Name
','         Operator
' '         Text.Whitespace
'do_rebase_upper' Name
','         Operator
'\n      '  Text.Whitespace
'Binder'    Name
','         Operator
' '         Text.Whitespace
'Stmt'      Name
','         Operator
' '         Text.Whitespace
't_binder'  Name
','         Operator
' '         Text.Whitespace
't_stmt'    Name
','
            Operator
' '         Text.Whitespace
't_exp'     Name
','         Operator
'\n    '    Text.Whitespace
'ModuleLoad' Name
';'         Punctuation
'\n '       Text.Whitespace
'export'    Keyword
'\n   '     Text.Whitespace
'# These first few are smart constructors (for themselves):\n' Comment.Single

'      '    Text.Whitespace
'ints'      Name
','         Operator
' '         Text.Whitespace
'sums'      Name
','         Operator
```

```
'\n     '    Text.Whitespace
'# while these are "proper functions"\n' Comment.Single

'      '    Text.Whitespace
'mk_HArray'  Name
','         Operator
' '         Text.Whitespace
'genLoop'    Name
','         Operator
' '         Text.Whitespace
'unproducts' Name
','         Operator
' '         Text.Whitespace
'unproduct'  Name
','         Operator
'\n        ' Text.Whitespace
'peel'       Name
','         Operator
' '         Text.Whitespace
'split'      Name
','         Operator
' '

   Text.Whitespace
'graft'      Name
','         Operator
' '         Text.Whitespace
'rebase_lower' Name
','         Operator
' '         Text.Whitespace
'rebase_upper' Name
','         Operator
' '         Text.Whitespace
'Print'      Name
';'         Punctuation
'\n '        Text.Whitespace
'# these names are not assigned (and should not be).  But they are\n' Comment.Single

' '         Text.Whitespace
'# used as global names, so document that here.\n' Comment.Single

' '         Text.Whitespace
'global'     Keyword
' '         Text.Whitespace
'Ints'       Name
','         Operator
' '         Text.Whitespace
'Sums'       Name
','         Operator
```

```
' '          Text.Whitespace
'csgn'       Name
','          Operator
' '          Text.Whitespace
'sum'        Name
','          Operator
' '          Text.Whitespace
'signum'     Name
';'          Punctuation
'\n '        Text.Whitespace
'uses'       Keyword
' '          Text.Whitespace
'Hakaru'
    Name
','          Operator
' '          Text.Whitespace
'KB'         Name
','          Operator
' '          Text.Whitespace
'Utilities'  Name
';'          Punctuation
'\n\n '      Text.Whitespace
't_binder'   Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'"'          Punctuation
'Binder'     Name
'('          Punctuation
'identical'  Name
'('          Punctuation
'product'    Name
','          Operator
' '          Text.Whitespace
'Product'    Name
','          Operator
' '          Text.Whitespace
'sum'        Name
','          Operator
' '          Text.Whitespace
'Sum'        Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
't_kb'        Name
')'          Punctuation
'"'          Punctuation
';'          Punctuation
```

'\n '   Text.Whitespace
't_stmt'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'"'   Punctuation
'Stmt'
        Name
'('   Punctuation
'anything'   Name
','   Operator
' '   Text.Whitespace
'list'   Name
','   Operator
' '   Text.Whitespace
'list'   Name
')'   Punctuation
'"'   Punctuation
';'   Punctuation
'\n '   Text.Whitespace
't_exp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'"'   Punctuation
'{'   Punctuation
'Stmt'   Name
'('   Punctuation
'identical'   Name
'('   Punctuation
'exp'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'[]'   Punctuation
','   Operator
' '   Text.Whitespace
'[])'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'Stmt'   Name
'('   Punctuation
'identical'   Name
'('   Punctuation
'`^`'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace

'['
          Punctuation
'anything'   Name
']'   Punctuation
','   Operator
' '   Text.Whitespace
'[])}'   Punctuation
'"'   Punctuation
';'   Punctuation
'\n\n '   Text.Whitespace
'ints'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'()'   Punctuation
' '   Text.Whitespace
'intssums'   Name
'('   Punctuation
'"'   Punctuation
'ints'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'int'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'_passed'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'sums'   Name
' '   Text.Whitespace
':='   Operator
' '

    Text.Whitespace
'proc'   Keyword
'()'   Punctuation
' '   Text.Whitespace
'intssums'   Name
'('   Punctuation
'"'   Punctuation

'sums'	Name
'"'	Punctuation
','	Operator
' '	Text.Whitespace
'"'	Punctuation
'sum'	Name
'"'	Punctuation
','	Operator
' '	Text.Whitespace
'_passed'	Name
')'	Punctuation
' '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'proc'	Keyword
';'	Punctuation
'\n\n '	Text.Whitespace
'Print'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'proc'	Keyword
'('	Punctuation
'kind'	Name
'::'	Operator
'identical'	Name
'('	Punctuation
'Ints'	Name
','	Operator
'Sums'	Name
','	Operator
'ints'	Name
','	Operator
'sums'	Name
')'	Punctuation
','	Operator
'e'	Name
','	Operator
'v'	Name
'::'	Operator
'name'	Name
','	Operator
'r0'	Name
'::'	Operator
'range'	Name
','	Operator
'rs'	Name

```
'::'        Operator
'list'      Name
'('         Punctuation
'name'      Name
'='         Operator
'range'     Name
')'         Punctuation
','         Operator
'$'         Operator
')'         Punctuation
'\n  '      Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'k'         Name
';'         Punctuation
'\n  '      Text.Whitespace
'k'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'StringTools' Name
'['         Punctuation
'Capitalize' Name
']('        Punctuation
'StringTools' Name
'['         Punctuation
'Chop'      Name
']('        Punctuation
'convert'   Name.Builtin
'('         Punctuation
'kind'      Name
','
        Operator
'string'    Name
')));'      Punctuation
'\n  '      Text.Whitespace
'k'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'parse'     Name.Builtin
'('         Punctuation
'cat'       Name.Builtin
'('         Punctuation
'"`print/"' Literal.String
','         Operator
'eval'      Name.Builtin
'('         Punctuation
```

'k'   Name

')'   Punctuation

','   Operator

'"`"'   Literal.String

'));'   Punctuation

'\n   '   Text.Whitespace

'eval'   Name.Builtin

'('   Punctuation

'k'   Name

')('   Punctuation

'e'   Name

','   Operator

'v'   Name

'['   Punctuation

'op'   Name.Builtin

'('   Punctuation

'rs'   Name

')]'   Punctuation

'='   Operator

'r0'   Name

');'   Punctuation

'\n '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'proc'

    Keyword

';'   Punctuation

'\n\n '   Text.Whitespace

'intssums' Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'proc'   Keyword

'('   Punctuation

'makes'   Name

'::'   Operator

'name'   Name

','   Operator

' '   Text.Whitespace

'make'   Name

'::'   Operator

'name'   Name

','   Operator

'\n   ' Text.Whitespace

'e'   Name

'::'   Operator

'anything' Name

','   Operator

```
' '          Text.Whitespace
'x'          Name
'::'         Operator
'name'       Name
','          Operator
' '          Text.Whitespace
'rr'         Name
'::'         Operator
'range'      Name
','          Operator
' '          Text.Whitespace
'll'         Name
'::'         Operator
'list'       Name
'('          Punctuation
'name'       Name
'='          Operator
'range'      Name
')'          Punctuation
','          Operator
'\n

             ' Text.Whitespace
'kb'         Name
'::'         Operator
't_kb'       Name
':='         Operator
'empty'      Name
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n   '      Text.Whitespace
'local'      Keyword
' '          Text.Whitespace
't'          Name
','          Operator
' '          Text.Whitespace
'r'          Name
','          Operator
' '          Text.Whitespace
'l'          Name
','          Operator
' '          Text.Whitespace
'kb2'        Name
','          Operator
' '          Text.Whitespace
'w0'         Name
','          Operator
```

```
' '         Text.Whitespace
'pp'        Name
','         Operator
' '         Text.Whitespace
'i'         Name
';'         Punctuation
'\n   '     Text.Whitespace
't'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`if`'      Name
'('         Punctuation
'make'      Name
'='
            Operator
'int'       Name
','         Operator
' '         Text.Whitespace
'HReal'     Name
'('         Punctuation
'open_bounds' Name
'('         Punctuation
'rr'        Name
'))'        Punctuation
','         Operator
' '         Text.Whitespace
'HInt'      Name
'('         Punctuation
'closed_bounds' Name
'('         Punctuation
'rr'        Name
')));'      Punctuation
'\n   '     Text.Whitespace
'r'         Name
','         Operator
' '         Text.Whitespace
'l'         Name
','         Operator
' '         Text.Whitespace
'kb2'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'genLoop'   Name
'('         Punctuation
'rr'        Name
','         Operator
```

' '	Text.Whitespace
'll'	Name
','	Operator
' '	Text.Whitespace
'kb'	Name
','	Operator
' '	Text.Whitespace
'"'	Punctuation
'Integrand'	Name
'"'	Punctuation
'('	Punctuation
'x'	Name
','	Operator
'e'	Name
'));'	Punctuation
'\n '	Text.Whitespace
'w0'	Name
','	Operator
' '	Text.Whitespace
'pp'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'unproducts'	Name
'('	Punctuation
'e'	Name
','	Operator
' '	Text.Whitespace
'x'	Name
','	Operator
' '	Text.Whitespace
'l'	Name
','	Operator
' '	Text.Whitespace
'kb2'	Name
');'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'depends'	Name
'('	Punctuation
'w0'	Name
','	Operator
' '	Text.Whitespace
'x'	Name
')'	Punctuation
' '	Text.Whitespace

'then'   Keyword

\n   '   Text.Whitespace

'"'   Punctuation

'makes'

        Name

'('   Punctuation

'e'   Name

','   Operator

' '   Text.Whitespace

'x'   Name

','   Operator

' '   Text.Whitespace

'rr'   Name

','   Operator

' '   Text.Whitespace

'll'   Name

')'   Punctuation

'"'   Punctuation

\n   '   Text.Whitespace

'else'   Keyword

\n   '   Text.Whitespace

'pp'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'"'   Punctuation

'make'   Name

'"'   Punctuation

'('   Punctuation

'pp'   Name

','   Operator

' '   Text.Whitespace

'x'   Name

'='   Operator

'r'   Name

');'   Punctuation

\n   '   Text.Whitespace

'for'   Keyword

' '   Text.Whitespace

'i'   Name

' '   Text.Whitespace

'in'   Keyword

' '   Text.Whitespace

'l'   Name

' '   Text.Whitespace

'do'

        Keyword

' '   Text.Whitespace

```
'pp'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'"'         Punctuation
'product'   Name
'"'         Punctuation
'('         Punctuation
'pp'        Name
','         Operator
' '         Text.Whitespace
'i'         Name
')'         Punctuation
' '         Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'do'        Keyword
';'         Punctuation
\n    '     Text.Whitespace
'NewSLO'    Name
':'         Operator
'-'         Operator
'simplify_factor_assuming' Name
'('         Punctuation
'w0'        Name
' '         Text.Whitespace
'*'         Operator
' '         Text.Whitespace
'pp'        Name
','         Operator
' '         Text.Whitespace
'kb'        Name
');'        Punctuation
\n   '      Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
\n '        Text.Whitespace
'end'
     Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
\n\n '      Text.Whitespace
'mk_HArray' Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
```

'proc'   Keyword
'('   Punctuation
't'   Name
'::'   Operator
't_type'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
'::'   Operator
'list'   Name
'('   Punctuation
'name'   Name
'='   Operator
'range'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'res'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
't'
        Name
';'   Punctuation
'\n   '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'i'   Name
' '   Text.Whitespace
'in'   Keyword
' '   Text.Whitespace
'loops'   Name
' '   Text.Whitespace
'do'   Keyword
' '   Text.Whitespace
'res'   Name
' '   Text.Whitespace

':='   Operator
' '   Text.Whitespace
'HArray'   Name
'('   Punctuation
'res'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
\n   '   Text.Whitespace
'res'   Name
\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
\n\n '   Text.Whitespace
'genLoop'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('

        Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
'::'   Operator
'list'   Name
'('   Punctuation
'name'   Name
'='   Operator
'range'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'kb'   Name
'::'   Operator
't_kb'   Name
')'   Punctuation
\n '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'kb1'   Name
','   Operator

```
' '         Text.Whitespace
'rng'       Name
','         Operator
' '         Text.Whitespace
'ind'       Name
','         Operator
' '         Text.Whitespace
'do_subst'  Name
','         Operator
' '         Text.Whitespace
'i'         Name
';'         Punctuation
'\n   '     Text.Whitespace
'kb1'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'kb'        Name
';'         Punctuation
'\n
    '       Text.Whitespace
'rng'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'table'     Name.Builtin
'();'       Punctuation
'\n   '     Text.Whitespace
'ind'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'table'     Name.Builtin
'();'       Punctuation
'\n   '     Text.Whitespace
'do_subst'  Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'e'         Name
' '         Text.Whitespace
'->'        Operator
' '         Text.Whitespace
'foldl'     Name
'((('       Punctuation
'e'         Name
','         Operator
'eq'        Name
```

')'   Punctuation
' '   Text.Whitespace
'->'   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'(['   Punctuation
'lhs'
            Name.Builtin
'('   Punctuation
'eq'   Name
')'   Punctuation
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'loops'   Name
')'   Punctuation
'='   Operator
'rhs'   Name.Builtin
'('   Punctuation
'eq'   Name
')))'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'e'   Name
','   Operator
' '   Text.Whitespace
'entries'   Name.Builtin
'('   Punctuation
'ind'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'pairs'   Name
'"'   Punctuation
'));'   Punctuation
'\n   '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'i'   Name
' '   Text.Whitespace
'from'   Keyword
' '   Text.Whitespace

'nops'   Name.Builtin
'('   Punctuation
'loops'   Name
')'
 Punctuation
' '   Text.Whitespace
'to'   Keyword
' '   Text.Whitespace
'1'   Literal.Number.Integer
' '   Text.Whitespace
'by'   Keyword
' '   Text.Whitespace
'-'   Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'do'   Keyword
'\n   ' Text.Whitespace
'rng'   Name
'['   Punctuation
'i'   Name
']'   Punctuation
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'do_subst'   Name
'('   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'i'   Name
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'loops'   Name
'));'   Punctuation
'\n   ' Text.Whitespace
'ind'   Name
'['   Punctuation
'i'   Name
']'   Punctuation
','   Operator
' '   Text.Whitespace
'kb1'   Name
' '
    Text.Whitespace
':='   Operator
' '   Text.Whitespace
'genType'   Name

```
'('          Punctuation
'op'          Name.Builtin
'(['          Punctuation
'i'           Name
','           Operator
'1'           Literal.Number.Integer
']'           Punctuation
','           Operator
'loops'       Name
')'           Punctuation
','           Operator
' '           Text.Whitespace
'HInt'        Name
'('           Punctuation
'closed_bounds' Name
'('           Punctuation
'rng'         Name
'['           Punctuation
'i'           Name
']))'         Punctuation
','           Operator
'\n                    ' Text.Whitespace
'kb1'         Name
','           Operator
' '           Text.Whitespace
'_rest'       Name
');'          Punctuation
'\n    '      Text.Whitespace
'end'         Keyword
' '           Text.Whitespace
'do'          Keyword
';'           Punctuation
'\n    '      Text.Whitespace
'do_subst'    Name
'('           Punctuation
'e'           Name
')'
              Punctuation
','           Operator
' '           Text.Whitespace
'zip'         Name
'('           Punctuation
'`=`'         Name
','           Operator
' '           Text.Whitespace
'['           Punctuation
'entries'     Name.Builtin
'('           Punctuation
```

'ind'   Name
','   Operator
' '   Text.Whitespace
'""'   Punctuation
'nolist'   Name
'""'   Punctuation
')]'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'['   Punctuation
'entries'   Name.Builtin
'('   Punctuation
'rng'   Name
','   Operator
' '   Text.Whitespace
'""'   Punctuation
'nolist'   Name
'""'   Punctuation
')])'   Punctuation
','   Operator
' '   Text.Whitespace
'kb1'   Name
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'unproducts'
 Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'w'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
'::'   Operator
'name'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
'::'   Operator
'list'   Name
'('   Punctuation
'name'   Name

'='   Operator
'range'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'kb'   Name
'::'   Operator
't_kb'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'w0'   Name
','   Operator
' '   Text.Whitespace
'pp'   Name
','   Operator
' '   Text.Whitespace
'j'   Name
','   Operator
' '   Text.Whitespace
'w1'

         Name
','   Operator
' '   Text.Whitespace
'w2'   Name
','   Operator
' '   Text.Whitespace
'loop'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'w0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
';'   Punctuation
'\n   '   Text.Whitespace
'pp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'w'   Name
';'   Punctuation
'\n   '   Text.Whitespace

```
'for'      Keyword
' '        Text.Whitespace
'j'        Name
' '        Text.Whitespace
'from'     Keyword
' '        Text.Whitespace
'nops'     Name.Builtin
'('        Punctuation
'loops'    Name
')'        Punctuation
' '        Text.Whitespace
'to'       Keyword
' '        Text.Whitespace
'1'        Literal.Number.Integer
' '        Text.Whitespace
'by'
           Keyword
' '        Text.Whitespace
'-'        Operator
'1'        Literal.Number.Integer
' '        Text.Whitespace
'do'       Keyword
'\n   '    Text.Whitespace
'w1'       Name
','        Operator
' '        Text.Whitespace
'pp'       Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'op'       Name.Builtin
'('        Punctuation
'unproduct'  Name
'('        Punctuation
'pp'       Name
','        Operator
' '        Text.Whitespace
'x'        Name
','        Operator
' '        Text.Whitespace
'op'       Name.Builtin
'('        Punctuation
'j'        Name
','        Operator
'loops'    Name
')'        Punctuation
','        Operator
' '        Text.Whitespace
```

'[]'   Punctuation
','   Operator
' '   Text.Whitespace
"`*`"   Name
','   Operator
' '   Text.Whitespace
'kb'   Name
','   Operator
'
'
' '   Text.Whitespace
'kb'   Name
'));'   Punctuation
'\n   ' Text.Whitespace
'# separate out each of the factors in w1, as they might have different\n' Comment.Single

'   '   Text.Whitespace
'# variable dependencies, which can be exploited by other routines\n' Comment.Single

'   '   Text.Whitespace
'w2'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
'w1'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'list'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'"'   Punctuation
"`*`"   Name
'"'   Punctuation
');'   Punctuation
'\n   ' Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'loop'   Name
' '   Text.Whitespace
'in'   Keyword
' '   Text.Whitespace
'['   Punctuation
'op'
        Name.Builtin
'('   Punctuation

'j'   Name
'+'   Operator
'1'   Literal.Number.Integer
'..'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'loops'   Name
')]'   Punctuation
' '   Text.Whitespace
'do'   Keyword
'\n   '   Text.Whitespace
'w2'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'map'   Name.Builtin
'(('   Punctuation
'w'   Name
' '   Text.Whitespace
'->'   Operator
' '   Text.Whitespace
'product' Name
'('   Punctuation
'eval'   Name.Builtin
'('   Punctuation
'w'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator
'idx'   Name
'('   Punctuation
'x'   Name
','   Operator
'lhs'   Name.Builtin
'('   Punctuation
'loop'

     Name
')))'   Punctuation
','   Operator
' '   Text.Whitespace
'loop'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'w2'   Name

');'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'w0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'w0'   Name
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'w2'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'# w0 := w0 * foldl(product, w1, op(j+1..-1, loops));\n' Comment.Single

'   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '

   Text.Whitespace
'# Rewrite ... * piecewise(i<=kk-1, xs^2, 1)\n' Comment.Single

'   '   Text.Whitespace
'#   to ... * xs ^ (2*piecewise(i<=kk-1, 1))\n' Comment.Single

'   '   Text.Whitespace
'# because the latter is easier to integrate and recognize with respect to xs\n' Comment.Single

'   '   Text.Whitespace
'pp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'for_poly' Name
'('   Punctuation
'pp'   Name
','   Operator

' '   Text.Whitespace
'# TODO: move this rewrite into eval_factor (then remove for_poly?)?\n' Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
' '   Text.Whitespace
'('   Punctuation
'p'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'n'   Name
','   Operator
' '   Text.Whitespace
's'   Name
','   Operator
' '

              Text.Whitespace
'r'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'p'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'And'   Name
'('   Punctuation
'specfunc'   Name
'('   Punctuation
'piecewise'   Name.Builtin
')'   Punctuation
','   Operator
' '   Text.Whitespace
'anyfunc'   Name
'('   Punctuation
'freeof'   Name
'('   Punctuation
'x'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'anything'   Name
','   Operator
' '   Text.Whitespace

'1'	Literal.Number.Integer
'))'	Punctuation
'"'	Punctuation
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'n'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'indets'	
	Name.Builtin
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'1'	Literal.Number.Integer
','	Operator
'p'	Name
')'	Punctuation
','	Operator
'name'	Name
');'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'op'	Name.Builtin
'('	Punctuation
'2'	Literal.Number.Integer
','	Operator
'p'	Name
')'	Punctuation
' '	Text.Whitespace
'::'	Operator
' '	Text.Whitespace
'{'	Punctuation
'"'	Punctuation
'exp'	Name
'('	Punctuation
'anything'	Name
')'	Punctuation
'"'	Punctuation
','	Operator
' '	Text.Whitespace
'"'	Punctuation
'`^`'	Name
'"'	Punctuation
'('	Punctuation
'"'	Punctuation

```
'freeof'     Name
'"'          Punctuation
'('
             Punctuation
'n'          Name
')'          Punctuation
','          Operator
'"'          Punctuation
'anything'   Name
'"'          Punctuation
')}'         Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n          ' Text.Whitespace
's'          Name
','          Operator
' '          Text.Whitespace
'r'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'selectremove' Name.Builtin
'('          Punctuation
'depends'    Name
','          Operator
' '          Text.Whitespace
'convert'    Name.Builtin
'('          Punctuation
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'-'          Operator
'1'          Literal.Number.Integer
']'          Punctuation
','          Operator
'p'          Name
')'          Punctuation
','          Operator
'"'          Punctuation
'list'       Name
'"'          Punctuation
','
    Operator
'"'          Punctuation
'`*`'        Name
'"'          Punctuation
')'          Punctuation
```

','   Operator

' '   Text.Whitespace

'n'   Name

');'   Punctuation

\n   ' Text.Whitespace

'subsop'   Name.Builtin

'('   Punctuation

'-'   Operator

'1'   Literal.Number.Integer

' '   Text.Whitespace

'='   Operator

' '   Text.Whitespace

"`*`"   Name

'('   Punctuation

'piecewise'   Name.Builtin

'('   Punctuation

'op'   Name.Builtin

'('   Punctuation

'1'   Literal.Number.Integer

','   Operator

'p'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace

"`*`"   Name

'('   Punctuation

'op'   Name.Builtin

'('   Punctuation

's'   Name

')))'   Punctuation

','   Operator

' '   Text.Whitespace

'op'   Name.Builtin

'('   Punctuation

'r'

        Name

'))'   Punctuation

','   Operator

' '   Text.Whitespace

'op'   Name.Builtin

'('   Punctuation

'2'   Literal.Number.Integer

','   Operator

'p'   Name

'))'   Punctuation

\n   ' Text.Whitespace

'else'   Keyword

\n   ' Text.Whitespace

```
's'         Name
','         Operator
' '         Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'depends'    Name
','         Operator
' '         Text.Whitespace
'convert'    Name.Builtin
'('         Punctuation
'op'         Name.Builtin
'('         Punctuation
'2'          Literal.Number.Integer
','         Operator
'p'          Name
')'         Punctuation
','         Operator
'"'          Punctuation
'list'       Name
'"'          Punctuation
','         Operator
'"'          Punctuation
'`*`'
    Name
'"'          Punctuation
')'         Punctuation
','         Operator
' '         Text.Whitespace
'n'          Name
');'         Punctuation
'\n          ' Text.Whitespace
'`*`'        Name
'('         Punctuation
'op'         Name.Builtin
'('         Punctuation
'r'          Name
'))'         Punctuation
' '         Text.Whitespace
'^'          Operator
' '         Text.Whitespace
'piecewise'  Name.Builtin
'('         Punctuation
'op'         Name.Builtin
'('         Punctuation
```

'1'   Literal.Number.Integer
','   Operator
'p'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
')'   Punctuation
'\n   ' Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'`if`'   Name
'('   Punctuation
'nops'   Name.Builtin
'('   Punctuation
's'   Name
')'   Punctuation
' '   Text.Whitespace
'>'

           Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'piecewise'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'p'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
's'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
')'   Punctuation
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
')'   Punctuation

'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n   ' Text.Whitespace
'else'   Keyword
'\n   ' Text.Whitespace
'p'   Name
'\n

       ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
');'   Punctuation
'\n   '   Text.Whitespace
'w0'   Name
','   Operator
' '   Text.Whitespace
'pp'   Name
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'# Find [w1,pp] so that\n' Comment.Single

' '   Text.Whitespace
'#   wrap(heap,w,mode,kb1,kb0)\n' Comment.Single

' '   Text.Whitespace
'#   = w1*product(eval(pp,var=idx(var,lhs(loop))),loop)\n' Comment.Single

' '   Text.Whitespace
'# making w1 depend on var as little as possible.\n' Comment.Single

' '   Text.Whitespace
'# The flag "mode" should be `+` if "heap" contains an entry of the form\n' Comment.Single

' '   Text.Whitespace
'# t_exp,
 or `*` otherwise.\n' Comment.Single

' '   Text.Whitespace

```
'unproduct'  Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'proc'       Keyword
'('          Punctuation
'w'          Name
','          Operator
' '          Text.Whitespace
'var'        Name
'::'         Operator
'name'       Name
','          Operator
' '          Text.Whitespace
'loop'       Name
'::'         Operator
'('          Punctuation
'name'       Name
'='          Operator
'range'      Name
')'          Punctuation
','          Operator
'\n                ' Text.Whitespace
'heap'       Name
'::'         Operator
'list'       Name
','          Operator
' '          Text.Whitespace
'mode'       Name
'::'         Operator
'identical'  Name
'('          Punctuation
'`*`'        Name
','          Operator
'`+`'        Name
')'          Punctuation
','          Operator
'\n                ' Text.Whitespace
'kb1'        Name
'::'
        Operator
't_kb'       Name
','          Operator
' '          Text.Whitespace
'kb0'        Name
'::'         Operator
't_kb'       Name
','          Operator
```

```
' '        Text.Whitespace
'$'        Operator
')'        Punctuation
'\n   '    Text.Whitespace
'local'    Keyword
' '        Text.Whitespace
'ind'      Name
','        Operator
' '        Text.Whitespace
'res'      Name
','        Operator
' '        Text.Whitespace
'dummy'    Name
','        Operator
' '        Text.Whitespace
'kb'       Name
','        Operator
' '        Text.Whitespace
'kbThen'   Name
','        Operator
' '        Text.Whitespace
'i'        Name
','        Operator
' '        Text.Whitespace
'w1'       Name
','        Operator
' '        Text.Whitespace
'pp'       Name
','        Operator
' '        Text.Whitespace
's'        Name
','        Operator
' '        Text.Whitespace
'r'        Name
','
           Operator
' '        Text.Whitespace
'x'        Name
';'        Punctuation
'\n   '    Text.Whitespace
'if'       Keyword
' '        Text.Whitespace
'not'      Keyword
' '        Text.Whitespace
'depends'  Name
'('        Punctuation
'w'        Name
','        Operator
```

```
' '         Text.Whitespace
'var'       Name
')'         Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'['         Punctuation
'wrap'      Name
'('         Punctuation
'heap'      Name
','         Operator
' '         Text.Whitespace
'w'         Name
','         Operator
' '         Text.Whitespace
'mode'      Name
','         Operator
' '         Text.Whitespace
'kb1'       Name
','         Operator
' '         Text.Whitespace
'kb0'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
']'
            Punctuation
'\n   '     Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n   '     Text.Whitespace
"# The `..' (indices) of all occurences of `idx(var,..)'\n" Comment.Single

'   '       Text.Whitespace
'ind'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'map2'      Name
'('         Punctuation
'op'        Name.Builtin
','         Operator
' '         Text.Whitespace
```

'2'   Literal.Number.Integer

','   Operator

' '   Text.Whitespace

'indets'   Name.Builtin

'('   Punctuation

'w'   Name

','   Operator

' '   Text.Whitespace

'"'   Punctuation

'idx'   Name

'('   Punctuation

'identical'   Name

'('   Punctuation

'var'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace

'anything'   Name

')'

    Punctuation

'"'   Punctuation

'));'   Punctuation

'\n   '   Text.Whitespace

'if'   Keyword

' '   Text.Whitespace

'nops'   Name.Builtin

'('   Punctuation

'ind'   Name

')'   Punctuation

' '   Text.Whitespace

'='   Operator

' '   Text.Whitespace

'1'   Literal.Number.Integer

' '   Text.Whitespace

'then'   Keyword

'\n   '   Text.Whitespace

'ind'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'op'   Name.Builtin

'('   Punctuation

'ind'   Name

');'   Punctuation

'\n   '   Text.Whitespace

'# Make sure ind contains no bound variables before lifting it!\n' Comment.Single

'   '   Text.Whitespace

'# So, check that "extract using indets" and "rename using eval" commute.\n' Comment.Single

'   '   Text.Whitespace
's'   Name
' '   Text.Whitespace
':='   Operator
' '

 Text.Whitespace
'indets'   Name.Builtin
'('   Punctuation
'ind'   Name
','   Operator
' '   Text.Whitespace
'"'"'   Punctuation
'name'   Name
'"'"'   Punctuation
');'   Punctuation
'\n   '   Text.Whitespace
's'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'map'   Name.Builtin
'('   Punctuation
'proc'   Keyword
'('   Punctuation
'x'   Name
','   Operator
'$'   Operator
')'   Punctuation
' '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'y'   Name
';'   Punctuation
' '   Text.Whitespace
'`if`'   Name
'('   Punctuation
'depends'   Name
'('   Punctuation
'ind'   Name
','   Operator
'x'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator

'y'
    Name
','   Operator
' '   Text.Whitespace
'NULL'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
' '   Text.Whitespace
's'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'indets'   Name.Builtin
'('   Punctuation
'eval'   Name.Builtin
'('   Punctuation
'w'   Name
','   Operator
' '   Text.Whitespace
's'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'idx'   Name
'('   Punctuation
'identical'   Name
'('   Punctuation
'var'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'anything'   Name
')'   Punctuation
'"'   Punctuation
')'   Punctuation
'\n   '
 Text.Whitespace
'='   Operator
' '   Text.Whitespace
'{'   Punctuation
'idx'   Name
'('   Punctuation

```
'var'        Name
','          Operator
' '          Text.Whitespace
'eval'       Name.Builtin
'('          Punctuation
'ind'        Name
','          Operator
' '          Text.Whitespace
's'          Name
'))}'        Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n   '      Text.Whitespace
"# use kb as a local context, and 'solve' for the innermost bound var\n" Comment.Single

'     '      Text.Whitespace
'#   used in ind.\n' Comment.Single

'     '      Text.Whitespace
'kb'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'assert'     Name
'('          Punctuation
'lhs'        Name.Builtin
'('          Punctuation
'loop'       Name
')'          Punctuation
'='          Operator
'ind'        Name
','          Operator
' '          Text.Whitespace
'kb1'
    Name
');'         Punctuation
' '          Text.Whitespace
'# BUG! bijectivity assumed!\n' Comment.Single

'     '      Text.Whitespace
"# if the assertion makes the KB false, it isn't needed(?)\n" Comment.Single

'     '      Text.Whitespace
'ASSERT'     Name.Builtin
'('          Punctuation
'type'       Name.Builtin
'('          Punctuation
'kb'         Name
```

','   Operator
' '   Text.Whitespace
't_kb'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'sprintf'   Name
'('   Punctuation
'"assert(%a,%a) produced a false KB!\\n"' Literal.String
','   Operator
' '   Text.Whitespace
'lhs'   Name.Builtin
'('   Punctuation
'loop'   Name
')'   Punctuation
'='   Operator
'ind'   Name
','   Operator
'kb1'   Name
'))'   Punctuation
':'   Operator
'\n   ' Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='

      Operator
' '   Text.Whitespace
'subs'   Name.Builtin
'('   Punctuation
'idx'   Name
'('   Punctuation
'var'   Name
','   Operator
'ind'   Name
')'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'idx'   Name
'('   Punctuation
'var'   Name
','   Operator
'lhs'   Name.Builtin
'('   Punctuation
'loop'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace

'w'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'wrap'   Name
'('   Punctuation
'heap'   Name
','   Operator
' '   Text.Whitespace
'res'   Name
','   Operator
' '   Text.Whitespace
'mode'   Name
','   Operator
' '   Text.Whitespace
'kb'

     Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'subs'   Name.Builtin
'('   Punctuation
'idx'   Name
'('   Punctuation
'var'   Name
','   Operator
'lhs'   Name.Builtin
'('   Punctuation
'loop'   Name
'))'   Punctuation
'='   Operator
'dummy'   Name
','   Operator
' '   Text.Whitespace
'res'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace

'not'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'res'   Name
','   Operator
' '   Text.Whitespace
'var'   Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'return'

     Keyword
' '   Text.Whitespace
'['   Punctuation
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'subs'   Name.Builtin
'('   Punctuation
'dummy'   Name
'='   Operator
'var'   Name
','   Operator
' '   Text.Whitespace
'res'   Name
')]'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'# distribute the unproduct over each part\n' Comment.Single

'   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'w'   Name

```
' '        Text.Whitespace
'::'        Operator
' '        Text.Whitespace
'mode'
    Name
' '        Text.Whitespace
'then'        Keyword
'\n     '    Text.Whitespace
'res'        Name
' '        Text.Whitespace
':='        Operator
' '        Text.Whitespace
'map'        Name.Builtin
'('        Punctuation
'unproduct'  Name
','        Operator
' '        Text.Whitespace
`if`        Name
'('        Punctuation
'mode'        Name
'='        Operator
`*`        Name
','        Operator
' '        Text.Whitespace
'list_of_mul' Name
'('        Punctuation
'w'        Name
')'        Punctuation
','        Operator
' '        Text.Whitespace
'['        Punctuation
'op'        Name.Builtin
'('        Punctuation
'w'        Name
')])'        Punctuation
','        Operator
'\n           ' Text.Whitespace
'var'        Name
','        Operator
' '        Text.Whitespace
'loop'        Name
','        Operator
' '        Text.Whitespace
'heap'        Name
','        Operator
' '
         Text.Whitespace
'mode'        Name
```

','	Operator
' '	Text.Whitespace
'kb1'	Name
','	Operator
' '	Text.Whitespace
'kb0'	Name
');'	Punctuation
'\n '	Text.Whitespace
'return'	Keyword
' '	Text.Whitespace
'['	Punctuation
'`*`'	Name
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'map2'	Name
'('	Punctuation
'op'	Name.Builtin
','	Operator
'1'	Literal.Number.Integer
','	Operator
'res'	Name
')))'	Punctuation
','	Operator
' '	Text.Whitespace
'`*`'	Name
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'map2'	Name
'('	Punctuation
'op'	Name.Builtin
','	Operator
'2'	Literal.Number.Integer
','	Operator
'res'	Name
')))]'	Punctuation
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'# for piecewise, just map right in (using KB for context tracking)\n'	Comment.Single
' '	Text.Whitespace
'if'	Keyword

```
' '        Text.Whitespace
'w'         Name
' '        Text.Whitespace
'::'       Operator
' '        Text.Whitespace
'"'        Punctuation
'specfunc'  Name
'('        Punctuation
'piecewise'  Name.Builtin
')'        Punctuation
'"'        Punctuation
' '        Text.Whitespace
'then'      Keyword
\n    '    Text.Whitespace
'kb'        Name
' '        Text.Whitespace
':='        Operator
' '        Text.Whitespace
'kb1'        Name
';'        Punctuation
\n    '    Text.Whitespace
'for'       Keyword
' '        Text.Whitespace
'i'         Name
' '        Text.Whitespace
'from'       Keyword
' '        Text.Whitespace
'1'         Literal.Number.Integer
'
    '        Text.Whitespace
'to'        Keyword
' '        Text.Whitespace
'nops'       Name.Builtin
'('        Punctuation
'w'         Name
')'        Punctuation
' '        Text.Whitespace
'do'        Keyword
\n    '    Text.Whitespace
'if'        Keyword
' '        Text.Whitespace
'i'         Name
' '        Text.Whitespace
'::'       Operator
' '        Text.Whitespace
'even'       Name
' '        Text.Whitespace
'then'       Keyword
```

'\n   ' Text.Whitespace
'kbThen'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'assert'   Name
'('   Punctuation
'   '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'i'   Name
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
'w'   Name
')'   Punctuation
' '   Text.Whitespace
','   Operator
' '   Text.Whitespace
'kb'   Name
');'

         Punctuation
'\n   ' Text.Whitespace
'# accumulate the rest, regardless\n' Comment.Single

'   ' Text.Whitespace
'kb'   Name
'   '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'assert'   Name
'('   Punctuation
'Not'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
'w'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'kb'   Name
');'   Punctuation
'\n\n   ' Text.Whitespace
'# if kbThen is invalid, deal appropriately\n' Comment.Single

```
'      '  Text.Whitespace
'if'      Keyword
' '       Text.Whitespace
'not'     Keyword
' '       Text.Whitespace
'type'    Name.Builtin
'('       Punctuation
'kbThen'  Name
','       Operator
't_kb'    Name
')'       Punctuation
' '
          Text.Whitespace
'then'    Keyword
' '       Text.Whitespace
'next'    Keyword
' '       Text.Whitespace
'end'     Keyword
' '       Text.Whitespace
'if'      Keyword
';'       Punctuation
'\n\n     ' Text.Whitespace
'w1'      Name
'['       Punctuation
'i'       Name
']'       Punctuation
','       Operator
' '       Text.Whitespace
'pp'      Name
'['       Punctuation
'i'       Name
']'       Punctuation
' '       Text.Whitespace
':='      Operator
' '       Text.Whitespace
'op'      Name.Builtin
'('       Punctuation
'unproduct'  Name
'('       Punctuation
'op'      Name.Builtin
'('       Punctuation
'i'       Name
','       Operator
'w'       Name
')'       Punctuation
','       Operator
'var'     Name
```

',' Operator
'loop' Name
',' Operator
'heap' Name
',' Operator
'mode' Name
',' Operator
'kbThen'
    Name
',' Operator
'kb0' Name
'));' Punctuation
'\n ' Text.Whitespace
"# if kb is inconsistent, we're done\n" Comment.Single

' ' Text.Whitespace
'if' Keyword
' ' Text.Whitespace
'not' Keyword
' ' Text.Whitespace
'type' Name.Builtin
'(' Punctuation
'kb' Name
',' Operator
't_kb' Name
')' Punctuation
' ' Text.Whitespace
'then' Keyword
' ' Text.Whitespace
'break' Keyword
' ' Text.Whitespace
'end' Keyword
' ' Text.Whitespace
'if' Keyword
';' Punctuation
'\n ' Text.Whitespace
'elif' Keyword
' ' Text.Whitespace
'i' Name
' ' Text.Whitespace
'=' Operator
' ' Text.Whitespace
'nops' Name.Builtin
'(' Punctuation
'w' Name
')' Punctuation
' ' Text.Whitespace
'then'

```
          Keyword
'\n        ' Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'not'       Keyword
' '         Text.Whitespace
'type'      Name.Builtin
'('         Punctuation
'kb'        Name
','         Operator
't_kb'      Name
')'         Punctuation
' '         Text.Whitespace
'then'      Keyword
' '         Text.Whitespace
'next'      Keyword
' '         Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n        ' Text.Whitespace
'w1'        Name
'['         Punctuation
'i'         Name
']'         Punctuation
','         Operator
' '         Text.Whitespace
'pp'        Name
'['         Punctuation
'i'         Name
']'         Punctuation
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'unproduct' Name
'('         Punctuation
'op'        Name.Builtin
'('
          Punctuation
'i'         Name
','         Operator
'w'         Name
')'         Punctuation
','         Operator
'var'       Name
```

','   Operator

'loop'   Name

','   Operator

'heap'   Name

','   Operator

'mode'   Name

','   Operator

'kb'   Name

' '   Text.Whitespace

','   Operator

'kb0'   Name

'))'   Punctuation

\n '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'if'   Keyword

\n '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'do'   Keyword

';'   Punctuation

\n '   Text.Whitespace

'return'   Keyword

' '   Text.Whitespace

'['   Punctuation

'`*`'   Name

'('   Punctuation

'entries'   Name.Builtin

'('   Punctuation

'w1'   Name

','   Operator

'"'   Punctuation

'nolist'   Name

'"'   Punctuation

'))'   Punctuation

';'

      Operator

' '   Text.Whitespace

'`*`'   Name

'('   Punctuation

'entries'   Name.Builtin

'('   Punctuation

'pp'   Name

','   Operator

'"'   Punctuation

'nolist'   Name

'"'   Punctuation

'))]'   Punctuation

'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'mode'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'`*`'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'w'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'('   Punctuation
'anything' Name
'^'   Operator
'freeof'   Name
'('   Punctuation
'var'   Name
'))'
            Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'unproduct' Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'w'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'var'   Name
','   Operator
' '   Text.Whitespace

```
'loop'       Name
','          Operator
'\n                   ' Text.Whitespace
'['          Punctuation
'op'         Name.Builtin
'('          Punctuation
'heap'       Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'Stmt'       Name
'('          Punctuation
'`^`'        Name
','          Operator
' '          Text.Whitespace
'[]'         Punctuation
','          Operator
' '          Text.Whitespace
'['          Punctuation
'op'         Name.Builtin
'('
             Punctuation
'2'          Literal.Number.Integer
','          Operator
'w'          Name
')])]'       Punctuation
','          Operator
' '          Text.Whitespace
'`*`'        Name
','          Operator
' '          Text.Whitespace
'kb1'        Name
','          Operator
' '          Text.Whitespace
'kb0'        Name
')'          Punctuation
'\n    '     Text.Whitespace
'elif'       Keyword
' '          Text.Whitespace
'w'          Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'exp'        Name
'('          Punctuation
'anything'   Name
')'          Punctuation
' '          Text.Whitespace
```

'then'   Keyword
'\n   ' Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'unproduct' Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'w'   Name
')'   Punctuation
','   Operator
'
 '   Text.Whitespace
'var'   Name
','   Operator
' '   Text.Whitespace
'loop'   Name
','   Operator
'\n   ' Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'heap'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'Stmt'   Name
'('   Punctuation
'exp'   Name
','   Operator
' '   Text.Whitespace
'[]'   Punctuation
','   Operator
' '   Text.Whitespace
'[])]'   Punctuation
','   Operator
' '   Text.Whitespace
'`+`'   Name
','   Operator
' '   Text.Whitespace
'kb1'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
')'   Punctuation
'\n   ' Text.Whitespace

'elif'   Keyword
' '   Text.Whitespace
'w'   Name
' '   Text.Whitespace
'::'   Operator
' '
    Text.Whitespace
'('   Punctuation
'freeof'   Name
'('   Punctuation
'var'   Name
')^'   Punctuation
'anything'   Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'unproduct' Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'w'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'var'   Name
','   Operator
' '   Text.Whitespace
'loop'   Name
','   Operator
'\n   '   Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'heap'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'Stmt'   Name
'('   Punctuation
'`^`'   Name
','   Operator
' '

	Text.Whitespace
'['	Punctuation
'op'	Name.Builtin
'('	Punctuation
'1'	Literal.Number.Integer
','	Operator
'w'	Name
')]'	Punctuation
','	Operator
' '	Text.Whitespace
'[])]'	Punctuation
','	Operator
' '	Text.Whitespace
'`+`'	Name
','	Operator
' '	Text.Whitespace
'kb1'	Name
','	Operator
' '	Text.Whitespace
'kb0'	Name
')'	Punctuation
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'mode'	Name
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace
'`+`'	Name
' '	Text.Whitespace
'and'	
	Keyword
' '	Text.Whitespace
'w'	Name
' '	Text.Whitespace
'::'	Operator
' '	Text.Whitespace
'`*`'	Name
' '	Text.Whitespace

'then'   Keyword
\n   '   Text.Whitespace
's'   Name
','   Operator
' '   Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'depends'   Name
','   Operator
' '   Text.Whitespace
'w'   Name
','   Operator
' '   Text.Whitespace
'var'   Name
');'   Punctuation
\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
's'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'`*`'   Name
' '   Text.Whitespace
'then'   Keyword
\n   '   Text.Whitespace
'# Nonlinear %1 (time to reread kiselyov-lifted?)\n'
 Comment.Single

'   '   Text.Whitespace
'else'   Keyword
\n   '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'unproduct' Name
'('   Punctuation
's'   Name
','   Operator
' '   Text.Whitespace
'var'   Name
','   Operator
' '   Text.Whitespace
'loop'   Name
','   Operator

'\n '	Text.Whitespace
'['	Punctuation
'op'	Name.Builtin
'('	Punctuation
'heap'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'Stmt'	Name
'('	Punctuation
'`*`'	Name
','	Operator
' '	Text.Whitespace
'[]'	Punctuation
','	Operator
' '	Text.Whitespace
'['	Punctuation
'r'	Name
'])]'	Punctuation
','	Operator
' '	Text.Whitespace
'`+`'	Name
','	Operator
' '	Text.Whitespace
'kb1'	
	Name
','	Operator
' '	Text.Whitespace
'kb0'	Name
')'	Punctuation
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'w'	Name
' '	Text.Whitespace
'::'	Operator
' '	Text.Whitespace
'And'	Name
'('	Punctuation

```
'specfunc'   Name
'('          Punctuation
`̀if'̀         Name
'('          Punctuation
'mode'       Name
' '          Text.Whitespace
'='          Operator
' '          Text.Whitespace
`̀*`̀         Name
','          Operator
' '          Text.Whitespace
'{'          Punctuation
'product'    Name
','          Operator
' '          Text.Whitespace
'Product'    Name
'}'          Punctuation
','
   Operator
' '          Text.Whitespace
'{'          Punctuation
'sum'        Name
','          Operator
' '          Text.Whitespace
'Sum'        Name
'}))'        Punctuation
','          Operator
'\n          ' Text.Whitespace
'anyfunc'    Name
'('          Punctuation
'anything'   Name
','          Operator
' '          Text.Whitespace
'name'       Name
'='          Operator
'range'      Name
'('          Punctuation
'freeof'     Name
'('          Punctuation
'var'        Name
')))))'      Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'x'          Name
','          Operator
' '          Text.Whitespace
'kb'         Name
```

```
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'genType'    Name
'('          Punctuation
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'1'          Literal.Number.Integer
']'
      Punctuation
','          Operator
'w'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'HInt'       Name
'('          Punctuation
'closed_bounds' Name
'('          Punctuation
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'2'          Literal.Number.Integer
']'          Punctuation
','          Operator
'w'          Name
')))'        Punctuation
','          Operator
' '          Text.Whitespace
'kb1'        Name
','          Operator
'\n                ' Text.Whitespace
'w'          Name
','          Operator
' '          Text.Whitespace
'var'        Name
','          Operator
' '          Text.Whitespace
'loop'       Name
','          Operator
' '          Text.Whitespace
'heap'       Name
');'         Punctuation
'\n    '     Text.Whitespace
'return'     Keyword
```

```
' '          Text.Whitespace
'unproduct'  Name
'('          Punctuation
'eval'
         Name.Builtin
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'w'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'1'          Literal.Number.Integer
']'          Punctuation
','          Operator
'w'          Name
')'          Punctuation
'='          Operator
'x'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'var'        Name
','          Operator
' '          Text.Whitespace
'loop'       Name
','          Operator
'\n                ' Text.Whitespace
'['          Punctuation
'op'         Name.Builtin
'('          Punctuation
'heap'       Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'Binder'     Name
'('          Punctuation
'op'
         Name.Builtin
'('          Punctuation
'0'          Literal.Number.Integer
','          Operator
```

'w'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'kb1'	Name
')]'	Punctuation
','	Operator
' '	Text.Whitespace
'mode'	Name
','	Operator
' '	Text.Whitespace
'kb'	Name
','	Operator
' '	Text.Whitespace
'kb0'	Name
')'	Punctuation
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'mode'	Name
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace
'`*`'	Name
' '	Text.Whitespace
'and'	Keyword
' '	Text.Whitespace
'w'	Name
' '	Text.Whitespace
'::'	Operator
' '	
	Text.Whitespace
'"'	Punctuation
'{'	Punctuation
'`+`'	Name
','	Operator
' '	Text.Whitespace
'specfunc'	Name
'({'	Punctuation
'sum'	Name
','	Operator
' '	Text.Whitespace
'Sum'	Name

'})}'   Punctuation
'"""'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'# Maybe this w is one of those big sums involving products that are\n' Comment.Single

'   '   Text.Whitespace
'# always equal to 1, left behind by the density of Categorical\n' Comment.Single

'   '   Text.Whitespace
'w1'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'graft'   Name
'('   Punctuation
'split'   Name
'('   Punctuation
'peel'   Name
'('   Punctuation
'w'   Name
')));'   Punctuation
'\n   '   Text.Whitespace
'w1'   Name
' '   Text.Whitespace
':='
            Operator
' '   Text.Whitespace
'combine'   Name
'('   Punctuation
'rebase_upper' Name
'('   Punctuation
'w1'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'w1'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'combine'   Name
'('   Punctuation
'rebase_lower' Name
'('   Punctuation
'w1'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'return'   Keyword

' '   Text.Whitespace
'['   Punctuation
'wrap'   Name
'('   Punctuation
'heap'   Name
','   Operator
' '   Text.Whitespace
'w1'   Name
','   Operator
' '   Text.Whitespace
'mode'   Name
','   Operator
' '   Text.Whitespace
'kb1'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'1'
        Literal.Number.Integer
']'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'['   Punctuation
'wrap'   Name
'('   Punctuation
'heap'   Name
','   Operator
' '   Text.Whitespace
'w'   Name
','   Operator
' '   Text.Whitespace
'mode'   Name
','   Operator
' '   Text.Whitespace
'kb1'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
')'   Punctuation

```
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
']'         Punctuation
'\n '       Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
'\n\n '     Text.Whitespace
'enter_piecewise' Name
' '         Text.Whitespace
':='
            Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'ee'        Name
','         Operator
' '         Text.Whitespace
'kb0'       Name
'::'        Operator
't_kb'      Name
','         Operator
' '         Text.Whitespace
'mode'      Name
'::'        Operator
'identical' Name
'('         Punctuation
'`*`'       Name
','         Operator
'`+`'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n '       Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'e'         Name
','         Operator
' '         Text.Whitespace
'kb'        Name
','         Operator
' '         Text.Whitespace
'mo'        Name
';'         Punctuation
```

```
'\n   '    Text.Whitespace
'e'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'ee'        Name
';'
            Punctuation
'\n   '    Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'kb0'       Name
';'         Punctuation
'\n   '    Text.Whitespace
'mo'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'mode'      Name
'();'       Punctuation
'\n   '    Text.Whitespace
'while'     Keyword
' '         Text.Whitespace
'e'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'"'        Punctuation
'specfunc'  Name
'('         Punctuation
'piecewise' Name.Builtin
')'         Punctuation
'"'        Punctuation
' '         Text.Whitespace
'and'       Keyword
' '         Text.Whitespace
'nops'      Name.Builtin
'('         Punctuation
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'3'         Literal.Number.Integer
'
```

```
'          Text.Whitespace
'do'        Keyword
'\n    '    Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'3'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'mo'        Name
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'assert'    Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'kb'        Name
');'        Punctuation
'\n    '    Text.Whitespace
'e'         Name
' '         Text.Whitespace
':='        Operator
' '

            Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'e'         Name
');'        Punctuation
'\n    '    Text.Whitespace
'elif'      Keyword
```

```
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'mo'        Name
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'assert'    Name
'('         Punctuation
'Not'       Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'e'         Name
'))'        Punctuation
','         Operator
' '         Text.Whitespace
'kb'
        Name
');'        Punctuation
'\n    '    Text.Whitespace
'e'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'3'         Literal.Number.Integer
','         Operator
'e'         Name
');'        Punctuation
'\n    '    Text.Whitespace
'else'      Keyword
'\n    '    Text.Whitespace
'break'     Keyword
```

';'   Punctuation

'\n   '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'if'   Keyword

';'   Punctuation

'\n   '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'do'   Keyword

';'   Punctuation

'\n   '   Text.Whitespace

'ASSERT'   Name.Builtin

'('   Punctuation

'type'   Name.Builtin

'('   Punctuation

'kb'   Name

','   Operator

't_kb'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace

'"enter_piecewise:

 KB of piecewise conditions is not valid, so the input piecewise must not be valid."' Literal.String

');'   Punctuation

'\n   '   Text.Whitespace

'e'   Name

','   Operator

' '   Text.Whitespace

'kb'   Name

'\n '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'proc'   Keyword

';'   Punctuation

'\n\n '   Text.Whitespace

'# heap is a list of t_binder and t_stmt\n' Comment.Single

' '   Text.Whitespace

'# one invariant to maintain:\n' Comment.Single

' '   Text.Whitespace

'# wrap(heap, mode(a,b)) = wrap(heap,a) * wrap(heap,b)\n' Comment.Single

'\n '   Text.Whitespace

'# Also, a t_binder is a Product/product/Sum/sum.\n' Comment.Single

' '   Text.Whitespace

'# And, a t_stmt is a 1-hole context of a (multiplicative) AST,\n' Comment.Single

' '   Text.Whitespace
'#   used for [a ^ hole, hole ^ b, exp(hole), c * hole].\n' Comment.Single

'\n
  '   Text.Whitespace
'wrap'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'heap'   Name
'::'   Operator
'list'   Name
','   Operator
' '   Text.Whitespace
'e1'   Name
','   Operator
' '   Text.Whitespace
'mode1'   Name
'::'   Operator
'identical' Name
'('   Punctuation
'`*`'   Name
','   Operator
'`+`'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'kb1'   Name
'::'   Operator
't_kb'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
'::'   Operator
't_kb'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'e'   Name
','   Operator

```
'
 '        Text.Whitespace
'kb'        Name
','        Operator
' '        Text.Whitespace
'mode'      Name
','        Operator
' '        Text.Whitespace
'i'        Name
','        Operator
' '        Text.Whitespace
'entry'     Name
','        Operator
' '        Text.Whitespace
'rest'      Name
','        Operator
' '        Text.Whitespace
'var'       Name
','        Operator
' '        Text.Whitespace
'new_rng'    Name
','        Operator
' '        Text.Whitespace
'make'      Name
','        Operator
' '        Text.Whitespace
'logmake'    Name
','        Operator
'\n     '  Text.Whitespace
'dom_spec'   Name
','        Operator
' '        Text.Whitespace
'w'         Name
','        Operator
' '        Text.Whitespace
'wPow'      Name
','        Operator
' '        Text.Whitespace
'wExp'      Name
','        Operator
' '        Text.Whitespace
'arrrgs'    Name
';'        Punctuation
'\n
   '   Text.Whitespace
'e'        Name
' '       Text.Whitespace
':='       Operator
```

```
' '         Text.Whitespace
'e1'        Name
';'         Punctuation
'\n    '    Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'kb1'       Name
';'         Punctuation
'\n    '    Text.Whitespace
'mode'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'mode1'     Name
';'         Punctuation
'\n    '    Text.Whitespace
'for'       Keyword
' '         Text.Whitespace
'i'         Name
' '         Text.Whitespace
'from'      Keyword
' '         Text.Whitespace
'nops'      Name.Builtin
'('         Punctuation
'heap'      Name
')'         Punctuation
' '         Text.Whitespace
'to'        Keyword
' '         Text.Whitespace
'1'         Literal.Number.Integer
' '         Text.Whitespace
'by'        Keyword
' '

        Text.Whitespace
'-'         Operator
'1'         Literal.Number.Integer
' '         Text.Whitespace
'do'        Keyword
'\n    '    Text.Whitespace
'entry'     Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'i'         Name
```

```
','          Operator
'heap'       Name
');'         Punctuation
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'entry'      Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
't_binder'   Name
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'not'        Keyword
' '          Text.Whitespace
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'entry'      Name
')'          Punctuation
' '          Text.Whitespace
'in'
             Keyword
' '          Text.Whitespace
'`if`'       Name
'('          Punctuation
'mode'       Name
'='          Operator
'`+`'        Name
','          Operator
' '          Text.Whitespace
'{'          Punctuation
'sum'        Name
','          Operator
'Sum'        Name
'}'          Punctuation
','          Operator
'\n                                  ' Text.Whitespace
'{'          Punctuation
'product'    Name
','          Operator
'Product'    Name
'}))'        Punctuation
```

```
' '          Text.Whitespace
'then'       Keyword
'\n   '      Text.Whitespace
'print'      Name.Builtin
'('          Punctuation
'"Warning: heap mode inconsistency"' Literal.String
','          Operator
' '          Text.Whitespace
'heap'       Name
','          Operator
' '          Text.Whitespace
'mode1'      Name
')'          Punctuation
'\n  '       Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
';'
             Punctuation
'\n   '      Text.Whitespace
'e'          Name
','          Operator
' '          Text.Whitespace
'kb'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'enter_piecewise' Name
'('          Punctuation
'e'          Name
','          Operator
' '          Text.Whitespace
'kb'         Name
','          Operator
' '          Text.Whitespace
'mode'       Name
');'         Punctuation
'\n   '      Text.Whitespace
'rest'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'kb_subtract' Name
'('          Punctuation
'kb'         Name
','          Operator
' '          Text.Whitespace
'op'         Name.Builtin
```

```
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'entry'     Name
'));'       Punctuation
'\n     '   Text.Whitespace
'new_rng'   Name
','         Operator
' '         Text.Whitespace
'rest'      Name
' '

            Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'type'      Name.Builtin
','         Operator
' '         Text.Whitespace
'rest'      Name
','         Operator
'\n     '   Text.Whitespace
'{['        Punctuation
'identical' Name
'('         Punctuation
'genType'   Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'name'      Name
','         Operator
' '         Text.Whitespace
'specfunc'  Name
'('         Punctuation
'HInt'      Name
')]'        Punctuation
','         Operator
'\n      '  Text.Whitespace
'['         Punctuation
'identical' Name
'('         Punctuation
'genLet'    Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'name'      Name
','         Operator
' '         Text.Whitespace
```

'anything'   Name
']});'   Punctuation
'\n   ' Text.Whitespace
'if'

 Keyword
' '   Text.Whitespace
'not'   Keyword
' '   Text.Whitespace
'('   Punctuation
'new_rng'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'['   Punctuation
'list'   Name
'])'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"kb_subtract should return exactly one gen*"' Literal.String
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   ' Text.Whitespace
'new_rng'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'new_rng'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'var'   Name
'   '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('

        Punctuation
'2'   Literal.Number.Integer
','   Operator
'new_rng'   Name
');'   Punctuation

'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'new_rng'   Name
')'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'genType'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'make'   Name
'   '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'entry'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'new_rng'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'range_of_HInt' Name
'('   Punctuation
'op'

      Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'new_rng'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'else'   Keyword
' '   Text.Whitespace
'# op(1,new_rng) = genLet\n' Comment.Single

'   '   Text.Whitespace
'make'   Name
'   '   Text.Whitespace

```
':='       Operator
' '        Text.Whitespace
'eval'     Name.Builtin
';'        Punctuation
'\n    '   Text.Whitespace
'new_rng'  Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'op'       Name.Builtin
'('        Punctuation
'3'        Literal.Number.Integer
','        Operator
'new_rng'  Name
');'       Punctuation
'\n    '   Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'if'       Keyword
';'        Punctuation
'\n    '   Text.Whitespace
'dom_spec' Name
','        Operator
' '        Text.Whitespace
'rest'
        Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'selectremove' Name.Builtin
'('        Punctuation
'depends'  Name
','        Operator
'\n    '   Text.Whitespace
'map'      Name.Builtin
'('        Punctuation
'proc'     Keyword
'('        Punctuation
'a'        Name
'::'       Operator
'['        Punctuation
'identical' Name
'('        Punctuation
'assert'   Name
')'        Punctuation
','        Operator
'anything' Name
']'        Punctuation
```

','   Operator
'$'   Operator
')'   Punctuation
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'a'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
' '   Text.Whitespace
'rest'   Name
')'
 Punctuation
','   Operator
'\n   ' Text.Whitespace
'var'   Name
');'   Punctuation
'\n\n   ' Text.Whitespace
'# Like e := make(piecewise(And(op(dom_spec)), e, mode()), var=new_rng);\n' Comment.Single

'   '   Text.Whitespace
'# but try to simplify by pushing the make and the piecewise into e\n' Comment.Single

'   '   Text.Whitespace
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'w'   Name
')'   Punctuation
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'depends'   Name
','   Operator
' '   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
'e'   Name
','   Operator

' '	Text.Whitespace
'"""'	Punctuation
'list'	Name
'"""'	Punctuation
','	Operator
' '	Text.Whitespace
"`*`"	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'var'	Name
');'	Punctuation
'\n '	Text.Whitespace
'w'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
"`*`"	Name
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'w'	Name
'));'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'mode'	Name
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace
"`*`"	Name
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'('	Punctuation
'wPow'	Name
','	Operator
' '	Text.Whitespace
'e'	Name
')'	Punctuation
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'selectremove'	Name.Builtin
'('	Punctuation
'type'	Name.Builtin
','	

Operator

' '   Text.Whitespace

'e'   Name

','   Operator

' '   Text.Whitespace

'"'   Punctuation

'`^`'   Name

'"'   Punctuation

'('   Punctuation

'"'   Punctuation

'freeof'   Name

'"'   Punctuation

'('   Punctuation

'var'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace

'"'   Punctuation

'anything' Name

'"'   Punctuation

'));'   Punctuation

'\n   ' Text.Whitespace

'('   Punctuation

'wExp'   Name

','   Operator

' '   Text.Whitespace

'e'   Name

')'   Punctuation

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'selectremove' Name.Builtin

'('   Punctuation

'type'   Name.Builtin

','   Operator

' '   Text.Whitespace

'e'   Name

','   Operator

' '   Text.Whitespace

'"'   Punctuation

'exp'

      Name

'('   Punctuation

'anything' Name

')'   Punctuation

'"'   Punctuation

');'   Punctuation

'\n   ' Text.Whitespace

```
'wExp'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
"`+`"       Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'map2'      Name
'('         Punctuation
'op'        Name.Builtin
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
','         Operator
' '         Text.Whitespace
'wExp'      Name
')));'      Punctuation
\n        ' Text.Whitespace
'wExp'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'expand'    Name.Builtin
'('         Punctuation
'wExp'      Name
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'indets'    Name.Builtin
'('         Punctuation
'wExp'
     Name
','         Operator
' '         Text.Whitespace
'function'  Name
')));'      Punctuation
\n        ' Text.Whitespace
'logmake'   Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
't'         Name
')'         Punctuation
\n         ' Text.Whitespace
```

'local'   Keyword
' '   Text.Whitespace
's'   Name
','   Operator
' '   Text.Whitespace
'r'   Name
';'   Punctuation
'\n   '   Text.Whitespace
's'   Name
','   Operator
' '   Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'depends'   Name
','   Operator
' '   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
't'   Name
','   Operator
' '   Text.Whitespace
'"""'
           Punctuation
'list'   Name
'"""'   Punctuation
','   Operator
' '   Text.Whitespace
'`*`'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'var'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'`if`'   Name
'('   Punctuation

'make'   Name
'='   Operator
'eval'   Name.Builtin
','   Operator
'eval'   Name.Builtin
','   Operator
'Sum'   Name
')'   Punctuation
'\n   ' Text.Whitespace
'('   Punctuation
'piecewise_And' Name
'('   Punctuation
'dom_spec'   Name
','   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('
     Punctuation
's'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
')'   Punctuation
','   Operator
' '   Text.Whitespace
'var'   Name
'='   Operator
'new_rng'   Name
'));'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n   ' Text.Whitespace
'w'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
' '   Text.Whitespace
'`if`'   Name
'('   Punctuation
'w'   Name

```
' '          Text.Whitespace
'='           Operator
' '          Text.Whitespace
'1'           Literal.Number.Integer
';'           Operator
' '          Text.Whitespace
'1'           Literal.Number.Integer
';'           Operator
' '          Text.Whitespace
'w'           Name
'
'           Text.Whitespace
'^'           Operator
' '          Text.Whitespace
'logmake'     Name
'('           Punctuation
'1'           Literal.Number.Integer
'))'          Punctuation
'\n          ' Text.Whitespace
','           Operator
' '          Text.Whitespace
'op'          Name.Builtin
'('           Punctuation
'map'         Name.Builtin
'(('          Punctuation
'f'           Name
' '          Text.Whitespace
'->'          Operator
' '          Text.Whitespace
'op'          Name.Builtin
'('           Punctuation
'1'           Literal.Number.Integer
','           Operator
'f'           Name
')'           Punctuation
' '          Text.Whitespace
'^'           Operator
' '          Text.Whitespace
'logmake'     Name
'('           Punctuation
'op'          Name.Builtin
'('           Punctuation
'2'           Literal.Number.Integer
','           Operator
'f'           Name
')))'         Punctuation
','           Operator
' '          Text.Whitespace
```

'wPow'
   Name
'))'   Punctuation
'\n   ' Text.Whitespace
','   Operator
' '   Text.Whitespace
'`if`'   Name
'('   Punctuation
'wExp'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'exp'   Name
'('   Punctuation
'maptype'   Name
'('   Punctuation
'`+`'   Name
','   Operator
'logmake'   Name
','   Operator
'wExp'   Name
')))'   Punctuation
' '   Text.Whitespace
');'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   ' Text.Whitespace
'e'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'w'
   Name
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'make'   Name
'('   Punctuation
'piecewise_And' Name

```
'('         Punctuation
'dom_spec'  Name
','         Operator
' '         Text.Whitespace
`*`         Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'e'         Name
'))'        Punctuation
','         Operator
' '         Text.Whitespace
'mode'      Name
'())'       Punctuation
','         Operator
' '         Text.Whitespace
'var'       Name
'='         Operator
'new_rng'   Name
');'        Punctuation
'\n\n     ' Text.Whitespace
"# `rest' originally comes from `entry', and this reinserts it after some\n" Comment.Single

'     '     Text.Whitespace
'# processing. The original KB was valid, so this one should also be valid.\n' Comment.Single

'     '     Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '
   Text.Whitespace
'foldr'     Name
'('         Punctuation
'assert'    Name
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'entry'     Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'rest'      Name
```

'));'   Punctuation
\n   ' Text.Whitespace
'ASSERT'   Name.Builtin
'('   Punctuation
'type'   Name.Builtin
'('   Punctuation
'kb'   Name
','   Operator
't_kb'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'"Loop/wrap{t_binder}: rebuilding kb produced contradiction"' Literal.String
');'   Punctuation
\n\n   ' Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'entry'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
't_stmt'

     Name
' '   Text.Whitespace
'then'   Keyword
\n   ' Text.Whitespace
'# We evaluate arrrgs first, in case op(1,stmt) is an operation (such as\n' Comment.Single

'   ' Text.Whitespace
'# piecewise) that looks ahead at how many arguments it is passed before\n' Comment.Single

'   ' Text.Whitespace
'# they are evaluated.\n' Comment.Single

'   ' Text.Whitespace
'arrrgs'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'entry'   Name
'))'   Punctuation
','   Operator

```
' '         Text.Whitespace
'e'         Name
','         Operator
' '         Text.Whitespace
'op'         Name.Builtin
'('         Punctuation
'op'         Name.Builtin
'('         Punctuation
'3'         Literal.Number.Integer
','
          Operator
'entry'      Name
'));'        Punctuation
\n      ' Text.Whitespace
'e'         Name
'   '     Text.Whitespace
':='         Operator
' '         Text.Whitespace
'op'         Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'entry'      Name
')('         Punctuation
'arrrgs'     Name
');'         Punctuation
\n      ' Text.Whitespace
'if'         Keyword
' '         Text.Whitespace
'entry'      Name
' '         Text.Whitespace
'::'         Operator
' '         Text.Whitespace
't_exp'      Name
' '         Text.Whitespace
'then'       Keyword
\n       ' Text.Whitespace
'if'         Keyword
' '         Text.Whitespace
'mode'       Name
' '         Text.Whitespace
'<>'         Operator
' '         Text.Whitespace
"`+`'       Name
' '         Text.Whitespace
'then'       Keyword
\n        ' Text.Whitespace
'print'      Name.Builtin
```

```
'('          Punctuation
'"Warning:
 heap mode inconsistency?"' Literal.String
','          Operator
' '          Text.Whitespace
'heap'       Name
','          Operator
' '          Text.Whitespace
'mode1'      Name
')'          Punctuation
'\n       ' Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
';'          Punctuation
'\n       ' Text.Whitespace
'mode'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'`*`'        Name
';'          Punctuation
'\n     ' Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
'\n    ' Text.Whitespace
'else'       Keyword
' '          Text.Whitespace
'error'      Keyword
' '          Text.Whitespace
'"Malformed heap entry %1"' Literal.String
','          Operator
' '          Text.Whitespace
'entry'      Name
' '          Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
'\n
   ' Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'do'         Keyword
';'          Punctuation
'\n   ' Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
```

```
'mode'       Name
' '          Text.Whitespace
'<>'         Operator
' '          Text.Whitespace
'`*`'        Name
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'print'      Name.Builtin
'('          Punctuation
'"Warning: heap mode inconsistency??"' Literal.String
';'          Operator
' '          Text.Whitespace
'heap'       Name
';'          Operator
' '          Text.Whitespace
'mode1'      Name
')'          Punctuation
'\n    '     Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
';'          Punctuation
'\n    '     Text.Whitespace
'e'          Name
';'          Operator
' '          Text.Whitespace
'kb'         Name
' '          Text.Whitespace
':='         Operator
' '
     Text.Whitespace
'enter_piecewise' Name
'('          Punctuation
'e'          Name
';'          Operator
' '          Text.Whitespace
'kb'         Name
';'          Operator
' '          Text.Whitespace
'mode'       Name
');'         Punctuation
'\n    '     Text.Whitespace
'rest'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'kb_subtract' Name
```

'('   Punctuation
'kb'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'rest'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'map'   Name.Builtin
'('   Punctuation
'proc'   Keyword
'('   Punctuation
'a'   Name
'::'   Operator
'['   Punctuation
'identical' Name
'('   Punctuation
'assert'   Name
')'   Punctuation
','   Operator
'anything'   Name
']'

 Punctuation
','   Operator
'$'   Operator
')'   Punctuation
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'a'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
' '   Text.Whitespace
'rest'   Name
');'   Punctuation
'\n '   Text.Whitespace
'('   Punctuation
'wExp'   Name
','   Operator

```
' '         Text.Whitespace
'e'         Name
')'         Punctuation
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'type'      Name.Builtin
','         Operator
' '         Text.Whitespace
'convert'   Name.Builtin
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'"'         Punctuation
'list'      Name
'"'         Punctuation
','         Operator
' '         Text.Whitespace
'`*`'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'"'         Punctuation
'exp'       Name
'('         Punctuation
'anything'  Name
')'         Punctuation
'"'         Punctuation
');'        Punctuation
'\n '       Text.Whitespace
'wExp'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`+`'       Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'map2'      Name
'('         Punctuation
'op'        Name.Builtin
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
```

```
','          Operator
' '          Text.Whitespace
'wExp'       Name
')));'       Punctuation
'\n   '      Text.Whitespace
'wExp'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'expand'
      Name.Builtin
'('          Punctuation
'wExp'       Name
','          Operator
' '          Text.Whitespace
'op'         Name.Builtin
'('          Punctuation
'indets'     Name.Builtin
'('          Punctuation
'wExp'       Name
','          Operator
' '          Text.Whitespace
'function'   Name
')));'       Punctuation
'\n   '      Text.Whitespace
'logmake'    Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'('          Punctuation
't'          Name
' '          Text.Whitespace
'->'         Operator
' '          Text.Whitespace
't'          Name
' '          Text.Whitespace
'*'          Operator
' '          Text.Whitespace
'piecewise_And' Name
'('          Punctuation
'rest'       Name
','          Operator
'1'          Literal.Number.Integer
','          Operator
'0'          Literal.Number.Integer
'));'        Punctuation
'\n   '      Text.Whitespace
'`if`'       Name
```

'('   Punctuation
'wExp'
          Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'exp'   Name
'('   Punctuation
'maptype'   Name
'('   Punctuation
'`+`'   Name
','   Operator
'logmake'   Name
','   Operator
'wExp'   Name
')))'   Punctuation
'\n   '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'piecewise_And' Name
'('   Punctuation
'rest'   Name
','   Operator
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'e'   Name
'))'   Punctuation
','   Operator
'1'   Literal.Number.Integer
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'
          Punctuation
'\n\n '   Text.Whitespace
'# Rewrite product(...piecewise(i+42=lo+42,th,el)...,i=lo..hi)\n' Comment.Single

' '   Text.Whitespace

'# to eval(...th...,i=lo)*product(...el...,i=lo+1..hi)\n' Comment.Single

' '   Text.Whitespace
't_peel'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'"'   Punctuation
'And'   Name
'('   Punctuation
'specfunc'   Name
'({'   Punctuation
'sum'   Name
','   Operator
'Sum'   Name
','   Operator
'product'   Name
','   Operator
'Product'   Name
'})'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'anyfunc'   Name
'('   Punctuation
'anything'   Name
','   Operator
' '   Text.Whitespace
'name'   Name
'='   Operator
'range'   Name
'))'   Punctuation
'"'   Punctuation
';'   Punctuation
'\n '   Text.Whitespace
'peel'
      Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'subsindets' Name.Builtin

'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
't_peel'   Name
','   Operator
' '   Text.Whitespace
'do_peel'   Name
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'do_peel'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '
 Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'make'   Name
','   Operator
' '   Text.Whitespace
'body'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace
'r'   Name
','   Operator
' '   Text.Whitespace
'cond'   Name
','   Operator
' '   Text.Whitespace
'line'   Name
','   Operator
' '   Text.Whitespace

'test'   Name
','   Operator
' '   Text.Whitespace
'x0'   Name
','   Operator
' '   Text.Whitespace
'r0'   Name
','   Operator
' '   Text.Whitespace
'cond0'   Name
','   Operator
' '   Text.Whitespace
'here'   Name
','   Operator
' '   Text.Whitespace
'rest'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'not'

 Keyword
' '   Text.Whitespace
'('   Punctuation
'e'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
't_peel'   Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'e'   Name
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator

```
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'in'        Keyword
' '         Text.Whitespace
'"""'       Punctuation
'{'         Punctuation
'sum'       Name
'  '        Text.Whitespace
','         Operator
'Sum'       Name
'  '        Text.Whitespace
'}'
    Punctuation
'"""'       Punctuation
' '         Text.Whitespace
'then'      Keyword
' '         Text.Whitespace
'make'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`+`'       Name
';'         Punctuation
'\n  '      Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'0'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'in'        Keyword
' '         Text.Whitespace
'"""'       Punctuation
'{'         Punctuation
'product'   Name
','         Operator
'Product'   Name
'}'         Punctuation
'"""'       Punctuation
' '         Text.Whitespace
'then'      Keyword
' '         Text.Whitespace
'make'      Name
' '         Text.Whitespace
```

```
':='        Operator
' '         Text.Whitespace
'`*`'       Name
';'         Punctuation
' '
 Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n    '    Text.Whitespace
'body'      Name
','         Operator
' '         Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'e'         Name
');'        Punctuation
'\n    '    Text.Whitespace
'x'         Name
','         Operator
' '         Text.Whitespace
'r'         Name
'  '        Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'r'         Name
');'        Punctuation
'\n    '    Text.Whitespace
'for'       Keyword
' '         Text.Whitespace
'cond'      Name
' '         Text.Whitespace
'in'        Keyword
' '         Text.Whitespace
'indets'    Name.Builtin
'('         Punctuation
'body'      Name
','         Operator
'
'           Text.Whitespace
'"'         Punctuation
```

```
'{'        Punctuation
"`=`"       Name
'('        Punctuation
'algebraic'   Name
')'        Punctuation
','        Operator
"`<`"       Name
','        Operator
"`<=`"       Name
'}'        Punctuation
'""'       Punctuation
')'        Punctuation
' '        Text.Whitespace
'do'       Keyword
'\n     '   Text.Whitespace
'line'      Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
"`-`"       Name
'('        Punctuation
'op'       Name.Builtin
'('        Punctuation
'cond'      Name
'));'       Punctuation
'\n     '   Text.Whitespace
'if'       Keyword
' '        Text.Whitespace
'1'        Literal.Number.Integer
' '        Text.Whitespace
'<>'       Operator
' '        Text.Whitespace
'degree'     Name.Builtin
'('        Punctuation
'line'      Name
','        Operator
' '        Text.Whitespace
'x'
 Name
')'        Punctuation
' '        Text.Whitespace
'then'      Keyword
' '        Text.Whitespace
'next'      Keyword
' '        Text.Whitespace
'end'       Keyword
' '        Text.Whitespace
'if'       Keyword
```

```
';'          Punctuation
'\n     '    Text.Whitespace
'if'          Keyword
' '           Text.Whitespace
'cond'       Name
' '           Text.Whitespace
'::'          Operator
' '           Text.Whitespace
'`=`'         Name
' '           Text.Whitespace
'then'        Keyword
'\n     '    Text.Whitespace
'cond0'      Name
' '           Text.Whitespace
':='          Operator
' '           Text.Whitespace
'true'        Name
';'           Punctuation
'\n     '    Text.Whitespace
'if'          Keyword
' '           Text.Whitespace
'Testzero'   Name
'('           Punctuation
'eval'        Name.Builtin
'('           Punctuation
'line'        Name
','           Operator
' '           Text.Whitespace
'x'           Name
'='           Operator
'lhs'
       Name.Builtin
'('           Punctuation
'r'           Name
')))'         Punctuation
' '           Text.Whitespace
'then'        Keyword
'\n     '    Text.Whitespace
'x0'          Name
' '           Text.Whitespace
':='          Operator
' '           Text.Whitespace
'lhs'         Name.Builtin
'('           Punctuation
'r'           Name
');'          Punctuation
' '           Text.Whitespace
'r0'          Name
```

```
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'applyop'   Name
'('         Punctuation
'`+`'       Name
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
','         Operator
' '         Text.Whitespace
'r'         Name
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
');'        Punctuation
'\n    '    Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'Testzero'  Name
'('         Punctuation
'eval'      Name.Builtin
'('
            Punctuation
'line'      Name
','         Operator
' '         Text.Whitespace
'x'         Name
'='         Operator
'rhs'       Name.Builtin
'('         Punctuation
'r'         Name
')))'       Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'x0'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'rhs'       Name.Builtin
'('         Punctuation
'r'         Name
');'        Punctuation
' '         Text.Whitespace
'r0'        Name
' '         Text.Whitespace
':='        Operator
```

```
' '          Text.Whitespace
'applyop'    Name
'('          Punctuation
"`-`"        Name
','          Operator
' '          Text.Whitespace
'2'          Literal.Number.Integer
','          Operator
' '          Text.Whitespace
'r'          Name
','          Operator
' '          Text.Whitespace
'1'          Literal.Number.Integer
');'         Punctuation
'\n
     '  Text.Whitespace
'else'       Keyword
' '          Text.Whitespace
'next'       Keyword
' '          Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
';'          Punctuation
'\n     '    Text.Whitespace
'else'       Keyword
'\n     '    Text.Whitespace
'test'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'proc'       Keyword
'('          Punctuation
'x0'         Name
','          Operator
' '          Text.Whitespace
'x1'         Name
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n     '    Text.Whitespace
'local'      Keyword
' '          Text.Whitespace
'res'        Name
';'          Punctuation
'\n     '    Text.Whitespace
'res'        Name
```

```
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'evalb'     Name.Builtin
'('         Punctuation
'not'       Keyword
' '

    Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'0'         Literal.Number.Integer
','         Operator
'cond'      Name
')('        Punctuation
'eval'      Name.Builtin
'('         Punctuation
'line'      Name
','         Operator
' '         Text.Whitespace
'x'         Name
'='         Operator
'x1'        Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'0'         Literal.Number.Integer
'));'       Punctuation
'\n        ' Text.Whitespace
'`if`'      Name
'('         Punctuation
'res'       Name
' '         Text.Whitespace
'in'        Keyword
' '         Text.Whitespace
'"""'       Punctuation
'{'         Punctuation
'true'      Name
','         Operator
'false'     Name
'}'         Punctuation
'"""'       Punctuation
'\n          ' Text.Whitespace
'and'       Keyword
' '         Text.Whitespace
'evalb'     Name.Builtin
'('         Punctuation
'op'
```

Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'cond'   Name
')('   Punctuation
'eval'   Name.Builtin
'('   Punctuation
'line'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator
'x0'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
'))'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'res'   Name
','   Operator
'\n   ' Text.Whitespace
'res'   Name
','   Operator
'\n   ' Text.Whitespace
'FAIL'   Name
')'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n   ' Text.Whitespace
'cond0'   Name
' '   Text.Whitespace
':='   Operator
' '

        Text.Whitespace
'test'   Name
'('   Punctuation
'lhs'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
','   Operator

```
' '          Text.Whitespace
'lhs'        Name.Builtin
'('          Punctuation
'r'          Name
')'          Punctuation
'+'          Operator
'1'          Literal.Number.Integer
');'         Punctuation
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'cond0'      Name
' '          Text.Whitespace
'<>'         Operator
' '          Text.Whitespace
'FAIL'       Name
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'x0'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'lhs'        Name.Builtin
'('          Punctuation
'r'          Name
');'         Punctuation
' '          Text.Whitespace
'r0'         Name
' '          Text.Whitespace
':='         Operator
' '

     Text.Whitespace
'applyop'    Name
'('          Punctuation
'`+`'        Name
','          Operator
' '          Text.Whitespace
'1'          Literal.Number.Integer
','          Operator
' '          Text.Whitespace
'r'          Name
','          Operator
' '          Text.Whitespace
'1'          Literal.Number.Integer
');'         Punctuation
'\n    '     Text.Whitespace
'else'       Keyword
```

```
'\n        ' Text.Whitespace
'cond0'      Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'test'       Name
'('          Punctuation
'rhs'        Name.Builtin
'('          Punctuation
'r'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'rhs'        Name.Builtin
'('          Punctuation
'r'          Name
')'          Punctuation
'-'          Operator
'1'          Literal.Number.Integer
');'         Punctuation
'\n        ' Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'cond0'
     Name
' '          Text.Whitespace
'<>'         Operator
' '          Text.Whitespace
'FAIL'       Name
' '          Text.Whitespace
'then'       Keyword
'\n        ' Text.Whitespace
'x0'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'rhs'        Name.Builtin
'('          Punctuation
'r'          Name
');'         Punctuation
' '          Text.Whitespace
'r0'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'applyop'    Name
'('          Punctuation
'`-`'        Name
```

','	Operator
' '	Text.Whitespace
'2'	Literal.Number.Integer
','	Operator
' '	Text.Whitespace
'r'	Name
','	Operator
' '	Text.Whitespace
'1'	Literal.Number.Integer
');'	Punctuation
'\n '	Text.Whitespace
'else'	Keyword
' '	Text.Whitespace
'next'	Keyword
' ' 	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'here'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'subs'	Name.Builtin
'('	Punctuation
'cond'	Name
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace
'cond0'	Name
' '	Text.Whitespace
','	Operator
' '	Text.Whitespace
'body'	Name
');'	Punctuation
'\n '	Text.Whitespace

```
'rest'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'subs'      Name.Builtin
'('         Punctuation
'cond'
     Name
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'evalb'     Name.Builtin
'('         Punctuation
'not'       Keyword
' '         Text.Whitespace
'cond0'     Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'body'      Name
');'        Punctuation
'\n    '    Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'make'      Name
'('         Punctuation
'eval'      Name.Builtin
'('         Punctuation
'here'      Name
','         Operator
' '         Text.Whitespace
'x'         Name
'='         Operator
'x0'        Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'do_peel'   Name
'('         Punctuation
'eval'      Name.Builtin
'('         Punctuation
'subsop'    Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
'='         Operator
'rest'      Name
','         Operator
'
```

```
'           '    Text.Whitespace
'['         Punctuation
'2'          Literal.Number.Integer
','         Operator
'2'          Literal.Number.Integer
']'         Punctuation
'='          Operator
'r0'         Name
','          Operator
' '          Text.Whitespace
'e'          Name
'))))'       Punctuation
'\n    '    Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'do'         Keyword
';'          Punctuation
'\n    '    Text.Whitespace
'return'      Keyword
' '          Text.Whitespace
'e'          Name
';'          Punctuation
'\n '       Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'proc'       Keyword
';'          Punctuation
'\n\n '     Text.Whitespace
'# Expand sum(a*(b-c),q) to sum(a*b,q)-sum(a*c,q)\n' Comment.Single

'  '         Text.Whitespace
'split'      Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'proc'       Keyword
'('          Punctuation
'e'
 Name
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n    '    Text.Whitespace
'subsindets' Name.Builtin
'('          Punctuation
'e'          Name
','          Operator
```

```
' '           Text.Whitespace
'"'           Punctuation
'And'         Name
'('           Punctuation
'specfunc'    Name
'({'          Punctuation
'sum'         Name
','           Operator
'Sum'         Name
'})'          Punctuation
','           Operator
'\n                ' Text.Whitespace
'anyfunc'     Name
'('           Punctuation
'And'         Name
'('           Punctuation
'`*`'         Name
','           Operator
'Not'         Name
'('           Punctuation
'`*`'         Name
'('           Punctuation
'Not'         Name
'('           Punctuation
'`+`'         Name
')))'         Punctuation
','           Operator
'name'        Name
'='           Operator
'anything'    Name
'))'          Punctuation
'"'           Punctuation
','           Operator
'\n'
              ' Text.Whitespace
'do_split'    Name
');'          Punctuation
'\n '         Text.Whitespace
'end'         Keyword
' '           Text.Whitespace
'proc'        Keyword
';'           Punctuation
'\n '         Text.Whitespace
'do_split'    Name
' '           Text.Whitespace
':='          Operator
' '           Text.Whitespace
'proc'        Keyword
```

'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'terms'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
';'   Punctuation
\n   '   Text.Whitespace
'terms'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
'expand'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'
          Literal.Number.Integer
','   Operator
'e'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'indets'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'e'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'function'   Name
')))'   Punctuation
','   Operator
\n   ' Text.Whitespace

Token	Type
'"'	Punctuation
'list'	Name
'"'	Punctuation
','	Operator
' '	Text.Whitespace
'`+`'	Name
');'	Punctuation
'\n '	Text.Whitespace
'x'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'op'	Name.Builtin
'(['	Punctuation
'2'	Literal.Number.Integer
','	Operator
'1'	Literal.Number.Integer
']'	Punctuation
','	Operator
'e'	Name
');'	Punctuation
'\n '	Text.Whitespace
'`+`'	Name
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'map'	Name.Builtin
'('	Punctuation
'proc'	Keyword
'('	Punctuation
'term'	Name
','	Operator
' '	Text.Whitespace
'$'	Operator
')'	Punctuation
'\n '	Text.Whitespace
'local'	Keyword
' '	Text.Whitespace
's'	Name
','	Operator
' '	Text.Whitespace
'r'	Name
';'	Punctuation
'\n '	Text.Whitespace
's'	Name
','	Operator
' '	Text.Whitespace

```
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'depends'    Name
','         Operator
' '

 Text.Whitespace
'convert'    Name.Builtin
'('         Punctuation
'term'       Name
','         Operator
' '         Text.Whitespace
'"'         Punctuation
'list'       Name
'"'         Punctuation
','         Operator
' '         Text.Whitespace
'`*`'        Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'x'         Name
');'        Punctuation
'\n     '    Text.Whitespace
'`*`'        Name
'('         Punctuation
'op'         Name.Builtin
'('         Punctuation
'r'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'subsop'     Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
'='         Operator
'`*`'        Name
'('         Punctuation
'op'         Name.Builtin
'('         Punctuation
's'         Name
'))'        Punctuation
','         Operator
'e'         Name
'))'        Punctuation
```

'\n ' Text.Whitespace
'end'
    Keyword
' ' Text.Whitespace
'proc' Keyword
',' Operator
' ' Text.Whitespace
'terms' Name
')))' Punctuation
'\n ' Text.Whitespace
'end' Keyword
' ' Text.Whitespace
'proc' Keyword
';' Punctuation
'\n\n ' Text.Whitespace
'# Simplify f(lo-1)*product(f(i),i=lo..hi) to product(f(i),i=lo-1..hi)\n' Comment.Single

' ' Text.Whitespace
'graft' Name
' ' Text.Whitespace
':=' Operator
' ' Text.Whitespace
'proc' Keyword
'(' Punctuation
'e' Name
',' Operator
' ' Text.Whitespace
'$' Operator
')' Punctuation
'\n ' Text.Whitespace
'subsindets' Name.Builtin
'(' Punctuation
'e' Name
',' Operator
' ' Text.Whitespace
'"' Punctuation
'Or' Name
'(' Punctuation
'And' Name
'(' Punctuation
'`*`' Name
','

    Operator
'Not' Name
'(' Punctuation
'`*`' Name
'(' Punctuation
'Not' Name

'('   Punctuation
'specfunc'   Name
'({'   Punctuation
'product'   Name
','   Operator
'Product'   Name
'})))))'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'And'   Name
'('   Punctuation
"`+`"   Name
','   Operator
'Not'   Name
'('   Punctuation
"`+`"   Name
'('   Punctuation
'Not'   Name
'('   Punctuation
'specfunc'   Name
'({'   Punctuation
'sum'   Name
'   '   Text.Whitespace
','   Operator
'Sum'   Name
'   '   Text.Whitespace
'}))))))'   Punctuation
'""'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'do_graft'   Name
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'
 Keyword
';'   Punctuation
'\n '   Text.Whitespace
'do_graft'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace

```
'$'         Operator
')'         Punctuation
'\n   '     Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'produce'   Name
','         Operator
' '         Text.Whitespace
'factors'   Name
','         Operator
' '         Text.Whitespace
'i'         Name
','         Operator
' '         Text.Whitespace
'j'         Name
';'         Punctuation
'\n   '     Text.Whitespace
'produce'   Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`if`'      Name
'('         Punctuation
'e'         Name
'::'        Operator
'`*`'       Name
','         Operator
' '         Text.Whitespace
'"'         Punctuation
'{'
            Punctuation
'product'   Name
','         Operator
'Product'   Name
'}'         Punctuation
'"'         Punctuation
','         Operator
'\n                   ' Text.Whitespace
'"'         Punctuation
'{'         Punctuation
'sum'       Name
'  '        Text.Whitespace
','         Operator
'Sum'       Name
'  '        Text.Whitespace
'}'         Punctuation
'"'         Punctuation
');'        Punctuation
```

```
'\n   '      Text.Whitespace
'factors'    Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'sort'       Name.Builtin
'('          Punctuation
'convert'    Name.Builtin
'('          Punctuation
'e'          Name
','          Operator
'"'          Punctuation
'list'       Name
'"'          Punctuation
')'          Punctuation
','          Operator
'\n             ' Text.Whitespace
'key'        Name
' '          Text.Whitespace
'='          Operator
' '          Text.Whitespace
'('
            Punctuation
'factor'     Name
' '          Text.Whitespace
'->'         Operator
' '          Text.Whitespace
'-'          Operator
'numboccur'  Name.Builtin
'('          Punctuation
'factor'     Name
','          Operator
'produce'    Name
')));'       Punctuation
'\n   '      Text.Whitespace
'for'        Keyword
' '          Text.Whitespace
'i'          Name
' '          Text.Whitespace
'from'       Keyword
' '          Text.Whitespace
'nops'       Name.Builtin
'('          Punctuation
'factors'    Name
')'          Punctuation
' '          Text.Whitespace
'to'         Keyword
' '          Text.Whitespace
```

'2'	Literal.Number.Integer
' '	Text.Whitespace
'by'	Keyword
' '	Text.Whitespace
'-'	Operator
'1'	Literal.Number.Integer
' '	Text.Whitespace
'do'	Keyword
'\n '	Text.Whitespace
'for'	Keyword
' '	Text.Whitespace
'j'	Name
' '	

 Text.Whitespace

'from'	Keyword
' '	Text.Whitespace
'i'	Name
'-'	Operator
'1'	Literal.Number.Integer
' '	Text.Whitespace
'to'	Keyword
' '	Text.Whitespace
'1'	Literal.Number.Integer
' '	Text.Whitespace
'by'	Keyword
' '	Text.Whitespace
'-'	Operator
'1'	Literal.Number.Integer
' '	Text.Whitespace
'do'	Keyword
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'op'	Name.Builtin
'('	Punctuation
'j'	Name
','	Operator
'factors'	Name
')'	Punctuation
' '	Text.Whitespace
'::'	Operator
' '	Text.Whitespace
'"'	Punctuation
'And'	Name
'"'	Punctuation
'('	Punctuation
'"'	Punctuation
'specfunc'	Name

'"'   Punctuation
'('   Punctuation
'produce'   Name
')'   Punctuation
','
          Operator
'\n   ' Text.Whitespace
'"'   Punctuation
'anyfunc'   Name
'('   Punctuation
'anything'   Name
','   Operator
'name'   Name
'='   Operator
'range'   Name
')'   Punctuation
'"'   Punctuation
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'Testzero'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name
','   Operator
'factors'   Name
')'   Punctuation
' '   Text.Whitespace
'-'   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'
      Punctuation
','   Operator
'\n   ' Text.Whitespace

'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'   Punctuation
'='   Operator
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
'))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'factors'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'subsop'
    Name.Builtin
'('   Punctuation
'i'   Name
'='   Operator
'NULL'   Name
','   Operator
'applyop'   Name
'('   Punctuation
'`-`'   Name
','   Operator
'['   Punctuation
'j'   Name

','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
','   Operator
'1'   Literal.Number.Integer
'));'   Punctuation
'\n   ' Text.Whitespace
'break'   Keyword
'\n   ' Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'Testzero'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name
','   Operator
'factors'   Name
')'   Punctuation
' '   Text.Whitespace
'-'   Operator
' '   Text.Whitespace
'eval'
      Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator

'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'   Punctuation
'='   Operator
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'   Punctuation
'+'
          Operator
'1'   Literal.Number.Integer
'))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'factors'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'subsop'   Name.Builtin
'('   Punctuation
'i'   Name
'='   Operator
'NULL'   Name
','   Operator
'applyop'   Name
'('   Punctuation
'`+`'   Name
','   Operator
'['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer

']'   Punctuation
','   Operator
'factors'   Name
','   Operator
'1'   Literal.Number.Integer
'));'   Punctuation
\n   ' Text.Whitespace
'break'   Keyword
\n   ' Text.Whitespace
'end'   Keyword
' '
      Text.Whitespace
'if'   Keyword
\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
\n   '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'e'   Name
')('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'factors'   Name
'))'   Punctuation
\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
\n\n '   Text.Whitespace
'# Normalize sum(f(i),i=2..hi) to sum(f(i+2),i=0..hi-2)\n' Comment.Single

' '   Text.Whitespace
'rebase_lower' Name
' '   Text.Whitespace

```
':='       Operator
'
'          Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n   '     Text.Whitespace
'subsindets' Name.Builtin
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'"'         Punctuation
'And'       Name
'('         Punctuation
'specfunc'  Name
'({'        Punctuation
'sum'       Name
','         Operator
'Sum'       Name
','         Operator
'product'   Name
','         Operator
'Product'   Name
'})'        Punctuation
','         Operator
'\n                 ' Text.Whitespace
'anyfunc'   Name
'('         Punctuation
'anything'  Name
','         Operator
'\n                 ' Text.Whitespace
'name'      Name
'='         Operator
'Not'       Name
'({'        Punctuation
'0'         Literal.Number.Integer
','         Operator
'SymbolicInfinity'
 Name
','         Operator
'undefined' Name
'})'        Punctuation
'..'        Operator
```

```
'anything'   Name
'))'          Punctuation
'""'           Punctuation
','           Operator
'\n             ' Text.Whitespace
'do_rebase_lower' Name
');'          Punctuation
'\n '     Text.Whitespace
'end'        Keyword
' '           Text.Whitespace
'proc'        Keyword
';'           Punctuation
'\n '     Text.Whitespace
'do_rebase_lower' Name
' '           Text.Whitespace
':='          Operator
' '           Text.Whitespace
'proc'        Keyword
'('           Punctuation
'e'          Name
','           Operator
' '           Text.Whitespace
'$'          Operator
')'           Punctuation
'\n    '    Text.Whitespace
'subsop'       Name.Builtin
'(['          Punctuation
'2'            Literal.Number.Integer
','           Operator
'2'            Literal.Number.Integer
','           Operator
'1'            Literal.Number.Integer
']'           Punctuation
'='
    Operator
'0'           Literal.Number.Integer
','           Operator
'\n        ' Text.Whitespace
'applyop'     Name
'('           Punctuation
'`-`'          Name
','           Operator
'\n                 ' Text.Whitespace
'['           Punctuation
'2'            Literal.Number.Integer
','           Operator
'2'            Literal.Number.Integer
','           Operator
```

```
'2'          Literal.Number.Integer
']'          Punctuation
','          Operator
'\n              ' Text.Whitespace
'applyop'    Name
'('          Punctuation
'eval'       Name.Builtin
','          Operator
' '          Text.Whitespace
'1'          Literal.Number.Integer
','          Operator
' '          Text.Whitespace
'e'          Name
','          Operator
' '          Text.Whitespace
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'1'          Literal.Number.Integer
']'          Punctuation
','          Operator
'e'
        Name
')'          Punctuation
'='          Operator
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'1'          Literal.Number.Integer
']'          Punctuation
','          Operator
'e'          Name
')'          Punctuation
'+'          Operator
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'2'          Literal.Number.Integer
','          Operator
'1'          Literal.Number.Integer
']'          Punctuation
','          Operator
'e'          Name
'))'         Punctuation
','          Operator
'\n              ' Text.Whitespace
```

'\n   ' Text.Whitespace
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'e'   Name
')))'   Punctuation
'\n
 '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'# Normalize sum(f(i),i=lo..2) to sum(f(i+2),i=lo-2..0)\n' Comment.Single

' '   Text.Whitespace
'rebase_upper' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n '   Text.Whitespace
'subsindets' Name.Builtin
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'""'   Punctuation
'And'   Name
'('   Punctuation
'specfunc' Name
'({'   Punctuation
'sum'   Name
','   Operator
'Sum'   Name
','   Operator

'product'   Name
','   Operator
'Product'   Name
'})'   Punctuation
','   Operator
'\n

                 ' Text.Whitespace
'anyfunc'   Name
'('   Punctuation
'anything'   Name
','   Operator
'\n   ' Text.Whitespace
'name'   Name
'='   Operator
'anything'   Name
'..'   Operator
'Not'   Name
'({'   Punctuation
'0'   Literal.Number.Integer
','   Operator
'SymbolicInfinity' Name
','   Operator
'undefined' Name
'})))'   Punctuation
'""'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'do_rebase_upper' Name
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'do_rebase_upper' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'

             Punctuation
'\n   '   Text.Whitespace

```
'subsop'      Name.Builtin
'(['          Punctuation
'2'           Literal.Number.Integer
','           Operator
'2'           Literal.Number.Integer
','           Operator
'2'           Literal.Number.Integer
']'           Punctuation
'='           Operator
'0'           Literal.Number.Integer
','           Operator
'\n      '    Text.Whitespace
'applyop'     Name
'('           Punctuation
"`-`"         Name
','           Operator
'\n          '    Text.Whitespace
'['           Punctuation
'2'           Literal.Number.Integer
','           Operator
'2'           Literal.Number.Integer
','           Operator
'1'           Literal.Number.Integer
']'           Punctuation
','           Operator
'\n          '    Text.Whitespace
'applyop'     Name
'('           Punctuation
'eval'        Name.Builtin
','           Operator
' '           Text.Whitespace
'1'           Literal.Number.Integer
','           Operator
' '
              Text.Whitespace
'e'           Name
','           Operator
' '           Text.Whitespace
'op'          Name.Builtin
'(['          Punctuation
'2'           Literal.Number.Integer
','           Operator
'1'           Literal.Number.Integer
']'           Punctuation
','           Operator
'e'           Name
')'           Punctuation
'='           Operator
```

'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'e'   Name
')'   Punctuation
'+'   Operator
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'e'   Name
'))'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'op'

        Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'e'   Name
')))'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'ModuleLoad' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'($)'   Punctuation
'\n   '   Text.Whitespace

'# Override csgn to work a little bit harder on piecewise and sum\n' Comment.Single

' '   Text.Whitespace
'# (to get rid of csgn(1/2+1/2*sum(piecewise(...,1,0),...))\n' Comment.Single

' '   Text.Whitespace
'# produced by int on a Gaussian mixture model)\n' Comment.Single

' '   Text.Whitespace
'unprotect'   Name
'('   Punctuation
'csgn'
        Name
');'   Punctuation
'\n   '   Text.Whitespace
'csgn'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'overload'   Name
'(['   Punctuation
'\n   '   Text.Whitespace
"# Handle if the csgn of a piecewise doesn't depend on which branch\n" Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'a'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'specfunc'   Name
'('   Punctuation
'piecewise' Name.Builtin
')'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'option'   Keyword
' '   Text.Whitespace
'overload'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'r'   Name

','	Operator
' '	Text.Whitespace
'i'	
	Name
';'	Punctuation
'\n '	Text.Whitespace
'r'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'{'	Punctuation
'seq'	Name.Builtin
'('	Punctuation
'`if`'	Name
'('	Punctuation
'i'	Name
'::'	Operator
'even'	Name
' '	Text.Whitespace
'or'	Keyword
' '	Text.Whitespace
'i'	Name
'='	Operator
'nops'	Name.Builtin
'('	Punctuation
'a'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'csgn'	Name
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'i'	Name
','	Operator
'a'	Name
'))'	Punctuation
','	Operator
' '	Text.Whitespace
'NULL'	Name
')'	Punctuation
','	Operator
'\n '	Text.Whitespace
'i'	
	Name
'='	Operator
'1'	Literal.Number.Integer
'..'	Punctuation

```
'nops'      Name.Builtin
'('         Punctuation
'a'         Name
'))};'      Punctuation
'\n    '    Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'nops'      Name.Builtin
'('         Punctuation
'r'         Name
')'         Punctuation
'='         Operator
'1'         Literal.Number.Integer
' '         Text.Whitespace
'then'      Keyword
' '         Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'r'         Name
')'         Punctuation
' '         Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n    '    Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'not'       Keyword
' '         Text.Whitespace
'assigned'  Name.Builtin
'(_'        Punctuation
'Envsignum0' Name
')'
            Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'r'         Name
' '         Text.Whitespace
'minus'     Keyword
' '         Text.Whitespace
```

'{'   Punctuation
'0'   Literal.Number.Integer
'};'   Punctuation
\n '   ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
'='   Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
\n

      ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
\n   ' Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"invalid input: cannot csgn %1"' Literal.String
','   Operator
' '   Text.Whitespace
'a'   Name
';'   Punctuation
\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
\n   '   Text.Whitespace
"# Handle if the csgn of a sum doesn't depend on the bound variable\n" Comment.Single

```
'   '       Text.Whitespace
'proc'      Keyword
'('         Punctuation
'a'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'And'       Name
'('         Punctuation
'specfunc'  Name
'({'        Punctuation
'sum'       Name
','         Operator
' '         Text.Whitespace
'Sum'       Name
'})'        Punctuation
';'
            Operator
' '         Text.Whitespace
'anyfunc'   Name
'('         Punctuation
'anything'  Name
','         Operator
' '         Text.Whitespace
'name'      Name
'='         Operator
'range'     Name
'))'        Punctuation
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
\n      '   Text.Whitespace
'option'    Keyword
' '         Text.Whitespace
'overload'  Name
';'         Punctuation
\n      '   Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'r'         Name
';'         Punctuation
\n      '   Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'csgn'      Name
```

'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'a'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '

            Text.Whitespace
'not'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'r'   Name
','   Operator
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'a'   Name
'))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'signum'   Name
'('   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'a'   Name
')'   Punctuation
'+'   Operator
'1'   Literal.Number.Integer
'-'   Operator
'op'   Name.Builtin

'(['

      Punctuation

'2'   Literal.Number.Integer

','   Operator

'2'   Literal.Number.Integer

','   Operator

'1'   Literal.Number.Integer

']'   Punctuation

','   Operator

'a'   Name

'))'   Punctuation

' '   Text.Whitespace

'*'   Operator

' '   Text.Whitespace

'r'   Name

'\n   ' Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'if'   Keyword

';'   Punctuation

'\n   ' Text.Whitespace

'error'   Keyword

' '   Text.Whitespace

'"invalid input: cannot csgn %1"' Literal.String

','   Operator

' '   Text.Whitespace

'a'   Name

';'   Punctuation

'\n ' Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'proc'   Keyword

','   Operator

'\n ' Text.Whitespace

'csgn'   Name

']);'   Punctuation

'\n '   Text.Whitespace

'protect'   Name

'('

     Punctuation

'csgn'   Name

');'   Punctuation

'\n\n '   Text.Whitespace

'# Do the same to signum.\n' Comment.Single

' '   Text.Whitespace

'unprotect' Name

'('   Punctuation

'signum'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'signum'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'overload' Name
'(['   Punctuation
'\n   ' Text.Whitespace
"# Handle if the signum of a piecewise doesn't depend on which branch\n" Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'a'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'specfunc' Name
'('   Punctuation
'piecewise' Name.Builtin
')'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   ' Text.Whitespace
'option'   Keyword
' '

 Text.Whitespace
'overload' Name
';'   Punctuation
'\n   ' Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'r'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
';'   Punctuation
'\n   ' Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'{'   Punctuation
'seq'   Name.Builtin

'('   Punctuation
'`if`'   Name
'('   Punctuation
'i'   Name
'::'   Operator
'even'   Name
' '   Text.Whitespace
'or'   Keyword
' '   Text.Whitespace
'i'   Name
'='   Operator
'nops'   Name.Builtin
'('   Punctuation
'a'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'signum'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name
','   Operator
'a'
     Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'NULL'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'i'   Name
'='   Operator
'1'   Literal.Number.Integer
'..'   Punctuation
'nops'   Name.Builtin
'('   Punctuation
'a'   Name
'))};'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
'='   Operator

```
'1'          Literal.Number.Integer
' '          Text.Whitespace
'then'       Keyword
' '          Text.Whitespace
'return'     Keyword
' '          Text.Whitespace
'op'         Name.Builtin
'('          Punctuation
'r'          Name
')'          Punctuation
' '          Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
';'          Punctuation
'\n
     '       Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'not'        Keyword
' '          Text.Whitespace
'assigned'   Name.Builtin
'(_'         Punctuation
'Envsignum0' Name
')'          Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n          ' Text.Whitespace
'r'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'r'          Name
' '          Text.Whitespace
'minus'      Keyword
' '          Text.Whitespace
'{'          Punctuation
'0'          Literal.Number.Integer
'};'         Punctuation
'\n          ' Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'nops'       Name.Builtin
'('          Punctuation
'r'          Name
')'          Punctuation
'='          Operator
'1'          Literal.Number.Integer
```

' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('

           Punctuation
'r'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"invalid input: cannot signum %1"' Literal.String
','   Operator
' '   Text.Whitespace
'a'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
'\n   '   Text.Whitespace
"# Handle if the signum of a sum doesn't depend on the bound variable\n" Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'a'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'And'

           Name
'('   Punctuation
'specfunc' Name
'({'   Punctuation

```
'sum'        Name
','          Operator
' '          Text.Whitespace
'Sum'        Name
'})'         Punctuation
','          Operator
' '          Text.Whitespace
'anyfunc'    Name
'('          Punctuation
'anything'   Name
','          Operator
' '          Text.Whitespace
'name'       Name
'='          Operator
'range'      Name
'))'         Punctuation
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n    '     Text.Whitespace
'option'     Keyword
' '          Text.Whitespace
'overload'   Name
';'          Punctuation
'\n    '     Text.Whitespace
'local'      Keyword
' '          Text.Whitespace
'r'          Name
';'          Punctuation
'\n    '     Text.Whitespace
'r'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'signum'     Name
'('          Punctuation
'op'
             Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'a'          Name
'));'        Punctuation
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'not'        Keyword
```

```
' '        Text.Whitespace
'depends'   Name
'('         Punctuation
'r'         Name
','         Operator
'op'        Name.Builtin
'(['        Punctuation
'2'         Literal.Number.Integer
','         Operator
'1'         Literal.Number.Integer
']'         Punctuation
','         Operator
'a'         Name
'))'        Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n     '   Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'signum'    Name
'('         Punctuation
'op'        Name.Builtin
'(['        Punctuation
'2'         Literal.Number.Integer
','         Operator
'2'         Literal.Number.Integer
','         Operator
'2'         Literal.Number.Integer
']'
            Punctuation
','         Operator
'a'         Name
')'         Punctuation
'+'         Operator
'1'         Literal.Number.Integer
'-'         Operator
'op'        Name.Builtin
'(['        Punctuation
'2'         Literal.Number.Integer
','         Operator
'2'         Literal.Number.Integer
','         Operator
'1'         Literal.Number.Integer
']'         Punctuation
','         Operator
'a'         Name
'))'        Punctuation
' '         Text.Whitespace
```

'*'   Operator
' '   Text.Whitespace
'r'   Name
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"'invalid input: cannot signum %1"' Literal.String
','   Operator
' '   Text.Whitespace
'a'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
'
    '   Text.Whitespace
'proc'   Keyword
','   Operator
'\n   '   Text.Whitespace
'signum'   Name
']);'   Punctuation
'\n   '   Text.Whitespace
'protect' Name
'('   Punctuation
'signum'   Name
');'   Punctuation
'\n\n   ' Text.Whitespace
'# Override sum to fail faster\n' Comment.Single

'   '   Text.Whitespace
'unprotect' Name
'('   Punctuation
'sum'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'sum'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'overload' Name
'(['   Punctuation
'\n   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation

```
'f'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'Not'       Name
'({'        Punctuation
'`+`'       Name
','         Operator
'`+`'       Name
'^'         Operator
'integer'   Name
'})'        Punctuation
','
            Operator
'\n      '  Text.Whitespace
'k'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'name'      Name
'='         Operator
'And'       Name
'('         Punctuation
'range'     Name
','         Operator
'Not'       Name
'('         Punctuation
'range'     Name
'('         Punctuation
'rational'  Name
')))'       Punctuation
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n      '  Text.Whitespace
'option'    Keyword
' '         Text.Whitespace
'overload'  Name
';'         Punctuation
'\n      '  Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'not'       Keyword
' '         Text.Whitespace
'('         Punctuation
'`-`'       Name
'('         Punctuation
```

'op'   Name.Builtin
'('   Punctuation
'rhs'   Name.Builtin
'('   Punctuation
'k'   Name
')))'
 Punctuation
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'rational'   Name
'"'   Punctuation
')'   Punctuation
'\n   ' Text.Whitespace
'and'   Keyword
' '   Text.Whitespace
'not'   Keyword
' '   Text.Whitespace
'('   Punctuation
'subsindets' Name.Builtin
'('   Punctuation
'f'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'anything'   Name
'^'   Operator
'integer'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'f'   Name
'->'   Operator
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'f'   Name
'))'   Punctuation
'\n   ' Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'{'   Punctuation
'`+`'
    Name
','   Operator

'And'   Name

'('   Punctuation

``*`'   Name

','   Operator

'Not'   Name

'('   Punctuation

``*`'   Name

'('   Punctuation

'Not'   Name

'('   Punctuation

``+`'   Name

')))))}'   Punctuation

'"'   Punctuation

')'   Punctuation

'\n   ' Text.Whitespace

'and'   Keyword

' '   Text.Whitespace

'depends'   Name

'('   Punctuation

'indets'   Name.Builtin

'('   Punctuation

'f'   Name

','   Operator

' '   Text.Whitespace

'"'   Punctuation

'{'   Punctuation

'specfunc' Name

'('   Punctuation

'idx'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace

'specindex' Name

'('   Punctuation

'idx'   Name

')}'   Punctuation

'"'   Punctuation

')'   Punctuation

','   Operator

' '   Text.Whitespace

'op'

            Name.Builtin

'('   Punctuation

'1'   Literal.Number.Integer

','   Operator

'k'   Name

'))'   Punctuation

'\n   '   Text.Whitespace

'then'   Keyword
'\n   ' Text.Whitespace
'"""   Punctuation
'procname'   Name
'(_'   Punctuation
'passed'   Name
')'   Punctuation
'"""   Punctuation
'\n   ' Text.Whitespace
'else'   Keyword
'\n   ' Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"invalid input: cannot fast-fail sum(%1, %2)"' Literal.String
','   Operator
' '   Text.Whitespace
'_passed'   Name
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
'\n   '   Text.Whitespace
'sum'   Name
']);'   Punctuation
'\n   '   Text.Whitespace
'protect'   Name
'('

          Punctuation
'sum'   Name
');'   Punctuation
'\n\n   '   Text.Whitespace
':'   Operator
'-'   Operator
'`print/Ints`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'curry'   Name
'('   Punctuation
'thismodule' Name
':'   Operator
'-'   Operator
'Print'   Name

```
','        Operator
'Ints'     Name
');'       Punctuation
'\n   '    Text.Whitespace
':'        Operator
'-'        Operator
`print/Sums`' Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'curry'    Name
'('        Punctuation
'thismodule' Name
':'        Operator
'-'        Operator
'Print'    Name
','        Operator
'Sums'     Name
');'       Punctuation
'\n   '    Text.Whitespace
':'        Operator
'-'        Operator
`print/ints`' Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'curry'
           Name
'('        Punctuation
'thismodule' Name
':'        Operator
'-'        Operator
'Print'    Name
','        Operator
'ints'     Name
');'       Punctuation
'\n   '    Text.Whitespace
':'        Operator
'-'        Operator
`print/sums`' Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'curry'    Name
'('        Punctuation
'thismodule' Name
':'        Operator
'-'        Operator
```

'Print'   Name
','   Operator
'sums'   Name
');'   Punctuation
'\n\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'ModuleLoad' Name
'()'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'module'   Keyword
';'   Punctuation
' '   Text.Whitespace
'# Loop\n'   Comment.Single

1.187 yup 1.6.1

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* /legend-engine-external-format-jsonschema-4-18-4-sources-jar/org/finos/legend/engine/external/format/jsonSchema/extension/JSONSchemaGenerationExtension.java

* /legend-engine-external-format-jsonschema-4-18-4-sources-jar/org/finos/legend/engine/external/format/jsonSchema/extension/JSONSchemaGenerationConfigBuilder.java

* /legend-engine-external-format-jsonschema-4-18-4-sources-jar/org/finos/legend/engine/external/format/jsonSchema/schema/generations/JSONSchemaConfig.java

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1.191 autobahn 24.4.2

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A. HISTORY OF THE SOFTWARE
=========================

Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see https://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see https://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations, which became
Zope Corporation. In 2001, the Python Software Foundation (PSF, see
https://www.python.org/psf/) was formed, a non-profit organization
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0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes

2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
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Thanks to the many outside volunteers who have worked under Guido's
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A. HISTORY OF THE SOFTWARE
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In May 2000, Guido and the Python core development team moved to
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2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
2.2.3	2.2.2	2003	PSF	yes
2.3	2.2.2	2002-2003	PSF	yes
2.3.1	2.3	2002-2003	PSF	yes
2.3.2	2.3.1	2002-2003	PSF	yes
2.3.3	2.3.2	2002-2003	PSF	yes
2.3.4	2.3.3	2004	PSF	yes
2.3.5	2.3.4	2005	PSF	yes

2.4	2.3	2004	PSF	yes
2.4.1	2.4	2005	PSF	yes
2.4.2	2.4.1	2005	PSF	yes
2.4.3	2.4.2	2006	PSF	yes
2.4.4	2.4.3	2006	PSF	yes
2.5	2.4	2006	PSF	yes
2.5.1	2.5	2007	PSF	yes
2.5.2	2.5.1	2008	PSF	yes
2.5.3	2.5.2	2008	PSF	yes
2.6	2.5	2008	PSF	yes
2.6.1	2.6	2008	PSF	yes
2.6.2	2.6.1	2009	PSF	yes
2.6.3	2.6.2	2009	PSF	yes
2.6.4	2.6.3	2009	PSF	yes
2.6.5	2.6.4	2010	PSF	yes
2.7	2.6	2010	PSF	yes

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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations (now Zope
Corporation, see http://www.zope.com). In 2001, the Python Software
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2.4.4	2.4.3	2006	PSF	yes
2.5	2.4	2006	PSF	yes
2.5.1	2.5	2007	PSF	yes
2.5.2	2.5.1	2008	PSF	yes
2.5.3	2.5.2	2008	PSF	yes
2.6	2.5	2008	PSF	yes
2.6.1	2.6	2008	PSF	yes
2.6.2	2.6.1	2009	PSF	yes
2.6.3	2.6.2	2009	PSF	yes
2.6.4	2.6.3	2009	PSF	yes
2.6.5	2.6.4	2010	PSF	yes
3.0	2.6	2008	PSF	yes
3.0.1	3.0	2009	PSF	yes
3.1	3.0.1	2009	PSF	yes
3.1.1	3.1	2009	PSF	yes
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1.201 paramiko 3.5.1

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1.208 astroid 3.3.9

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 If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may distribute the object
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   with the Library, with the complete machine-readable "work that

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b) Use a suitable shared library mechanism for linking with the
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rather than copying library functions into the executable, and (2)
will operate properly
with a modified version of the library, if
the user installs one, as long as the modified version is
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1.212 axios 1.8.4

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Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see http://www.cnri.reston.va.us) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see http://www.zope.com). In 2001, the Python Software Foundation (PSF, see http://www.python.org/psf/) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member
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0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes

2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
2.2.3	2.2.2	2003	PSF	yes
2.3	2.2.2	2002-2003	PSF	yes
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2.3.4	2.3.3	2004	PSF	yes
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2.4.3	2.4.2	2006	PSF	yes
2.4.4	2.4.3	2006	PSF	yes
2.5	2.4	2006	PSF	yes
2.5.1	2.5	2007	PSF	yes
2.5.2	2.5.1	2008	PSF	yes
2.5.3	2.5.2	2008	PSF	yes
2.6	2.5	2008	PSF	yes
2.6.1	2.6	2008	PSF	yes
2.6.2	2.6.1	2009	PSF	yes
2.6.3	2.6.2	2009	PSF	yes
2.6.4	2.6.3	2009	PSF	yes
2.6.5	2.6.4	2010	PSF	yes
3.0	2.6	2008	PSF	yes
3.0.1	3.0	2009	PSF	yes
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1.215 pytz 2025.2

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1.216 boto3 1.37.19

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1.217 botocore 1.37.19

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{
 "version":"2.0",
 "metadata":{
  "apiVersion":"2018-08-01",
  "endpointPrefix":"license-manager",
  "jsonVersion":"1.1",
  "protocol":"json",
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the same that is performing the check out, you must specify the account as the beneficiary.</p> </note>"
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     ],
     "documentation":"<p>Creates a grant for the specified license. A grant shares the use of license entitlements with
a specific Amazon Web Services account, an organization, or an organizational unit (OU). For more information,
see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/granted-licenses.html\">Granted
licenses in License Manager</a> in the <i>License Manager User Guide</i>.</p>"
    },
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    "http":{
     "method":"POST",
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      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Creates a license configuration.</p> <p>A license configuration is an abstraction of a customer license agreement that can be consumed and enforced by License Manager. Components include specifications for the license type (licensing by instance, socket, CPU, or vCPU), allowed tenancy (shared tenancy, Dedicated Instance,
 Dedicated Host, or all of these), license affinity to host (how long a license must be associated with a host), and the number of licenses purchased and used.</p>"
    },
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```
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    "documentation":"<p>Creates a long-lived
 token.</p> <p>A refresh token is a JWT token used to get an access token. With an access token, you can call
AssumeRoleWithWebIdentity to get role credentials that you can use to call License Manager to manage the
specified license.</p>"
  },
  "DeleteGrant":{
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configuration that is in use.</p>"
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action cannot be reversed. It has no effect on the previous reports from this generator.</p>"
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information about the specified license configuration.</p>"
    },
    "GetLicenseConversionTask":{
      "name":"GetLicenseConversionTask",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"GetLicenseConversionTaskRequest"},
      "output":{"shape":"GetLicenseConversionTaskResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Gets information about the specified license type conversion task.</p>"
    },
```

```
"GetLicenseManagerReportGenerator":{
  "name":"GetLicenseManagerReportGenerator",
  "http":{
    "method":"POST",
    "requestUri":"/"
  },
  "input":{"shape":"GetLicenseManagerReportGeneratorRequest"},
  "output":{"shape":"GetLicenseManagerReportGeneratorResponse"},
  "errors":[
    {"shape":"ValidationException"},
    {"shape":"InvalidParameterValueException"},
    {"shape":"ResourceLimitExceededException"},
    {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"RateLimitExceededException"},
    {"shape":"AccessDeniedException"},
    {"shape":"ResourceNotFoundException"}
  ],
  "documentation":"<p>Gets information about the specified report generator.</p>"
},
"GetLicenseUsage":{
  "name":"GetLicenseUsage",
  "http":{
    "method":"POST",
    "requestUri":"/"
  },
  "input":{"shape":"GetLicenseUsageRequest"},
  "output":{"shape":"GetLicenseUsageResponse"},
  "errors":[
    {"shape":"ValidationException"},
    {"shape":"InvalidParameterValueException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"},
    {"shape":"ServerInternalException"}
  ],
  "documentation":"<p>Gets detailed information about the usage of the specified license.</p>"
},
"GetServiceSettings":{
  "name":"GetServiceSettings",
  "http":{
    "method":"POST",
    "requestUri":"/"
  },
  "input":{"shape":"GetServiceSettingsRequest"},
  "output":{"shape":"GetServiceSettingsResponse"},
  "errors":[
    {"shape":"ServerInternalException"},
```

```
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Gets the License Manager settings for the current Region.</p>"
    },
    "ListAssociationsForLicenseConfiguration":{
     "name":"ListAssociationsForLicenseConfiguration",
     "http":{
       "method":"POST",
       "requestUri":"/"
     },
     "input":{"shape":"ListAssociationsForLicenseConfigurationRequest"},
     "output":{"shape":"ListAssociationsForLicenseConfigurationResponse"},
     "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"FilterLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Lists the resource associations for the specified license configuration.</p> <p>Resource
associations need not consume licenses from a license configuration. For example, an AMI or a stopped instance
might not consume a license (depending on the license rules).</p>"
    },
    "ListDistributedGrants":{
     "name":"ListDistributedGrants",
     "http":{
       "method":"POST",
       "requestUri":"/"
     },
     "input":{"shape":"ListDistributedGrantsRequest"},
     "output":{"shape":"ListDistributedGrantsResponse"},
     "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Lists the grants distributed for the specified license.</p>"
    },
    "ListFailuresForLicenseConfigurationOperations":{
     "name":"ListFailuresForLicenseConfigurationOperations",
     "http":{
```

```
    "method":"POST",
    "requestUri":"/"
   },
   "input":{"shape":"ListFailuresForLicenseConfigurationOperationsRequest"},
   "output":{"shape":"ListFailuresForLicenseConfigurationOperationsResponse"},
   "errors":[
    {"shape":"InvalidParameterValueException"},
    {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
   ],
   "documentation":"<p>Lists the license configuration operations that failed.</p>"
  },
  "ListLicenseConfigurations":{
   "name":"ListLicenseConfigurations",
   "http":{
    "method":"POST",
    "requestUri":"/"
   },
   "input":{"shape":"ListLicenseConfigurationsRequest"},
   "output":{"shape":"ListLicenseConfigurationsResponse"},
   "errors":[
    {"shape":"InvalidParameterValueException"},
    {"shape":"ServerInternalException"},
    {"shape":"FilterLimitExceededException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
   ],
   "documentation":"<p>Lists the license configurations for your account.</p>"
  },
  "ListLicenseConversionTasks":{
   "name":"ListLicenseConversionTasks",
   "http":{
    "method":"POST",
    "requestUri":"/"
   },
   "input":{"shape":"ListLicenseConversionTasksRequest"},
   "output":{"shape":"ListLicenseConversionTasksResponse"},
   "errors":[
    {"shape":"InvalidParameterValueException"},
     {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
   ],
   "documentation":"<p>Lists the license type conversion tasks for your account.</p>"
```

        },
       "ListLicenseManagerReportGenerators":{
        "name":"ListLicenseManagerReportGenerators",
        "http":{
         "method":"POST",
         "requestUri":"/"
        },
        "input":{"shape":"ListLicenseManagerReportGeneratorsRequest"},
        "output":{"shape":"ListLicenseManagerReportGeneratorsResponse"},
        "errors":[
         {"shape":"ValidationException"},
         {"shape":"InvalidParameterValueException"},
         {"shape":"ResourceLimitExceededException"},
         {"shape":"ServerInternalException"},
         {"shape":"AuthorizationException"},
         {"shape":"RateLimitExceededException"},
         {"shape":"AccessDeniedException"},
         {"shape":"ResourceNotFoundException"}
        ],
        "documentation":"<p>Lists the report generators for your account.</p>"
       },
       "ListLicenseSpecificationsForResource":{
        "name":"ListLicenseSpecificationsForResource",
        "http":{
         "method":"POST",
         "requestUri":"/"
        },
        "input":{"shape":"ListLicenseSpecificationsForResourceRequest"},
        "output":{"shape":"ListLicenseSpecificationsForResourceResponse"},
        "errors":[
         {"shape":"InvalidParameterValueException"},
         {"shape":"ServerInternalException"},
         {"shape":"AuthorizationException"},
         {"shape":"AccessDeniedException"},
         {"shape":"RateLimitExceededException"}
        ],
        "documentation":"<p>Describes the license configurations for the specified resource.</p>"
       },
       "ListLicenseVersions":{
        "name":"ListLicenseVersions",
        "http":{
         "method":"POST",
         "requestUri":"/"
        },
        "input":{"shape":"ListLicenseVersionsRequest"},
        "output":{"shape":"ListLicenseVersionsResponse"},
        "errors":[
         {"shape":"InvalidParameterValueException"},

```
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"},
    {"shape":"ServerInternalException"}
   ],
   "documentation":"<p>Lists all versions of the specified license.</p>"
  },
  "ListLicenses":{
   "name":"ListLicenses",
   "http":{
    "method":"POST",
    "requestUri":"/"
   },
   "input":{"shape":"ListLicensesRequest"},
   "output":{"shape":"ListLicensesResponse"},
   "errors":[
    {"shape":"ValidationException"},
    {"shape":"InvalidParameterValueException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"},
    {"shape":"ServerInternalException"}
   ],
   "documentation":"<p>Lists the licenses for your account.</p>"
  },
  "ListReceivedGrants":{
   "name":"ListReceivedGrants",
   "http":{
    "method":"POST",
    "requestUri":"/"
   },
   "input":{"shape":"ListReceivedGrantsRequest"},
   "output":{"shape":"ListReceivedGrantsResponse"},
   "errors":[
    {"shape":"ValidationException"},
    {"shape":"InvalidParameterValueException"},
    {"shape":"ResourceLimitExceededException"},
    {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
   ],
   "documentation":"<p>Lists grants that are received. Received grants are grants created while specifying the
recipient as this Amazon Web Services account, your organization, or an organizational unit (OU) to which this
member account belongs.</p>"
  },
  "ListReceivedGrantsForOrganization":{
   "name":"ListReceivedGrantsForOrganization",
```

```
  "http":{
   "method":"POST",
   "requestUri":"/"
  },
  "input":{"shape":"ListReceivedGrantsForOrganizationRequest"},
  "output":{"shape":"ListReceivedGrantsForOrganizationResponse"},
  "errors":[
   {"shape":"ValidationException"},
   {"shape":"InvalidParameterValueException"},
   {"shape":"ResourceLimitExceededException"},
   {"shape":"ServerInternalException"},
   {"shape":"AuthorizationException"},
   {"shape":"AccessDeniedException"},
   {"shape":"RateLimitExceededException"}
  ],
  "documentation":"<p>Lists the grants received for all accounts in the organization.</p>"
 },
 "ListReceivedLicenses":{
  "name":"ListReceivedLicenses",
  "http":{
   "method":"POST",
   "requestUri":"/"
  },
  "input":{"shape":"ListReceivedLicensesRequest"},
  "output":{"shape":"ListReceivedLicensesResponse"},
  "errors":[
   {"shape":"ValidationException"},
   {"shape":"InvalidParameterValueException"},
   {"shape":"ResourceLimitExceededException"},
   {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
   {"shape":"AccessDeniedException"},
   {"shape":"RateLimitExceededException"}
  ],
  "documentation":"<p>Lists received licenses.</p>"
 },
 "ListReceivedLicensesForOrganization":{
  "name":"ListReceivedLicensesForOrganization",
  "http":{
   "method":"POST",
   "requestUri":"/"
  },
  "input":{"shape":"ListReceivedLicensesForOrganizationRequest"},
  "output":{"shape":"ListReceivedLicensesForOrganizationResponse"},
  "errors":[
   {"shape":"ValidationException"},
   {"shape":"InvalidParameterValueException"},
   {"shape":"ResourceLimitExceededException"},
```

```
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Lists the licenses received for all accounts in the organization.</p>"
    },
    "ListResourceInventory":{
      "name":"ListResourceInventory",
     "http":{
       "method":"POST",
       "requestUri":"/"
     },
     "input":{"shape":"ListResourceInventoryRequest"},
     "output":{"shape":"ListResourceInventoryResponse"},
     "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"ServerInternalException"},
      {"shape":"FilterLimitExceededException"},
      {"shape":"FailedDependencyException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Lists resources managed using Systems Manager inventory.</p>"
    },
    "ListTagsForResource":{
     "name":"ListTagsForResource",
     "http":{
       "method":"POST",
       "requestUri":"/"
     },
     "input":{"shape":"ListTagsForResourceRequest"},
     "output":{"shape":"ListTagsForResourceResponse"},
     "errors":[
      {"shape":"InvalidParameterValueException"},
       {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Lists the tags for the specified license configuration.</p>"
    },
    "ListTokens":{
     "name":"ListTokens",
     "http":{
       "method":"POST",
       "requestUri":"/"
```

```
    },
    "input":{"shape":"ListTokensRequest"},
    "output":{"shape":"ListTokensResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"}
    ],
    "documentation":"<p>Lists your tokens.</p>"
  },
  "ListUsageForLicenseConfiguration":{
    "name":"ListUsageForLicenseConfiguration",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListUsageForLicenseConfigurationRequest"},
    "output":{"shape":"ListUsageForLicenseConfigurationResponse"},
    "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"FilterLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists all license usage records for a license configuration, displaying license consumption
details by resource at a selected point in time. Use this action to audit the current license consumption for any
license inventory and configuration.</p>"
  },
  "RejectGrant":{
    "name":"RejectGrant",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"RejectGrantRequest"},
    "output":{"shape":"RejectGrantResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"}
```

```
    ],
    "documentation":"<p>Rejects the specified grant.</p>"
   },
   "TagResource":{
    "name":"TagResource",
    "http":{
     "method":"POST",
     "requestUri":"/"
    },
    "input":{"shape":"TagResourceRequest"},
    "output":{"shape":"TagResourceResponse"},
    "errors":[
     {"shape":"InvalidParameterValueException"},
     {"shape":"ServerInternalException"},
     {"shape":"AuthorizationException"},
     {"shape":"AccessDeniedException"},
     {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Adds the specified tags to the specified license configuration.</p>"
   },
   "UntagResource":{
    "name":"UntagResource",
    "http":{
     "method":"POST",
     "requestUri":"/"
    },
    "input":{"shape":"UntagResourceRequest"},
    "output":{"shape":"UntagResourceResponse"},
    "errors":[
     {"shape":"InvalidParameterValueException"},
     {"shape":"ServerInternalException"},
     {"shape":"AuthorizationException"},
     {"shape":"AccessDeniedException"},
     {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Removes the specified tags from the specified license configuration.</p>"
   },
   "UpdateLicenseConfiguration":{
    "name":"UpdateLicenseConfiguration",
    "http":{
     "method":"POST",
     "requestUri":"/"
    },
    "input":{"shape":"UpdateLicenseConfigurationRequest"},
    "output":{"shape":"UpdateLicenseConfigurationResponse"},
    "errors":[
     {"shape":"InvalidParameterValueException"},
     {"shape":"ServerInternalException"},
```

```
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"},
        {"shape":"ResourceLimitExceededException"}
      ],
      "documentation":"<p>Modifies the attributes of an existing license configuration.</p>"
    },
    "UpdateLicenseManagerReportGenerator":{
      "name":"UpdateLicenseManagerReportGenerator",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"UpdateLicenseManagerReportGeneratorRequest"},
      "output":{"shape":"UpdateLicenseManagerReportGeneratorResponse"},
      "errors":[
        {"shape":"ValidationException"},
        {"shape":"InvalidParameterValueException"},
        {"shape":"RateLimitExceededException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"ResourceLimitExceededException"}
      ],
      "documentation":"<p>Updates a report generator.</p> <p>After you make changes to a report generator, it
starts generating new reports within 60 minutes of being updated.</p>"
    },
    "UpdateLicenseSpecificationsForResource":{
      "name":"UpdateLicenseSpecificationsForResource",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"UpdateLicenseSpecificationsForResourceRequest"},
      "output":{"shape":"UpdateLicenseSpecificationsForResourceResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"InvalidResourceStateException"},
        {"shape":"LicenseUsageException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Adds or removes the specified license configurations for the specified Amazon Web
Services resource.</p> <p>You can update the license specifications of AMIs, instances, and hosts. You cannot
update the license specifications
```

for launch templates and CloudFormation templates, as they send license configurations to the operation that creates the resource.</p>"
```
    },
    "UpdateServiceSettings":{
      "name":"UpdateServiceSettings",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"UpdateServiceSettingsRequest"},
      "output":{"shape":"UpdateServiceSettingsResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Updates License Manager settings for the current Region.</p>"
    }
  },
  "shapes":{
    "AcceptGrantRequest":{
      "type":"structure",
      "required":["GrantArn"],
      "members":{
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
        }
      }
    },
    "AcceptGrantResponse":{
      "type":"structure",
      "members":{
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Grant ARN.</p>"
        },
        "Status":{
          "shape":"GrantStatus",
          "documentation":"<p>Grant status.</p>"
        },
        "Version":{
          "shape":"String",
          "documentation":"<p>Grant version.</p>"
        }
      }
```

```
    },
    "AccessDeniedException":{
     "type":"structure",
     "members":{
       "Message":{"shape":"Message"}
     },
     "documentation":"<p>Access to resource denied.</p>",
     "exception":true
    },
    "ActivationOverrideBehavior":{
     "type":"string",
     "enum":[
       "DISTRIBUTED_GRANTS_ONLY",
       "ALL_GRANTS_PERMITTED_BY_ISSUER"
     ]
    },
    "AllowedOperation":{
     "type":"string",
     "enum":[
       "CreateGrant",
       "CheckoutLicense",
       "CheckoutBorrowLicense",
       "CheckInLicense",
       "ExtendConsumptionLicense",
       "ListPurchasedLicenses",
       "CreateToken"
     ]
    },
    "AllowedOperationList":{
     "type":"list",
     "member":{"shape":"AllowedOperation"},
     "max":7,
     "min":1
    },
    "Arn":{
     "type":"string",
     "max":2048,
     "pattern":"^arn:aws(-(cn|us-gov|iso-b|iso-c|iso-d))?:[A-Za-z0-9][A-Za-z0-9_/.-]{0,62}:[A-Za-z0-9_/.-]{0,63}:[A-
Za-z0-9_/.-]{0,63}:[A-Za-z0-9][A-Za-z0-9:_/+=,@.-]{0,1023}$"
    },
    "ArnList":{
     "type":"list",
     "member":{"shape":"Arn"}
    },
    "AuthorizationException":{
     "type":"structure",
     "members":{
       "Message":{"shape":"Message"}
```

    },
    "documentation":"<p>The Amazon Web Services user account does not have permission to perform the action.
Check the IAM policy associated with this account.</p>",
    "exception":true
   },
   "AutomatedDiscoveryInformation":{
    "type":"structure",
    "members":{
     "LastRunTime":{
      "shape":"DateTime",
      "documentation":"<p>Time
that automated discovery last ran.</p>"
     }
    },
    "documentation":"<p>Describes automated discovery.</p>"
   },
   "Boolean":{"type":"boolean"},
   "BorrowConfiguration":{
    "type":"structure",
    "required":[
     "AllowEarlyCheckIn",
     "MaxTimeToLiveInMinutes"
    ],
    "members":{
     "AllowEarlyCheckIn":{
      "shape":"BoxBoolean",
      "documentation":"<p>Indicates whether early check-ins are allowed.</p>"
     },
     "MaxTimeToLiveInMinutes":{
      "shape":"BoxInteger",
      "documentation":"<p>Maximum time for the borrow configuration, in minutes.</p>"
     }
    },
    "documentation":"<p>Details about a borrow configuration.</p>"
   },
   "BoxBoolean":{"type":"boolean"},
   "BoxInteger":{"type":"integer"},
   "BoxLong":{"type":"long"},
   "CheckInLicenseRequest":{
    "type":"structure",
    "required":["LicenseConsumptionToken"],
    "members":{
     "LicenseConsumptionToken":{
      "shape":"String",
      "documentation":"<p>License consumption token.</p>"
     },
     "Beneficiary":{
      "shape":"String",

```
      "documentation":"<p>License beneficiary.</p>"
    }
  }
},
"CheckInLicenseResponse":{
 "type":"structure",
 "members":{
 }
},
"CheckoutBorrowLicenseRequest":{
 "type":"structure",
 "required":[
   "LicenseArn",
   "Entitlements",
   "DigitalSignatureMethod",
   "ClientToken"
 ],
 "members":{
   "LicenseArn":{
     "shape":"Arn",
     "documentation":"<p>Amazon Resource Name (ARN) of the license. The license must use the borrow
consumption configuration.</p>"
   },
   "Entitlements":{
     "shape":"EntitlementDataList",
     "documentation":"<p>License entitlements. Partial checkouts are not supported.</p>"
   },
   "DigitalSignatureMethod":{
     "shape":"DigitalSignatureMethod",

   "documentation":"<p>Digital signature method. The possible value is JSON Web Signature (JWS) algorithm
PS384. For more information, see <a href=\"https://tools.ietf.org/html/rfc7518#section-3.5\">RFC 7518 Digital
Signature with RSASSA-PSS</a>.</p>"
   },
   "NodeId":{
     "shape":"String",
     "documentation":"<p>Node ID.</p>"
   },
   "CheckoutMetadata":{
     "shape":"MetadataList",
     "documentation":"<p>Information about constraints.</p>"
   },
   "ClientToken":{
     "shape":"ClientToken",
     "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
   }
 }
```

```
    },
    "CheckoutBorrowLicenseResponse":{
     "type":"structure",
     "members":{
      "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "LicenseConsumptionToken":{
       "shape":"String",
       "documentation":"<p>License consumption token.</p>"
      },
      "EntitlementsAllowed":{
       "shape":"EntitlementDataList",
       "documentation":"<p>Allowed license entitlements.</p>"
      },
      "NodeId":{
       "shape":"String",
       "documentation":"<p>Node ID.</p>"
      },
      "SignedToken":{
       "shape":"SignedToken",
       "documentation":"<p>Signed token.</p>"
      },
      "IssuedAt":{
       "shape":"ISO8601DateTime",
       "documentation":"<p>Date and time at which the license checkout is issued.</p>"
      },
      "Expiration":{
       "shape":"ISO8601DateTime",
       "documentation":"<p>Date and time at which the license checkout expires.</p>"
      },
      "CheckoutMetadata":{
       "shape":"MetadataList",
       "documentation":"<p>Information about constraints.</p>"
      }
     }
    },
    "CheckoutLicenseRequest":{
     "type":"structure",
     "required":[
      "ProductSKU",
      "CheckoutType",
      "KeyFingerprint",
      "Entitlements",
      "ClientToken"
     ],
     "members":{
```

```
      "ProductSKU":{
        "shape":"String",
        "documentation":"<p>Product SKU.</p>"
      },
      "CheckoutType":{
        "shape":"CheckoutType",
        "documentation":"<p>Checkout type.</p>"
      },
      "KeyFingerprint":{
        "shape":"String",
        "documentation":"<p>Key fingerprint identifying the license.</p>"
      },
      "Entitlements":{
        "shape":"EntitlementDataList",
        "documentation":"<p>License entitlements.</p>"
      },
      "ClientToken":{
        "shape":"ClientToken",
        "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      },
      "Beneficiary":{
        "shape":"String",
        "documentation":"<p>License beneficiary.</p>"
      },
      "NodeId":{
        "shape":"String",
        "documentation":"<p>Node ID.</p>"
      }
    }
  },
  "CheckoutLicenseResponse":{
    "type":"structure",
    "members":{
      "CheckoutType":{
        "shape":"CheckoutType",
        "documentation":"<p>Checkout type.</p>"
      },
      "LicenseConsumptionToken":{
        "shape":"String",
        "documentation":"<p>License consumption token.</p>"
      },
      "EntitlementsAllowed":{
        "shape":"EntitlementDataList",
        "documentation":"<p>Allowed license entitlements.</p>"
      },
      "SignedToken":{
        "shape":"SignedToken",
```

```
          "documentation":"<p>Signed token.</p>"
        },
        "NodeId":{
          "shape":"String",
          "documentation":"<p>Node ID.</p>"
        },
        "IssuedAt":{
          "shape":"ISO8601DateTime",
          "documentation":"<p>Date and time at which the license checkout is issued.</p>"
        },
        "Expiration":{
          "shape":"ISO8601DateTime",

"documentation":"<p>Date and time at which the license checkout expires.</p>"
        },
        "LicenseArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the checkout license.</p>"
        }
      }
    },
    "CheckoutType":{
      "type":"string",
      "enum":[
        "PROVISIONAL",
        "PERPETUAL"
      ]
    },
    "ClientRequestToken":{
      "type":"string",
      "max":36,
      "min":1
    },
    "ClientToken":{
      "type":"string",
      "max":2048,
      "pattern":"\\S+"
    },
    "ConflictException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>There was a conflict processing the request. Try your request again.</p>",
      "exception":true
    },
    "ConsumedLicenseSummary":{
      "type":"structure",
```

```
    "members":{
     "ResourceType":{
      "shape":"ResourceType",
      "documentation":"<p>Resource type of the resource consuming a
license.</p>"
     },
     "ConsumedLicenses":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses consumed by the resource.</p>"
     }
    },
    "documentation":"<p>Details about license consumption.</p>"
   },
   "ConsumedLicenseSummaryList":{
    "type":"list",
    "member":{"shape":"ConsumedLicenseSummary"}
   },
   "ConsumptionConfiguration":{
    "type":"structure",
    "members":{
     "RenewType":{
      "shape":"RenewType",
      "documentation":"<p>Renewal frequency.</p>"
     },
     "ProvisionalConfiguration":{
      "shape":"ProvisionalConfiguration",
      "documentation":"<p>Details about a provisional configuration.</p>"
     },
     "BorrowConfiguration":{
      "shape":"BorrowConfiguration",
      "documentation":"<p>Details about a borrow configuration.</p>"
     }
    },
    "documentation":"<p>Details about a consumption configuration.</p>"
   },
   "CreateGrantRequest":{
    "type":"structure",
    "required":[
     "ClientToken",
     "GrantName",
     "LicenseArn",
     "Principals",
     "HomeRegion",
     "AllowedOperations"
    ],
    "members":{
     "ClientToken":{
      "shape":"ClientToken",
```

       "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      },
     "GrantName":{
      "shape":"String",
      "documentation":"<p>Grant name.</p>"
     },
     "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
     },
     "Principals":{
      "shape":"PrincipalArnList",
      "documentation":"<p>The grant principals. You can specify one of the following as an Amazon Resource
Name (ARN):</p>   <p>An Amazon Web Services account, which includes only the account
specified.</p>   <p>An organizational unit (OU), which
 includes all accounts in the OU.</p>   <p>An organization, which will include all accounts
across your organization.</p> "
     },
     "HomeRegion":{
      "shape":"String",
      "documentation":"<p>Home Region of the grant.</p>"
     },
     "AllowedOperations":{
      "shape":"AllowedOperationList",
      "documentation":"<p>Allowed operations for the grant.</p>"
     }
    }
   },
   "CreateGrantResponse":{
    "type":"structure",
    "members":{
     "GrantArn":{
      "shape":"Arn",
      "documentation":"<p>Grant ARN.</p>"
     },
     "Status":{
      "shape":"GrantStatus",
      "documentation":"<p>Grant status.</p>"
     },
     "Version":{
      "shape":"String",
      "documentation":"<p>Grant version.</p>"
     }
    }
   },
   "CreateGrantVersionRequest":{
    "type":"structure",

```
    "required":[
      "ClientToken",
      "GrantArn"
    ],

 "members":{
      "ClientToken":{
       "shape":"ClientToken",
       "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      },
      "GrantArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
      },
      "GrantName":{
       "shape":"String",
       "documentation":"<p>Grant name.</p>"
      },
      "AllowedOperations":{
       "shape":"AllowedOperationList",
       "documentation":"<p>Allowed operations for the grant.</p>"
      },
      "Status":{
       "shape":"GrantStatus",
       "documentation":"<p>Grant status.</p>"
      },
      "StatusReason":{
       "shape":"StatusReasonMessage",
       "documentation":"<p>Grant status reason.</p>"
      },
      "SourceVersion":{
       "shape":"String",
       "documentation":"<p>Current version of the grant.</p>"
      },
      "Options":{

       "shape":"Options",
       "documentation":"<p>The options specified for the grant.</p>"
      }
    }
   },
   "CreateGrantVersionResponse":{
    "type":"structure",
    "members":{
     "GrantArn":{
      "shape":"Arn",
      "documentation":"<p>Grant ARN.</p>"
```

```
      },
     "Status":{
       "shape":"GrantStatus",
       "documentation":"<p>Grant status.</p>"
     },
     "Version":{
       "shape":"String",
       "documentation":"<p>New version of the grant.</p>"
     }
    }
   },
  "CreateLicenseConfigurationRequest":{
   "type":"structure",
   "required":[
    "Name",
    "LicenseCountingType"
   ],
   "members":{
    "Name":{
      "shape":"String",
      "documentation":"<p>Name of the license configuration.</p>"
    },
    "Description":{
      "shape":"String",
      "documentation":"<p>Description of the license configuration.</p>"
    },
    "LicenseCountingType":{
       "shape":"LicenseCountingType",
      "documentation":"<p>Dimension used to track the license inventory.</p>"
    },
    "LicenseCount":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses managed by the license configuration.</p>"
    },
    "LicenseCountHardLimit":{
      "shape":"BoxBoolean",
      "documentation":"<p>Indicates whether hard or soft license enforcement is used. Exceeding a hard limit
blocks the launch of new instances.</p>"
    },
    "LicenseRules":{
      "shape":"StringList",
      "documentation":"<p>License rules. The syntax is #name=value (for example, #allowedTenancy=EC2-
DedicatedHost). The available rules vary by dimension, as follows.</p> <ul> <li> <p> <code>Cores</code>
dimension: <code>allowedTenancy</code> | <code>licenseAffinityToHost</code> |
<code>maximumCores</code> | <code>minimumCores</code> </p> </li> <li> <p> <code>Instances</code>
dimension: <code>allowedTenancy</code>
 | <code>maximumCores</code> | <code>minimumCores</code> | <code>maximumSockets</code> |
<code>minimumSockets</code> | <code>maximumVcpus</code> | <code>minimumVcpus</code> </p> </li> <li>
```

<p> <code>Sockets</code> dimension: <code>allowedTenancy</code> | <code>licenseAffinityToHost</code> | <code>maximumSockets</code> | <code>minimumSockets</code> </p>   <p> <code>vCPUs</code> dimension: <code>allowedTenancy</code> | <code>honorVcpuOptimization</code> | <code>maximumVcpus</code> | <code>minimumVcpus</code> </p>   <p>The unit for <code>licenseAffinityToHost</code> is days and the range is 1 to 180. The possible values for <code>allowedTenancy</code> are <code>EC2-Default</code>, <code>EC2-DedicatedHost</code>, and <code>EC2-DedicatedInstance</code>. The possible values for <code>honorVcpuOptimization</code> are <code>True</code> and <code>False</code>.</p>"
      },
      "Tags":{
        "shape":"TagList",
        "documentation":"<p>Tags to add to the
license configuration.</p>"
      },
      "DisassociateWhenNotFound":{
        "shape":"BoxBoolean",
        "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
      },
      "ProductInformationList":{
        "shape":"ProductInformationList",
        "documentation":"<p>Product information.</p>"
      }
    }
  },
  "CreateLicenseConfigurationResponse":{
    "type":"structure",
    "members":{
      "LicenseConfigurationArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      }
    }
  },
  "CreateLicenseConversionTaskForResourceRequest":{
    "type":"structure",
    "required":[
      "ResourceArn",
      "SourceLicenseContext",
      "DestinationLicenseContext"
    ],
    "members":{
      "ResourceArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the resource you are converting
the license type for.</p>"
      },
      "SourceLicenseContext":{
        "shape":"LicenseConversionContext",

```
      "documentation":"<p>Information that identifies the license type you are converting from. For the structure of
the source license, see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/conversion-
procedures.html#conversion-cli\">Convert a license type using the CLI </a> in the <i>License Manager User
Guide</i>.</p>"
        },
      "DestinationLicenseContext":{
        "shape":"LicenseConversionContext",
        "documentation":"<p>Information that identifies the license type you are converting to. For the structure of the
destination license, see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/conversion-
procedures.html#conversion-cli\">Convert a license type using the CLI </a> in the <i>License Manager User
Guide</i>.</p>"
        }
      }
    },
    "CreateLicenseConversionTaskForResourceResponse":{
      "type":"structure",
      "members":{
        "LicenseConversionTaskId":{
          "shape":"LicenseConversionTaskId",
          "documentation":"<p>The ID of the created license type conversion task.</p>"
        }
      }
    },
    "CreateLicenseManagerReportGeneratorRequest":{
      "type":"structure",
      "required":[
        "ReportGeneratorName",
        "Type",
        "ReportContext",
        "ReportFrequency",
        "ClientToken"
      ],
      "members":{
        "ReportGeneratorName":{
          "shape":"ReportGeneratorName",
          "documentation":"<p>Name of the report generator.</p>"
        },
        "Type":{
          "shape":"ReportTypeList",
          "documentation":"<p>Type of reports to generate. The following report types an be generated:</p> <ul> <li>
<p>License configuration report - Reports the number and details of consumed licenses for a license
configuration.</p> </li> <li> <p>Resource report - Reports the tracked licenses and resource consumption
for a license configuration.</p> </li> </ul>"
        },
        "ReportContext":{
          "shape":"ReportContext",
          "documentation":"<p>Defines the type of license configuration the report generator tracks.</p>"
        },
```

"ReportFrequency":{
  "shape":"ReportFrequency",
  "documentation":"<p>Frequency by which reports are generated. Reports can be generated daily, monthly, or weekly.</p>"
 },
 "ClientToken":{
  "shape":"ClientRequestToken",
  "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the request.</p>"
 },
 "Description":{
  "shape":"String",
  "documentation":"<p>Description of the report generator.</p>"
 },
 "Tags":{
  "shape":"TagList",
  "documentation":"<p>Tags to add to the report generator.</p>"
 }
 }
 },
 "CreateLicenseManagerReportGeneratorResponse":{
  "type":"structure",
  "members":{
   "LicenseManagerReportGeneratorArn":{
    "shape":"String",
    "documentation":"<p>The Amazon Resource Name (ARN) of the new report generator.</p>"
   }
  }
 },
 "CreateLicenseRequest":{
  "type":"structure",
  "required":[
   "LicenseName",
   "ProductName",
   "ProductSKU",
   "Issuer",
   "HomeRegion",
   "Validity",
   "Entitlements",
   "Beneficiary",
   "ConsumptionConfiguration",
   "ClientToken"
  ],
  "members":{
   "LicenseName":{
    "shape":"String",
    "documentation":"<p>License name.</p>"
   },

```
    "ProductName":{
     "shape":"String",
     "documentation":"<p>Product name.</p>"
    },
    "ProductSKU":{
     "shape":"String",
     "documentation":"<p>Product SKU.</p>"
    },
    "Issuer":{
     "shape":"Issuer",
     "documentation":"<p>License issuer.</p>"
    },

  "HomeRegion":{
     "shape":"String",
     "documentation":"<p>Home Region for the license.</p>"
    },
    "Validity":{
     "shape":"DatetimeRange",
     "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
    },
    "Entitlements":{
     "shape":"EntitlementList",
     "documentation":"<p>License entitlements.</p>"
    },
    "Beneficiary":{
     "shape":"String",
     "documentation":"<p>License beneficiary.</p>"
    },
    "ConsumptionConfiguration":{
     "shape":"ConsumptionConfiguration",
     "documentation":"<p>Configuration for consumption of the license. Choose a provisional configuration for
workloads running with continuous connectivity. Choose a borrow configuration for workloads with offline
usage.</p>"
    },
    "LicenseMetadata":{
     "shape":"MetadataList",
     "documentation":"<p>Information about the license.</p>"
    },
    "ClientToken":{
     "shape":"ClientToken",
     "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
    }
   }
  },
  "CreateLicenseResponse":{
   "type":"structure",
```

```
      "members":{
       "LicenseArn":{
         "shape":"Arn",
         "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
       },
       "Status":{
         "shape":"LicenseStatus",
         "documentation":"<p>License status.</p>"
       },
       "Version":{
         "shape":"String",
         "documentation":"<p>License version.</p>"
       }
      }
    },
    "CreateLicenseVersionRequest":{
      "type":"structure",
      "required":[
       "LicenseArn",
       "LicenseName",
       "ProductName",
       "Issuer",
       "HomeRegion",
       "Validity",
       "Entitlements",
       "ConsumptionConfiguration",
       "Status",
       "ClientToken"
      ],

      "members":{
         "LicenseArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
         },
         "LicenseName":{
          "shape":"String",
          "documentation":"<p>License name.</p>"
         },
         "ProductName":{
          "shape":"String",
          "documentation":"<p>Product name.</p>"
         },
         "Issuer":{
          "shape":"Issuer",
          "documentation":"<p>License issuer.</p>"
         },
         "HomeRegion":{
```

```
      "shape":"String",
      "documentation":"<p>Home Region of the license.</p>"
     },
     "Validity":{
      "shape":"DatetimeRange",
      "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
     },
     "LicenseMetadata":{
      "shape":"MetadataList",
      "documentation":"<p>Information about the license.</p>"
     },
     "Entitlements":{
      "shape":"EntitlementList",
      "documentation":"<p>License
entitlements.</p>"
     },
     "ConsumptionConfiguration":{
      "shape":"ConsumptionConfiguration",
      "documentation":"<p>Configuration for consumption of the license. Choose a provisional configuration for
workloads running with continuous connectivity. Choose a borrow configuration for workloads with offline
usage.</p>"
     },
     "Status":{
      "shape":"LicenseStatus",
      "documentation":"<p>License status.</p>"
     },
     "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
     },
     "SourceVersion":{
      "shape":"String",
      "documentation":"<p>Current version of the license.</p>"
     }
    }
   },
   "CreateLicenseVersionResponse":{
    "type":"structure",
    "members":{
     "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>License
ARN.</p>"
     },
     "Version":{
      "shape":"String",
      "documentation":"<p>New version of the license.</p>"
```

```
    },
    "Status":{
      "shape":"LicenseStatus",
      "documentation":"<p>License status.</p>"
    }
  }
},
"CreateTokenRequest":{
  "type":"structure",
  "required":[
    "LicenseArn",
    "ClientToken"
  ],
  "members":{
    "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the license. The ARN is mapped to the aud claim of
the JWT token.</p>"
    },
    "RoleArns":{
      "shape":"ArnList",
      "documentation":"<p>Amazon Resource Name (ARN) of the IAM roles to embed in the token. License
Manager does not check whether the roles are in use.</p>"
    },
    "ExpirationInDays":{
      "shape":"Integer",
      "documentation":"<p>Token expiration, in days, counted from token creation. The default is 365
days.</p>"
    },
    "TokenProperties":{
      "shape":"MaxSize3StringList",
      "documentation":"<p>Data specified by the caller to be included in the JWT token. The data is mapped to the
amr claim of the JWT token.</p>"
    },
    "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Idempotency token, valid for 10 minutes.</p>"
    }
  }
},
"CreateTokenResponse":{
  "type":"structure",
  "members":{
    "TokenId":{
      "shape":"String",
      "documentation":"<p>Token ID.</p>"
    },
    "TokenType":{
```

```
      "shape":"TokenType",
      "documentation":"<p>Token type.</p>"
     },
     "Token":{
      "shape":"TokenString",
      "documentation":"<p>Refresh token, encoded as a JWT token.</p>"
     }
    }
   },
   "DateTime":{"type":"timestamp"},
   "DatetimeRange":{
    "type":"structure",
    "required":["Begin"],
    "members":{
     "Begin":{

      "shape":"ISO8601DateTime",
       "documentation":"<p>Start of the time range.</p>"
     },
     "End":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>End of the time range.</p>"
     }
    },
    "documentation":"<p>Describes a time range, in ISO8601-UTC format.</p>"
   },
   "DeleteGrantRequest":{
    "type":"structure",
    "required":[
     "GrantArn",
     "Version"
    ],
    "members":{
     "GrantArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
     },
     "StatusReason":{
      "shape":"StatusReasonMessage",
      "documentation":"<p>The Status reason for the delete request.</p>"
     },
     "Version":{
      "shape":"String",
      "documentation":"<p>Current version of the grant.</p>"
     }
    }
   },
   "DeleteGrantResponse":{
```

```
  "type":"structure",
  "members":{
   "GrantArn":{
     "shape":"Arn",
     "documentation":"<p>Grant ARN.</p>"
   },
   "Status":{
     "shape":"GrantStatus",
     "documentation":"<p>Grant status.</p>"
   },
   "Version":{
     "shape":"String",
     "documentation":"<p>Grant version.</p>"
   }
  }
 },
 "DeleteLicenseConfigurationRequest":{
  "type":"structure",
  "required":["LicenseConfigurationArn"],
  "members":{
   "LicenseConfigurationArn":{
     "shape":"String",
     "documentation":"<p>ID of the license configuration.</p>"
   }
  }
 },
 "DeleteLicenseConfigurationResponse":{
  "type":"structure",
  "members":{
  }
 },
 "DeleteLicenseManagerReportGeneratorRequest":{
  "type":"structure",
  "required":["LicenseManagerReportGeneratorArn"],
  "members":{
   "LicenseManagerReportGeneratorArn":{
     "shape":"String",
     "documentation":"<p>Amazon Resource Name (ARN) of the report generator to be deleted.</p>"
   }
  }
 },
 "DeleteLicenseManagerReportGeneratorResponse":{
  "type":"structure",
  "members":{
  }
 },
 "DeleteLicenseRequest":{
  "type":"structure",
```

```
    "required":[
      "LicenseArn",
      "SourceVersion"
    ],
    "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "SourceVersion":{
        "shape":"String",
        "documentation":"<p>Current version of the license.</p>"
      }
    }
  },
  "DeleteLicenseResponse":{
    "type":"structure",
    "members":{
      "Status":{
        "shape":"LicenseDeletionStatus",
        "documentation":"<p>License status.</p>"
      },
      "DeletionDate":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>Date when the license is deleted.</p>"
      }
    }
  },
  "DeleteTokenRequest":{
    "type":"structure",
    "required":["TokenId"],
    "members":{
      "TokenId":{
        "shape":"String",
        "documentation":"<p>Token ID.</p>"
      }
    }
  },
  "DeleteTokenResponse":{
    "type":"structure",
    "members":{
    }
  },
  "DigitalSignatureMethod":{
    "type":"string",
    "enum":["JWT_PS384"]
  },
  "Entitlement":{
```

```
    "type":"structure",
    "required":[
     "Name",
     "Unit"
    ],
    "members":{
     "Name":{
      "shape":"String",
      "documentation":"<p>Entitlement name.</p>"
     },
     "Value":{
      "shape":"String",
      "documentation":"<p>Entitlement resource. Use only if the unit is None.</p>"
     },
     "MaxCount":{
      "shape":"Long",
      "documentation":"<p>Maximum entitlement count. Use if the unit is not None.</p>"
     },
     "Overage":{
      "shape":"BoxBoolean",
      "documentation":"<p>Indicates whether overages are allowed.</p>"
     },
     "Unit":{
       "shape":"EntitlementUnit",
      "documentation":"<p>Entitlement unit.</p>"
     },
     "AllowCheckIn":{
      "shape":"BoxBoolean",
      "documentation":"<p>Indicates whether check-ins are allowed.</p>"
     }
    },
    "documentation":"<p>Describes a resource entitled for use with a license.</p>"
   },
   "EntitlementData":{
    "type":"structure",
    "required":[
     "Name",
     "Unit"
    ],
    "members":{
     "Name":{
      "shape":"String",
      "documentation":"<p>Entitlement data name.</p>"
     },
     "Value":{
      "shape":"String",
      "documentation":"<p>Entitlement data value.</p>"
     },
```

```
    "Unit":{
     "shape":"EntitlementDataUnit",
     "documentation":"<p>Entitlement data unit.</p>"
    }
   },
   "documentation":"<p>Data associated with an entitlement resource.</p>"
  },
  "EntitlementDataList":{
   "type":"list",
   "member":{"shape":"EntitlementData"}
  },
  "EntitlementDataUnit":{
   "type":"string",
   "enum":[
    "Count",
    "None",
    "Seconds",
    "Microseconds",
    "Milliseconds",
    "Bytes",
    "Kilobytes",
    "Megabytes",
    "Gigabytes",
    "Terabytes",
    "Bits",
    "Kilobits",
    "Megabits",
    "Gigabits",
    "Terabits",
    "Percent",
    "Bytes/Second",
    "Kilobytes/Second",
    "Megabytes/Second",
    "Gigabytes/Second",
    "Terabytes/Second",
    "Bits/Second",
    "Kilobits/Second",
    "Megabits/Second",
    "Gigabits/Second",
    "Terabits/Second",
    "Count/Second"
   ]
  },
  "EntitlementList":{
   "type":"list",
   "member":{"shape":"Entitlement"}
  },
  "EntitlementNotAllowedException":{
```

```
  "type":"structure",
  "members":{
   "Message":{"shape":"Message"}
  },
  "documentation":"<p>The entitlement is not allowed.</p>",
  "exception":true
 },
 "EntitlementUnit":{
  "type":"string",
  "enum":[
   "Count",
   "None",
   "Seconds",
   "Microseconds",
   "Milliseconds",
   "Bytes",
   "Kilobytes",
   "Megabytes",
   "Gigabytes",
   "Terabytes",
   "Bits",
   "Kilobits",
   "Megabits",
   "Gigabits",
   "Terabits",
   "Percent",
   "Bytes/Second",
   "Kilobytes/Second",
   "Megabytes/Second",
   "Gigabytes/Second",
   "Terabytes/Second",
   "Bits/Second",
   "Kilobits/Second",
   "Megabits/Second",
   "Gigabits/Second",
   "Terabits/Second",
   "Count/Second"
  ]
 },
 "EntitlementUsage":{
  "type":"structure",
  "required":[
   "Name",
   "ConsumedValue",
   "Unit"
  ],
  "members":{
   "Name":{
```

```
        "shape":"String",
        "documentation":"<p>Entitlement usage name.</p>"
      },
      "ConsumedValue":{
        "shape":"String",
        "documentation":"<p>Resource usage consumed.</p>"
      },
      "MaxCount":{
        "shape":"String",
        "documentation":"<p>Maximum entitlement usage count.</p>"
      },
      "Unit":{
        "shape":"EntitlementDataUnit",
        "documentation":"<p>Entitlement usage unit.</p>"
      }
    },
    "documentation":"<p>Usage associated with an entitlement resource.</p>"
  },
  "EntitlementUsageList":{
    "type":"list",
    "member":{"shape":"EntitlementUsage"}
  },
  "ExtendLicenseConsumptionRequest":{
    "type":"structure",
    "required":["LicenseConsumptionToken"],
    "members":{
      "LicenseConsumptionToken":{
        "shape":"String",
        "documentation":"<p>License consumption token.</p>"
      },
      "DryRun":{
        "shape":"Boolean",
        "documentation":"<p>Checks whether you have the required permissions for the action, without actually
making the request. Provides
 an error response if you do not have the required permissions.</p>"
      }
    }
  },
  "ExtendLicenseConsumptionResponse":{
    "type":"structure",
    "members":{
      "LicenseConsumptionToken":{
        "shape":"String",
        "documentation":"<p>License consumption token.</p>"
      },
      "Expiration":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>Date and time at which the license consumption expires.</p>"
```

```
        }
       }
      },
      "FailedDependencyException":{
       "type":"structure",
       "members":{
         "Message":{"shape":"Message"},
         "ErrorCode":{"shape":"String"}
       },
       "documentation":"<p>A dependency required to run the API is missing.</p>",
       "exception":true
      },
      "Filter":{
       "type":"structure",
       "members":{
         "Name":{
           "shape":"FilterName",
           "documentation":"<p>Name of the filter. Filter names are case-sensitive.</p>"
         },
         "Values":{

           "shape":"FilterValues",
           "documentation":"<p>The value of the filter, which is case-sensitive. You can only specify one value for the
filter.</p>"
         }
       },
       "documentation":"<p>A filter name and value pair that is used to return more specific results from a describe
operation. Filters can be used to match a set of resources by specific criteria, such as tags, attributes, or IDs.</p>"
      },
      "FilterLimitExceededException":{
       "type":"structure",
       "members":{
         "Message":{"shape":"Message"}
       },
       "documentation":"<p>The request uses too many filters or too many filter values.</p>",
       "exception":true
      },
      "FilterList":{
       "type":"list",
       "member":{"shape":"Filter"}
      },
      "FilterName":{"type":"string"},
      "FilterValue":{"type":"string"},
      "FilterValues":{
       "type":"list",
       "member":{"shape":"FilterValue"}
      },
      "Filters":{
```

```
    "type":"list",
    "member":{"shape":"Filter"}
  },


"GetAccessTokenRequest":{
    "type":"structure",
    "required":["Token"],
    "members":{
      "Token":{
        "shape":"TokenString",
        "documentation":"<p>Refresh token, encoded as a JWT token.</p>"
      },
      "TokenProperties":{
        "shape":"MaxSize3StringList",
        "documentation":"<p>Token properties to validate against those present in the JWT token.</p>"
      }
    }
  },
  "GetAccessTokenResponse":{
    "type":"structure",
    "members":{
      "AccessToken":{
        "shape":"TokenString",
        "documentation":"<p>Temporary access token.</p>"
      }
    }
  },
  "GetGrantRequest":{
    "type":"structure",
    "required":["GrantArn"],
    "members":{
      "GrantArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
      },
      "Version":{
        "shape":"String",
        "documentation":"<p>Grant version.</p>"
      }
    }
  },
  "GetGrantResponse":{
    "type":"structure",
    "members":{
      "Grant":{
        "shape":"Grant",
        "documentation":"<p>Grant details.</p>"
      }
```

```
      }
    },
    "GetLicenseConfigurationRequest":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        }
      }
    },
    "GetLicenseConfigurationResponse":{
      "type":"structure",
      "members":{
        "LicenseConfigurationId":{
          "shape":"String",
          "documentation":"<p>Unique ID for the license configuration.</p>"
        },
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        },
        "Name":{
          "shape":"String",
          "documentation":"<p>Name of the license configuration.</p>"
        },
        "Description":{
          "shape":"String",
          "documentation":"<p>Description of the license configuration.</p>"
        },
        "LicenseCountingType":{
          "shape":"LicenseCountingType",
          "documentation":"<p>Dimension for which the licenses are counted.</p>"
        },
        "LicenseRules":{
          "shape":"StringList",
          "documentation":"<p>License rules.</p>"
        },
        "LicenseCount":{
          "shape":"BoxLong",
          "documentation":"<p>Number of available licenses.</p>"
        },
        "LicenseCountHardLimit":{
          "shape":"BoxBoolean",
          "documentation":"<p>Sets the number of available licenses as a hard limit.</p>"
        },
        "ConsumedLicenses":{
```

```
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses assigned to resources.</p>"
     },
     "Status":{
      "shape":"String",
      "documentation":"<p>License configuration status.</p>"
     },
     "OwnerAccountId":{
      "shape":"String",
      "documentation":"<p>Account ID of the owner of the license configuration.</p>"
     },
     "ConsumedLicenseSummaryList":{
      "shape":"ConsumedLicenseSummaryList",
      "documentation":"<p>Summaries of the licenses consumed by resources.</p>"
     },
     "ManagedResourceSummaryList":{
      "shape":"ManagedResourceSummaryList",
      "documentation":"<p>Summaries of the managed resources.</p>"
     },
     "Tags":{
      "shape":"TagList",
      "documentation":"<p>Tags for the license configuration.</p>"
     },
     "ProductInformationList":{
      "shape":"ProductInformationList",
      "documentation":"<p>Product information.</p>"
     },
     "AutomatedDiscoveryInformation":{
      "shape":"AutomatedDiscoveryInformation",
      "documentation":"<p>Automated discovery information.</p>"
     },
     "DisassociateWhenNotFound":{
      "shape":"BoxBoolean",
      "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
     }
    }
   },
   "GetLicenseConversionTaskRequest":{
    "type":"structure",
    "required":["LicenseConversionTaskId"],
    "members":{
     "LicenseConversionTaskId":{
      "shape":"LicenseConversionTaskId",
      "documentation":"<p>ID of the license type conversion task to retrieve information on.</p>"
     }
    }
   },
   "GetLicenseConversionTaskResponse":{
```

```
      "type":"structure",
    "members":{
     "LicenseConversionTaskId":{
       "shape":"LicenseConversionTaskId",
       "documentation":"<p>ID of the license type conversion task.</p>"
     },
     "ResourceArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Names (ARN) of the resources the license conversion task is
associated with.</p>"
     },
     "SourceLicenseContext":{
       "shape":"LicenseConversionContext",
       "documentation":"<p>Information about the license type converted from.</p>"
     },
     "DestinationLicenseContext":{
       "shape":"LicenseConversionContext",
       "documentation":"<p>Information about the license type converted to.</p>"
     },
     "StatusMessage":{
       "shape":"String",
       "documentation":"<p>The status message for the conversion task.</p>"
     },
     "Status":{
       "shape":"LicenseConversionTaskStatus",
       "documentation":"<p>Status of the license type conversion task.</p>"
     },
     "StartTime":{
       "shape":"DateTime",
       "documentation":"<p>Time at which the license type conversion task was started .</p>"
     },
     "LicenseConversionTime":{
       "shape":"DateTime",
       "documentation":"<p>Amount of time to complete the license type conversion.</p>"
     },
     "EndTime":{
       "shape":"DateTime",
       "documentation":"<p>Time
at which the license type conversion task was completed.</p>"
     }
    }
   },
   "GetLicenseManagerReportGeneratorRequest":{
    "type":"structure",
    "required":["LicenseManagerReportGeneratorArn"],
    "members":{
     "LicenseManagerReportGeneratorArn":{
       "shape":"String",
```

```
          "documentation":"<p>Amazon Resource Name (ARN) of the report generator.</p>"
        }
      }
    },
    "GetLicenseManagerReportGeneratorResponse":{
      "type":"structure",
      "members":{
        "ReportGenerator":{
          "shape":"ReportGenerator",
          "documentation":"<p>A report generator that creates periodic reports about your license configurations.</p>"
        }
      }
    },
    "GetLicenseRequest":{
      "type":"structure",
      "required":["LicenseArn"],
      "members":{
        "LicenseArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
        },
        "Version":{

          "shape":"String",
          "documentation":"<p>License version.</p>"
        }
      }
    },
    "GetLicenseResponse":{
      "type":"structure",
      "members":{
        "License":{
          "shape":"License",
          "documentation":"<p>License details.</p>"
        }
      }
    },
    "GetLicenseUsageRequest":{
      "type":"structure",
      "required":["LicenseArn"],
      "members":{
        "LicenseArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
        }
      }
    },
    "GetLicenseUsageResponse":{
```

```
    "type":"structure",
   "members":{
    "LicenseUsage":{
     "shape":"LicenseUsage",
     "documentation":"<p>License usage details.</p>"
    }
   }
  },
  "GetServiceSettingsRequest":{
   "type":"structure",
   "members":{
   }
  },
  "GetServiceSettingsResponse":{
   "type":"structure",
   "members":{
    "S3BucketArn":{
     "shape":"String",

     "documentation":"<p>Regional S3 bucket path for storing reports, license trail event data, discovery data, and
so on.</p>"
    },
    "SnsTopicArn":{
     "shape":"String",
     "documentation":"<p>SNS topic configured to receive notifications from License Manager.</p>"
    },
    "OrganizationConfiguration":{
     "shape":"OrganizationConfiguration",
     "documentation":"<p>Indicates whether Organizations is integrated with License Manager for cross-account
discovery.</p>"
    },
    "EnableCrossAccountsDiscovery":{
     "shape":"BoxBoolean",
     "documentation":"<p>Indicates whether cross-account discovery is enabled.</p>"
    },
    "LicenseManagerResourceShareArn":{
     "shape":"String",
     "documentation":"<p>Amazon Resource Name (ARN) of the resource share. The License Manager
management account provides member accounts with access to this share.</p>"
    }
   }
  },
  "Grant":{
   "type":"structure",
   "required":[
    "GrantArn",
    "GrantName",
    "ParentArn",
```

      "LicenseArn",
      "GranteePrincipalArn",
      "HomeRegion",
      "GrantStatus",
      "Version",
      "GrantedOperations"
    ],
    "members":{
     "GrantArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
     },
     "GrantName":{
       "shape":"String",
       "documentation":"<p>Grant name.</p>"
     },
     "ParentArn":{
       "shape":"Arn",
       "documentation":"<p>Parent ARN.</p>"
     },
     "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>License ARN.</p>"
     },
     "GranteePrincipalArn":{
       "shape":"Arn",
       "documentation":"<p>The grantee principal ARN.</p>"
     },
     "HomeRegion":{
       "shape":"String",
       "documentation":"<p>Home Region of the grant.</p>"
     },
     "GrantStatus":{
        "shape":"GrantStatus",
       "documentation":"<p>Grant status.</p>"
     },
     "StatusReason":{
       "shape":"StatusReasonMessage",
       "documentation":"<p>Grant status reason.</p>"
     },
     "Version":{
       "shape":"String",
       "documentation":"<p>Grant version.</p>"
     },
     "GrantedOperations":{
       "shape":"AllowedOperationList",
       "documentation":"<p>Granted operations.</p>"
     },

```
      "Options":{
        "shape":"Options",
        "documentation":"<p>The options specified for the grant.</p>"
      }
    },
    "documentation":"<p>Describes a grant.</p>"
  },
  "GrantList":{
    "type":"list",
    "member":{"shape":"Grant"}
  },
  "GrantStatus":{
    "type":"string",
    "enum":[
      "PENDING_WORKFLOW",
      "PENDING_ACCEPT",
      "REJECTED",
      "ACTIVE",
      "FAILED_WORKFLOW",
      "DELETED",
      "PENDING_DELETE",
      "DISABLED",

"WORKFLOW_COMPLETED"
    ]
  },
  "GrantedLicense":{
    "type":"structure",
    "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "LicenseName":{
        "shape":"String",
        "documentation":"<p>License name.</p>"
      },
      "ProductName":{
        "shape":"String",
        "documentation":"<p>Product name.</p>"
      },
      "ProductSKU":{
        "shape":"String",
        "documentation":"<p>Product SKU.</p>"
      },
      "Issuer":{
        "shape":"IssuerDetails",
        "documentation":"<p>Granted license issuer.</p>"
```

```
        },
      "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region of the granted license.</p>"
      },
      "Status":{
        "shape":"LicenseStatus",
        "documentation":"<p>Granted license status.</p>"
      },
      "Validity":{
        "shape":"DatetimeRange",
        "documentation":"<p>Date and time range during which the granted license is valid, in ISO8601-UTC
format.</p>"
      },
      "Beneficiary":{
        "shape":"String",
        "documentation":"<p>Granted license beneficiary.</p>"
      },
      "Entitlements":{
        "shape":"EntitlementList",
        "documentation":"<p>License entitlements.</p>"
      },
      "ConsumptionConfiguration":{
        "shape":"ConsumptionConfiguration",
        "documentation":"<p>Configuration for consumption of the license.</p>"
      },
      "LicenseMetadata":{
        "shape":"MetadataList",
        "documentation":"<p>Granted license metadata.</p>"
      },
      "CreateTime":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>Creation time of the granted license.</p>"
      },
      "Version":{
        "shape":"String",
        "documentation":"<p>Version of the granted license.</p>"
      },
      "ReceivedMetadata":{
        "shape":"ReceivedMetadata",
        "documentation":"<p>Granted license received metadata.</p>"
      }
    },
    "documentation":"<p>Describes a license that is granted to a grantee.</p>"
  },
  "GrantedLicenseList":{
    "type":"list",
    "member":{"shape":"GrantedLicense"}
```

```
    },
  "ISO8601DateTime":{
    "type":"string",
    "max":50,
    "pattern":"^(-?(?:[1-9][0-9]*)?[0-9]{4})-(1[0-2]|0[1-9])-(3[0-1]|0[1-9]|[1-2][0-9])T(2[0-3]|[0-1][0-9]):([0-5][0-
9]):([0-5][0-9])(\\.[0-9]+)?(Z|[+-](?:2[ 0-3]|[0-1][0-9]):[0-5][0-9])+$"
    },
  "Integer":{"type":"integer"},
  "InvalidParameterValueException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>One or more parameter values are not valid.</p>",
    "exception":true,
    "synthetic":true
    },
  "InvalidResourceStateException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}

    },
    "documentation":"<p>License Manager cannot allocate a license to a resource because of its state. </p> <p>For
example, you cannot allocate a license to an instance in the process of shutting down.</p>",
    "exception":true
    },
  "InventoryFilter":{
    "type":"structure",
    "required":[
      "Name",
      "Condition"
    ],
    "members":{
      "Name":{
        "shape":"String",
        "documentation":"<p>Name of the filter.</p>"
      },
      "Condition":{
        "shape":"InventoryFilterCondition",
        "documentation":"<p>Condition of the filter.</p>"
      },
      "Value":{
        "shape":"String",
        "documentation":"<p>Value of the filter.</p>"
      }
    },
    "documentation":"<p>An inventory filter.</p>"
```

    },
   "InventoryFilterCondition":{
    "type":"string",
    "enum":[
     "EQUALS",
     "NOT_EQUALS",
     "BEGINS_WITH",
     "CONTAINS"
    ]
   },
   "InventoryFilterList":{
    "type":"list",
    "member":{"shape":"InventoryFilter"}
   },
   "Issuer":{
    "type":"structure",
    "required":["Name"],
    "members":{
     "Name":{
      "shape":"String",
      "documentation":"<p>Issuer name.</p>"
     },
     "SignKey":{
      "shape":"String",
      "documentation":"<p>Asymmetric KMS key from Key Management Service. The KMS key must have a key usage of sign and verify, and support the RSASSA-PSS SHA-256 signing algorithm.</p>"
     }
    },
    "documentation":"<p>Details about the issuer of a license.</p>"
   },
   "IssuerDetails":{
    "type":"structure",
    "members":{
     "Name":{
      "shape":"String",
      "documentation":"<p>Issuer name.</p>"
     },
     "SignKey":{
      "shape":"String",
      "documentation":"<p>Asymmetric KMS key from Key Management Service. The KMS key must have a key usage of sign and verify, and support the RSASSA-PSS SHA-256 signing algorithm.</p>"
     },
     "KeyFingerprint":{
      "shape":"String",
      "documentation":"<p>Issuer key fingerprint.</p>"
     }
    },
    "documentation":"<p>Details associated with the issuer of a license.</p>"

```
        },
      "License":{
       "type":"structure",
       "members":{
        "LicenseArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
         },
        "LicenseName":{
          "shape":"String",
          "documentation":"<p>License name.</p>"
         },
        "ProductName":{
          "shape":"String",
          "documentation":"<p>Product name.</p>"
         },
        "ProductSKU":{
          "shape":"String",
          "documentation":"<p>Product SKU.</p>"
         },
        "Issuer":{
          "shape":"IssuerDetails",
          "documentation":"<p>License issuer.</p>"
         },
        "HomeRegion":{
          "shape":"String",
          "documentation":"<p>Home Region of the license.</p>"
         },
        "Status":{
          "shape":"LicenseStatus",
          "documentation":"<p>License status.</p>"
         },
        "Validity":{
          "shape":"DatetimeRange",
          "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
         },
        "Beneficiary":{
          "shape":"String",
          "documentation":"<p>License beneficiary.</p>"
         },
        "Entitlements":{
          "shape":"EntitlementList",
          "documentation":"<p>License entitlements.</p>"
         },
        "ConsumptionConfiguration":{
          "shape":"ConsumptionConfiguration",
          "documentation":"<p>Configuration for consumption of the license.</p>"
         },
```

```
    "LicenseMetadata":{
      "shape":"MetadataList",
      "documentation":"<p>License metadata.</p>"
    },
    "CreateTime":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>License creation time.</p>"
    },
    "Version":{
      "shape":"String",
      "documentation":"<p>License version.</p>"
    }
  },
  "documentation":"<p>Software license that is managed in License Manager.</p>"
},
"LicenseConfiguration":{
  "type":"structure",
  "members":{
    "LicenseConfigurationId":{
      "shape":"String",
      "documentation":"<p>Unique ID of the license configuration.</p>"
    },
    "LicenseConfigurationArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    },
    "Name":{
      "shape":"String",
      "documentation":"<p>Name of the license configuration.</p>"
    },
    "Description":{
      "shape":"String",
      "documentation":"<p>Description of the license configuration.</p>"
    },
    "LicenseCountingType":{
      "shape":"LicenseCountingType",
      "documentation":"<p>Dimension to use to track the license inventory.</p>"
    },
    "LicenseRules":{
      "shape":"StringList",
      "documentation":"<p>License rules.</p>"
    },
    "LicenseCount":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses managed by the license configuration.</p>"
    },
    "LicenseCountHardLimit":{
      "shape":"BoxBoolean",
```

```
          "documentation":"<p>Number of available licenses as a hard limit.</p>"
        },
        "DisassociateWhenNotFound":{
          "shape":"BoxBoolean",
          "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
        },
        "ConsumedLicenses":{
          "shape":"BoxLong",
          "documentation":"<p>Number of licenses consumed. </p>"
        },
        "Status":{
          "shape":"String",
          "documentation":"<p>Status of the license configuration.</p>"
        },
        "OwnerAccountId":{
          "shape":"String",
          "documentation":"<p>Account ID of the license
configuration's owner.</p>"
        },
        "ConsumedLicenseSummaryList":{
          "shape":"ConsumedLicenseSummaryList",
          "documentation":"<p>Summaries for licenses consumed by various resources.</p>"
        },
        "ManagedResourceSummaryList":{
          "shape":"ManagedResourceSummaryList",
          "documentation":"<p>Summaries for managed resources.</p>"
        },
        "ProductInformationList":{
          "shape":"ProductInformationList",
          "documentation":"<p>Product information.</p>"
        },
        "AutomatedDiscoveryInformation":{
          "shape":"AutomatedDiscoveryInformation",
          "documentation":"<p>Automated discovery information.</p>"
        }
      },
      "documentation":"<p>A license configuration is an abstraction of a customer license agreement that can be
consumed and enforced by License Manager. Components include specifications for the license type (licensing by
instance, socket, CPU, or vCPU), allowed tenancy (shared
 tenancy, Dedicated Instance, Dedicated Host, or all of these), host affinity (how long a VM must be associated with
a host), and the number of licenses purchased and used.</p>"
    },
    "LicenseConfigurationAssociation":{
      "type":"structure",
      "members":{
        "ResourceArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
```

        },
        "ResourceType":{
         "shape":"ResourceType",
         "documentation":"<p>Type of server resource.</p>"
        },
        "ResourceOwnerId":{
         "shape":"String",
         "documentation":"<p>ID of the Amazon Web Services account that owns the resource consuming
licenses.</p>"
        },
        "AssociationTime":{
         "shape":"DateTime",
         "documentation":"<p>Time when the license configuration was associated with the resource.</p>"
        },
        "AmiAssociationScope":{
         "shape":"String",
         "documentation":"<p>Scope of
 AMI associations. The possible value is <code>cross-account</code>.</p>"
        }
       },
       "documentation":"<p>Describes an association with a license configuration.</p>"
      },
      "LicenseConfigurationAssociations":{
       "type":"list",
       "member":{"shape":"LicenseConfigurationAssociation"}
      },
      "LicenseConfigurationStatus":{
       "type":"string",
       "enum":[
        "AVAILABLE",
        "DISABLED"
       ]
      },
      "LicenseConfigurationUsage":{
       "type":"structure",
       "members":{
        "ResourceArn":{
         "shape":"String",
         "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
        },
        "ResourceType":{
         "shape":"ResourceType",
         "documentation":"<p>Type of resource.</p>"
        },
        "ResourceStatus":{
         "shape":"String",
         "documentation":"<p>Status of the resource.</p>"
        },

```
    "ResourceOwnerId":{
      "shape":"String",
      "documentation":"<p>ID of
the account that owns the resource.</p>"
    },
    "AssociationTime":{
      "shape":"DateTime",
      "documentation":"<p>Time when the license configuration was initially associated with the resource.</p>"
    },
    "ConsumedLicenses":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses consumed by the resource.</p>"
    }
  },
  "documentation":"<p>Details about the usage of a resource associated with a license configuration.</p>"
},
"LicenseConfigurationUsageList":{
  "type":"list",
  "member":{"shape":"LicenseConfigurationUsage"}
},
"LicenseConfigurations":{
  "type":"list",
  "member":{"shape":"LicenseConfiguration"}
},
"LicenseConversionContext":{
  "type":"structure",
  "members":{
    "UsageOperation":{
      "shape":"UsageOperation",
      "documentation":"<p>The Usage operation value that corresponds to the license type you are converting your
resource
 from. For more information about which platforms correspond to which usage operation values see <a
href=\"https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/billing-info-fields.html#billing-info\">Sample
data: usage operation by platform </a> </p>"
    }
  },
  "documentation":"<p>Information about a license type conversion task.</p>"
},
"LicenseConversionTask":{
  "type":"structure",
  "members":{
    "LicenseConversionTaskId":{
      "shape":"LicenseConversionTaskId",
      "documentation":"<p>The ID of the license type conversion task.</p>"
    },
    "ResourceArn":{
      "shape":"String",
      "documentation":"<p>The Amazon Resource Name (ARN) of the resource associated with the license type
```

conversion task.</p>"
      },
      "SourceLicenseContext":{
        "shape":"LicenseConversionContext",
        "documentation":"<p>Information about the license type this conversion task converted from.</p>"
      },

     "DestinationLicenseContext":{
        "shape":"LicenseConversionContext",
        "documentation":"<p>Information about the license type this conversion task converted to.</p>"
      },
      "Status":{
        "shape":"LicenseConversionTaskStatus",
        "documentation":"<p>The status of the conversion task.</p>"
      },
      "StatusMessage":{
        "shape":"String",
        "documentation":"<p>The status message for the conversion task.</p>"
      },
      "StartTime":{
        "shape":"DateTime",
        "documentation":"<p>The time the conversion task was started at.</p>"
      },
      "LicenseConversionTime":{
        "shape":"DateTime",
        "documentation":"<p>The time the usage operation value of the resource was changed.</p>"
      },
      "EndTime":{
        "shape":"DateTime",
        "documentation":"<p>The time the conversion task was completed.</p>"
      }
    },
    "documentation":"<p>Information about a
license type conversion task.</p>"
  },
  "LicenseConversionTaskId":{
   "type":"string",
   "max":50,
   "pattern":"^lct-[a-zA-Z0-9]*"
  },
  "LicenseConversionTaskStatus":{
   "type":"string",
   "enum":[
    "IN_PROGRESS",
    "SUCCEEDED",
    "FAILED"
   ]
  },

```
"LicenseConversionTasks":{
 "type":"list",
 "member":{"shape":"LicenseConversionTask"}
},
"LicenseCountingType":{
 "type":"string",
 "enum":[
  "vCPU",
  "Instance",
  "Core",
  "Socket"
 ]
},
"LicenseDeletionStatus":{
 "type":"string",
 "enum":[
  "PENDING_DELETE",
  "DELETED"
 ]
},
"LicenseList":{
 "type":"list",
 "member":{"shape":"License"}
},
"LicenseOperationFailure":{
 "type":"structure",
 "members":{
  "ResourceArn":{
   "shape":"String",
   "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
  },

"ResourceType":{
   "shape":"ResourceType",
   "documentation":"<p>Resource type.</p>"
  },
  "ErrorMessage":{
   "shape":"String",
   "documentation":"<p>Error message.</p>"
  },
  "FailureTime":{
   "shape":"DateTime",
   "documentation":"<p>Failure time.</p>"
  },
  "OperationName":{
   "shape":"String",
   "documentation":"<p>Name of the operation.</p>"
  },
```

```
    "ResourceOwnerId":{
      "shape":"String",
      "documentation":"<p>ID of the Amazon Web Services account that owns the resource.</p>"
    },
    "OperationRequestedBy":{
      "shape":"String",
      "documentation":"<p>The requester is \"License Manager Automated Discovery\".</p>"
    },
    "MetadataList":{
      "shape":"MetadataList",
      "documentation":"<p>Reserved.</p>"
    }
  },
  "documentation":"<p>Describes the failure of a license operation.</p>"
},
"LicenseOperationFailureList":{
  "type":"list",
  "member":{"shape":"LicenseOperationFailure"}
},
"LicenseSpecification":{
  "type":"structure",
  "required":["LicenseConfigurationArn"],
  "members":{
    "LicenseConfigurationArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    },
    "AmiAssociationScope":{
      "shape":"String",
      "documentation":"<p>Scope of AMI associations. The possible value is <code>cross-account</code>.</p>"
    }
  },
  "documentation":"<p>Details for associating a license configuration with a resource.</p>"
},
"LicenseSpecifications":{
  "type":"list",
  "member":{"shape":"LicenseSpecification"}
},
"LicenseStatus":{
  "type":"string",
  "enum":[
    "AVAILABLE",
    "PENDING_AVAILABLE",
    "DEACTIVATED",
    "SUSPENDED",
    "EXPIRED",
    "PENDING_DELETE",
```

```
      "DELETED"
    ]
  },
  "LicenseUsage":{
    "type":"structure",
    "members":{
      "EntitlementUsages":{
        "shape":"EntitlementUsageList",
        "documentation":"<p>License entitlement usages.</p>"
      }
    },
    "documentation":"<p>Describes the entitlement usage associated with a license.</p>"
  },
  "LicenseUsageException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>You do not have enough licenses available to support a new resource launch.</p>",
    "exception":true
  },
  "ListAssociationsForLicenseConfigurationRequest":{
    "type":"structure",
    "required":["LicenseConfigurationArn"],
    "members":{
      "LicenseConfigurationArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of a license configuration.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>Maximum
number of results to return in a single call.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListAssociationsForLicenseConfigurationResponse":{
    "type":"structure",
    "members":{
      "LicenseConfigurationAssociations":{
        "shape":"LicenseConfigurationAssociations",
        "documentation":"<p>Information about the associations for the license configuration.</p>"
      },
      "NextToken":{
```

```
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListDistributedGrantsRequest":{
      "type":"structure",
      "members":{
        "GrantArns":{
          "shape":"ArnList",
          "documentation":"<p>Amazon Resource Names (ARNs) of the grants.</p>"
        },
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>Filters to scope the results.
 The following filters are supported:</p> <ul> <li> <p> <code>LicenseArn</code> </p> </li> <li> <p>
<code>GrantStatus</code> </p> </li> <li> <p> <code>GranteePrincipalARN</code> </p> </li> <li> <p>
<code>ProductSKU</code> </p> </li> <li> <p> <code>LicenseIssuerName</code> </p> </li> </ul>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "MaxResults":{
          "shape":"MaxSize100",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        }
      }
    },
    "ListDistributedGrantsResponse":{
      "type":"structure",
      "members":{
        "Grants":{
          "shape":"GrantList",
          "documentation":"<p>Distributed grant details.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListFailuresForLicenseConfigurationOperationsRequest":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
```

```
        "documentation":"<p>Amazon Resource Name of the license configuration.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListFailuresForLicenseConfigurationOperationsResponse":{
    "type":"structure",
    "members":{
      "LicenseOperationFailureList":{
        "shape":"LicenseOperationFailureList",
        "documentation":"<p>License configuration operations that failed.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }


  },
  "ListLicenseConfigurationsRequest":{
    "type":"structure",
    "members":{
      "LicenseConfigurationArns":{
        "shape":"StringList",
        "documentation":"<p>Amazon Resource Names (ARN) of the license configurations.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "Filters":{
        "shape":"Filters",
        "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p> <ul> <li> <p> <code>licenseCountingType</code> - The dimension for which licenses are counted.
Possible values are <code>vCPU</code> | <code>Instance</code> | <code>Core</code> | <code>Socket</code>.
Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li>
```

      <p> <code>enforceLicenseCount</code> - A Boolean value that indicates whether hard license enforcement is used. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p>   <p> <code>usagelimitExceeded</code> - A Boolean value that indicates whether the available licenses have been exceeded. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> "
       }
     }
   },
  "ListLicenseConfigurationsResponse":{
   "type":"structure",
   "members":{
    "LicenseConfigurations":{
     "shape":"LicenseConfigurations",
     "documentation":"<p>Information about the license configurations.</p>"
    },
    "NextToken":{
     "shape":"String",
     "documentation":"<p>Token for the next set of results.</p>"
    }
   }
  },
  "ListLicenseConversionTasksRequest":{
   "type":"structure",
   "members":{
    "NextToken":{
     "shape":"String",
     "documentation":"<p>Token
for the next set of results.</p>"
    },
    "MaxResults":{
     "shape":"BoxInteger",
     "documentation":"<p>Maximum number of results to return in a single call.</p>"
    },
    "Filters":{
     "shape":"Filters",
     "documentation":"<p> Filters to scope the results. Valid filters are <code>ResourceArns</code> and <code>Status</code>. </p>"
    }
   }
  },
  "ListLicenseConversionTasksResponse":{
   "type":"structure",
   "members":{
    "LicenseConversionTasks":{
     "shape":"LicenseConversionTasks",
     "documentation":"<p>Information about the license configuration tasks for your account.</p>"
    },
    "NextToken":{
     "shape":"String",

          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListLicenseManagerReportGeneratorsRequest":{
      "type":"structure",
      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>Filters
to scope the results. The following filters are supported: </p>   <p>
<code>LicenseConfigurationArn</code> </p> "
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "MaxResults":{
          "shape":"MaxSize100",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        }
      }
    },
    "ListLicenseManagerReportGeneratorsResponse":{
      "type":"structure",
      "members":{
        "ReportGenerators":{
          "shape":"ReportGeneratorList",
          "documentation":"<p>A report generator that creates periodic reports about your license configurations.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListLicenseSpecificationsForResourceRequest":{
      "type":"structure",
      "required":["ResourceArn"],
      "members":{
        "ResourceArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of a resource that has an associated license
configuration.</p>"
        },
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"

```
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
     }
    },
    "ListLicenseSpecificationsForResourceResponse":{
     "type":"structure",
     "members":{
      "LicenseSpecifications":{
       "shape":"LicenseSpecifications",
       "documentation":"<p>License configurations associated with a resource.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
     }
    },
    "ListLicenseVersionsRequest":{
     "type":"structure",

     "required":["LicenseArn"],
     "members":{
      "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
       "shape":"MaxSize100",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
     }
    },
    "ListLicenseVersionsResponse":{
     "type":"structure",
     "members":{
      "Licenses":{
       "shape":"LicenseList",
       "documentation":"<p>License details.</p>"
      },
      "NextToken":{
       "shape":"String",
```

```
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListLicensesRequest":{
    "type":"structure",
    "members":{
      "LicenseArns":{
        "shape":"ArnList",
        "documentation":"<p>Amazon Resource Names
 (ARNs) of the licenses.</p>"
      },
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>Beneficiary</code> </p> </li> <li> <p> <code>ProductSKU</code> </p> </li> <li> <p>
<code>Fingerprint</code> </p> </li> <li> <p> <code>Status</code> </p> </li> </ul>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListLicensesResponse":{
    "type":"structure",
    "members":{
      "Licenses":{
        "shape":"LicenseList",
        "documentation":"<p>License details.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListReceivedGrantsForOrganizationRequest":{
    "type":"structure",
    "required":["LicenseArn"],
    "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the received license.</p>"
```

```
    },
    "Filters":{
      "shape":"FilterList",
      "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>ParentArn</code> </p> </li> <li> <p> <code>GranteePrincipalArn</code> </p> </li> </ul>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    },
    "MaxResults":{
      "shape":"MaxSize100",
      "documentation":"<p>Maximum number of results to return in a single call.</p>"
    }
  }
},
"ListReceivedGrantsForOrganizationResponse":{
  "type":"structure",
  "members":{
    "Grants":{

 "shape":"GrantList",
      "documentation":"<p>Lists the grants the organization has received.</p>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    }
  }
},
"ListReceivedGrantsRequest":{
  "type":"structure",
  "members":{
    "GrantArns":{
      "shape":"ArnList",
      "documentation":"<p>Amazon Resource Names (ARNs) of the grants.</p>"
    },
    "Filters":{
      "shape":"FilterList",
      "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>ProductSKU</code> </p> </li> <li> <p> <code>LicenseIssuerName</code> </p> </li> <li> <p>
<code>LicenseArn</code> </p> </li> <li> <p> <code>GrantStatus</code> </p> </li> <li> <p>
<code>GranterAccountId</code> </p> </li> </ul>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
```

```
      },
      "MaxResults":{
       "shape":"MaxSize100",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
     }
    },
    "ListReceivedGrantsResponse":{
     "type":"structure",
     "members":{
      "Grants":{
       "shape":"GrantList",
       "documentation":"<p>Received grant details.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
     }
    },
    "ListReceivedLicensesForOrganizationRequest":{
     "type":"structure",
     "members":{
      "Filters":{
       "shape":"FilterList",
       "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>Beneficiary</code> </p> </li> <li> <p> <code>ProductSKU</code> </p> </li> </ul>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of
results.</p>"
      },
      "MaxResults":{
       "shape":"MaxSize100",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
     }
    },
    "ListReceivedLicensesForOrganizationResponse":{
     "type":"structure",
     "members":{
      "Licenses":{
       "shape":"GrantedLicenseList",
       "documentation":"<p>Lists the licenses the organization has received.</p>"
      },
      "NextToken":{
       "shape":"String",
```

```
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListReceivedLicensesRequest":{
   "type":"structure",
   "members":{
     "LicenseArns":{
      "shape":"ArnList",
      "documentation":"<p>Amazon Resource Names (ARNs) of the licenses.</p>"
     },
     "Filters":{
      "shape":"FilterList",
      "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>ProductSKU</code>
 </p> </li> <li> <p> <code>Status</code> </p> </li> <li> <p> <code>Fingerprint</code> </p> </li> <li> <p>
<code>IssuerName</code> </p> </li> <li> <p> <code>Beneficiary</code> </p> </li> </ul>"
     },
     "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
     },
     "MaxResults":{
      "shape":"MaxSize100",
      "documentation":"<p>Maximum number of results to return in a single call.</p>"
     }
    }
  },
  "ListReceivedLicensesResponse":{
   "type":"structure",
   "members":{
     "Licenses":{
      "shape":"GrantedLicenseList",
      "documentation":"<p>Received license details.</p>"
     },
     "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
     }
    }
  },
  "ListResourceInventoryRequest":{
   "type":"structure",
   "members":{
     "MaxResults":{
      "shape":"BoxInteger",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
     },
```

```
    "NextToken":{
     "shape":"String",
     "documentation":"<p>Token for the next set of results.</p>"
    },
    "Filters":{
     "shape":"InventoryFilterList",
     "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p> <ul> <li> <p> <code>account_id</code> - The ID of the Amazon Web Services account that owns
the resource. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li> <p>
<code>application_name</code> - The name of the application. Logical operators are <code>EQUALS</code> |
<code>BEGINS_WITH</code>.</p> </li> <li> <p> <code>license_included</code> - The type of license
included. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>. Possible values are
<code>sql-server-enterprise</code> | <code>sql-server-standard</code> | <code>sql-server-web</code>
 | <code>windows-server-datacenter</code>.</p> </li> <li> <p> <code>platform</code> - The platform of the
resource. Logical operators are <code>EQUALS</code> | <code>BEGINS_WITH</code>.</p> </li> <li> <p>
<code>resource_id</code> - The ID of the resource. Logical operators are <code>EQUALS</code> |
<code>NOT_EQUALS</code>.</p> </li> <li> <p> <code>tag:&lt;key&gt;</code> - The key/value combination of
a tag assigned to the resource. Logical operators are <code>EQUALS</code> (single account) or
<code>EQUALS</code> | <code>NOT_EQUALS</code> (cross account).</p> </li> </ul>"
    }
   }
  },
  "ListResourceInventoryResponse":{
   "type":"structure",
   "members":{
    "ResourceInventoryList":{
     "shape":"ResourceInventoryList",
     "documentation":"<p>Information about the resources.</p>"
    },
    "NextToken":{
     "shape":"String",
     "documentation":"<p>Token for the next set of results.</p>"
    }
   }
  },
  "ListTagsForResourceRequest":{
   "type":"structure",
   "required":["ResourceArn"],
   "members":{
    "ResourceArn":{
     "shape":"String",
     "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    }
   }
  },
  "ListTagsForResourceResponse":{
   "type":"structure",
   "members":{
```

```
      "Tags":{
        "shape":"TagList",
        "documentation":"<p>Information about the tags.</p>"
      }
    }
  },
  "ListTokensRequest":{
    "type":"structure",
    "members":{
      "TokenIds":{
        "shape":"StringList",
        "documentation":"<p>Token IDs.</p>"
      },
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>Filters to scope the results. The following filter is supported:</p> <ul> <li> <p>
<code>LicenseArns</code> </p> </li> </ul>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of
results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListTokensResponse":{
    "type":"structure",
    "members":{
      "Tokens":{
        "shape":"TokenList",
        "documentation":"<p>Received token details.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListUsageForLicenseConfigurationRequest":{
    "type":"structure",
    "required":["LicenseConfigurationArn"],
    "members":{
      "LicenseConfigurationArn":{
        "shape":"String",
```

```
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },

  "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "Filters":{
        "shape":"Filters",
        "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p> <ul> <li> <p> <code>resourceArn</code> - The ARN of the license configuration resource. Logical
operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li> <p>
<code>resourceType</code> - The resource type (<code>EC2_INSTANCE</code> | <code>EC2_HOST</code> |
<code>EC2_AMI</code> | <code>SYSTEMS_MANAGER_MANAGED_INSTANCE</code>). Logical operators
are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li> <p> <code>resourceAccount</code>
- The ID of the account that owns the resource. Logical operators are <code>EQUALS</code> |
<code>NOT_EQUALS</code>.</p> </li> </ul>"
      }
    }
  },
  "ListUsageForLicenseConfigurationResponse":{
    "type":"structure",
    "members":{
      "LicenseConfigurationUsageList":{
        "shape":"LicenseConfigurationUsageList",
        "documentation":"<p>Information about the license configurations.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "Location":{"type":"string"},
  "Long":{"type":"long"},
  "ManagedResourceSummary":{
    "type":"structure",
    "members":{
      "ResourceType":{
        "shape":"ResourceType",
        "documentation":"<p>Type of resource associated with a license.</p>"
      },
      "AssociationCount":{
        "shape":"BoxLong",
```

```
          "documentation":"<p>Number of resources associated with licenses.</p>"
      }
    },
    "documentation":"<p>Summary information about a managed resource.</p>"
  },
  "ManagedResourceSummaryList":{
    "type":"list",
    "member":{"shape":"ManagedResourceSummary"}
  },
  "MaxSize100":{
    "type":"integer",
    "max":100,
    "min":1
  },
  "MaxSize3StringList":{
    "type":"list",
    "member":{"shape":"String"},
    "max":3
  },
  "Message":{"type":"string"},
  "Metadata":{
    "type":"structure",
    "members":{
      "Name":{
        "shape":"String",
        "documentation":"<p>The key name.</p>"
      },
      "Value":{
        "shape":"String",
        "documentation":"<p>The value.</p>"
      }
    },
    "documentation":"<p>Describes key/value pairs.</p>"
  },
  "MetadataList":{
    "type":"list",
    "member":{"shape":"Metadata"}
  },
  "NoEntitlementsAllowedException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>There are no entitlements found for this license, or the entitlement maximum count is
reached.</p>",
    "exception":true
  },
  "Options":{
```

```
      "type":"structure",
      "members":{
       "ActivationOverrideBehavior":{
         "shape":"ActivationOverrideBehavior",
         "documentation":"<p>An activation option for your grant that determines the behavior of activating a grant.
Activation options can only be used with granted licenses sourced from the Amazon Web Services Marketplace.
Additionally, the operation must specify the value of <code>ACTIVE</code> for the <code>Status</code>
parameter.</p> <ul> <li> <p>As a license administrator, you can optionally specify an
<code>ActivationOverrideBehavior</code> when activating a grant.</p> </li> <li> <p>As a grantor, you can
optionally specify an <code>ActivationOverrideBehavior</code> when you activate a grant for a grantee account in
your organization.</p> </li> <li> <p>As a grantee, if the grantor creating the distributed grant doesnt specify an
<code>ActivationOverrideBehavior</code>, you can optionally specify one when you are activating the grant.</p>
</li> </ul> <dl> <dt>DISTRIBUTED_GRANTS_ONLY</dt> <dd> <p>Use this value to activate
 a grant without replacing any member accounts active grants for the same product.</p> </dd>
<dt>ALL_GRANTS_PERMITTED_BY_ISSUER</dt> <dd> <p>Use this value to activate a grant and disable
other active grants in any member accounts for the same product. This action will also replace their previously
activated grants with this activated grant.</p> </dd> </dl>"
       }
      },
      "documentation":"<p>The options you can specify when you create a new version of a grant, such as activation
override behavior. For more information, see <a href=\"https://docs.aws.amazon.com/license-
manager/latest/userguide/granted-licenses.html\">Granted licenses in License Manager</a> in the <i>License
Manager User Guide</i>.</p>"
     },
     "OrganizationConfiguration":{
      "type":"structure",
      "required":["EnableIntegration"],
      "members":{
       "EnableIntegration":{
         "shape":"Boolean",
         "documentation":"<p>Enables Organizations integration.</p>"
       }
      },

      "documentation":"<p>Configuration information for Organizations.</p>"
     },
     "PrincipalArnList":{
      "type":"list",
      "member":{"shape":"Arn"},
      "max":1,
      "min":1
     },
     "ProductInformation":{
      "type":"structure",
      "required":[
       "ResourceType",
       "ProductInformationFilterList"
      ],
```

```
"members":{
 "ResourceType":{
  "shape":"String",
  "documentation":"<p>Resource type. The possible values are <code>SSM_MANAGED</code> |
<code>RDS</code>.</p>"
  },
 "ProductInformationFilterList":{
  "shape":"ProductInformationFilterList",
  "documentation":"<p>A Product information filter consists of a
<code>ProductInformationFilterComparator</code> which is a logical operator, a
<code>ProductInformationFilterName</code> which specifies the type of filter being declared, and a
<code>ProductInformationFilterValue</code> that specifies the value to filter on. </p> <p>Accepted values for
<code>ProductInformationFilterName</code>
 are listed here along with descriptions and valid options for <code>ProductInformationFilterComparator</code>.
</p> <p>The following filters and are supported when the resource type is <code>SSM_MANAGED</code>:</p>
<ul> <li> <p> <code>Application Name</code> - The name of the application. Logical operator is
<code>EQUALS</code>.</p> </li> <li> <p> <code>Application Publisher</code> - The publisher of the
application. Logical operator is <code>EQUALS</code>.</p> </li> <li> <p> <code>Application Version</code> -
The version of the application. Logical operator is <code>EQUALS</code>.</p> </li> <li> <p> <code>Platform
Name</code> - The name of the platform. Logical operator is <code>EQUALS</code>.</p> </li> <li> <p>
<code>Platform Type</code> - The platform type. Logical operator is <code>EQUALS</code>.</p> </li> <li>
<p> <code>Tag:key</code> - The key of a tag attached to an Amazon Web Services resource you wish to exclude
from automated discovery. Logical
 operator is <code>NOT_EQUALS</code>. The key for your tag must be appended to <code>Tag:</code>
following the example: <code>Tag:name-of-your-key</code>. <code>ProductInformationFilterValue</code> is
optional if you are not using values for the key. </p> </li> <li> <p> <code>AccountId</code> - The 12-digit ID of
an Amazon Web Services account you wish to exclude from automated discovery. Logical operator is
<code>NOT_EQUALS</code>.</p> </li> <li> <p> <code>License Included</code> - The type of license
included. Logical operators are <code>EQUALS</code> and <code>NOT_EQUALS</code>. Possible values are:
<code>sql-server-enterprise</code> | <code>sql-server-standard</code> | <code>sql-server-web</code> |
<code>windows-server-datacenter</code>.</p> </li> </ul> <p>The following filters and logical operators are
supported when the resource type is <code>RDS</code>:</p> <ul> <li> <p> <code>Engine Edition</code> - The
edition of the database engine. Logical operator is <code>EQUALS</code>. Possible
 values are: <code>oracle-ee</code> | <code>oracle-se</code> | <code>oracle-se1</code> | <code>oracle-
se2</code>.</p> </li> <li> <p> <code>License Pack</code> - The license pack. Logical operator is
<code>EQUALS</code>. Possible values are: <code>data guard</code> | <code>diagnostic pack sqlt</code> |
<code>tuning pack sqlt</code> | <code>ols</code> | <code>olap</code>.</p> </li> </ul>"
  }
 },
 "documentation":"<p>Describes product information for a license configuration.</p>"
 },
 "ProductInformationFilter":{
  "type":"structure",
  "required":[
   "ProductInformationFilterName",
   "ProductInformationFilterComparator"
  ],
  "members":{
```

```
    "ProductInformationFilterName":{
      "shape":"String",
      "documentation":"<p>Filter name.</p>"
    },
    "ProductInformationFilterValue":{
      "shape":"StringList",
      "documentation":"<p>Filter value.</p>"
    },
    "ProductInformationFilterComparator":{
      "shape":"String",
      "documentation":"<p>Logical operator.</p>"
    }
  },
  "documentation":"<p>Describes product information filters.</p>"
},
"ProductInformationFilterList":{
  "type":"list",
  "member":{"shape":"ProductInformationFilter"}
},
"ProductInformationList":{
  "type":"list",
  "member":{"shape":"ProductInformation"}
},
"ProvisionalConfiguration":{
  "type":"structure",
  "required":["MaxTimeToLiveInMinutes"],
  "members":{
    "MaxTimeToLiveInMinutes":{
      "shape":"BoxInteger",
      "documentation":"<p>Maximum time for the provisional configuration, in minutes.</p>"
    }
  },
  "documentation":"<p>Details about a provisional configuration.</p>"
},
"RateLimitExceededException":{
  "type":"structure",
  "members":{
    "Message":{"shape":"Message"}
  },
  "documentation":"<p>Too many requests have been submitted. Try again after
a brief wait.</p>",
  "exception":true
},
"ReceivedMetadata":{
  "type":"structure",
  "members":{
    "ReceivedStatus":{
      "shape":"ReceivedStatus",
```

```
      "documentation":"<p>Received status.</p>"
     },
    "ReceivedStatusReason":{
      "shape":"StatusReasonMessage",
      "documentation":"<p>Received status reason.</p>"
     },
    "AllowedOperations":{
      "shape":"AllowedOperationList",
      "documentation":"<p>Allowed operations.</p>"
     }
    },
   "documentation":"<p>Metadata associated with received licenses and grants.</p>"
  },
  "ReceivedStatus":{
   "type":"string",
   "enum":[
     "PENDING_WORKFLOW",
     "PENDING_ACCEPT",
     "REJECTED",
     "ACTIVE",
     "FAILED_WORKFLOW",
     "DELETED",
     "DISABLED",
     "WORKFLOW_COMPLETED"
    ]
  },
  "RedirectException":{
   "type":"structure",
   "members":{
     "Location":{"shape":"Location"},
     "Message":{"shape":"Message"}
    },
   "documentation":"<p>This is not the correct Region for the resource. Try again.</p>",
   "exception":true
  },
  "RejectGrantRequest":{
   "type":"structure",
   "required":["GrantArn"],
   "members":{
     "GrantArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
     }
    }
  },
  "RejectGrantResponse":{
   "type":"structure",
   "members":{
```

```
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Grant ARN.</p>"
        },
        "Status":{
          "shape":"GrantStatus",
          "documentation":"<p>Grant status.</p>"
        },
        "Version":{
          "shape":"String",
          "documentation":"<p>Grant version.</p>"
        }
      }
    },
    "RenewType":{
      "type":"string",
      "enum":[
        "None",
        "Weekly",
        "Monthly"
      ]
    },
    "ReportContext":{
      "type":"structure",
      "required":["licenseConfigurationArns"],
      "members":{
        "licenseConfigurationArns":{
          "shape":"ArnList",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration that this generator reports
on.</p>"
        }
      },
      "documentation":"<p>Details of the license configuration that this generator reports on.</p>"
    },
    "ReportFrequency":{
      "type":"structure",
      "members":{
        "value":{
          "shape":"Integer",
          "documentation":"<p>Number of times within the frequency period that a report is generated. The only
supported value is <code>1</code>.</p>"
        },
        "period":{
          "shape":"ReportFrequencyType",
          "documentation":"<p>Time period between each report. The period can be daily, weekly, or monthly.</p>"
        }
      },
      "documentation":"<p>Details about how frequently reports are generated.</p>"
```

```
    },
  "ReportFrequencyType":{
   "type":"string",
   "enum":[
     "DAY",
     "WEEK",
     "MONTH"
   ]
  },
  "ReportGenerator":{
   "type":"structure",
   "members":{
     "ReportGeneratorName":{
      "shape":"String",
      "documentation":"<p>Name of the report generator.</p>"
     },
     "ReportType":{
      "shape":"ReportTypeList",
      "documentation":"<p>Type of reports that are generated.</p>"
     },
     "ReportContext":{
      "shape":"ReportContext",
      "documentation":"<p>License configuration type for this generator.</p>"
     },
     "ReportFrequency":{
      "shape":"ReportFrequency",
      "documentation":"<p>Details about how frequently reports are generated.</p>"
     },
     "LicenseManagerReportGeneratorArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the report generator.</p>"
     },
     "LastRunStatus":{
      "shape":"String",
      "documentation":"<p>Status of the
last report generation attempt.</p>"
     },
     "LastRunFailureReason":{
      "shape":"String",
      "documentation":"<p>Failure message for the last report generation attempt.</p>"
     },
     "LastReportGenerationTime":{
      "shape":"String",
      "documentation":"<p>Time the last report was generated at.</p>"
     },
     "ReportCreatorAccount":{
      "shape":"String",
      "documentation":"<p>The Amazon Web Services account ID used to create the report generator.</p>"
```

        },
        "Description":{
          "shape":"String",
          "documentation":"<p>Description of the report generator.</p>"
        },
        "S3Location":{
          "shape":"S3Location",
          "documentation":"<p>Details of the S3 bucket that report generator reports are published to.</p>"
        },
        "CreateTime":{
          "shape":"String",
          "documentation":"<p>Time the report was created.</p>"
        },
        "Tags":{

      "shape":"TagList",
          "documentation":"<p>Tags associated with the report generator.</p>"
        }
      },
      "documentation":"<p>Describe the details of a report generator.</p>"
    },
    "ReportGeneratorList":{
      "type":"list",
      "member":{"shape":"ReportGenerator"}
    },
    "ReportGeneratorName":{
      "type":"string",
      "max":100,
      "min":1
    },
    "ReportType":{
      "type":"string",
      "enum":[
        "LicenseConfigurationSummaryReport",
        "LicenseConfigurationUsageReport"
      ]
    },
    "ReportTypeList":{
      "type":"list",
      "member":{"shape":"ReportType"}
    },
    "ResourceInventory":{
      "type":"structure",
      "members":{
        "ResourceId":{
          "shape":"String",
          "documentation":"<p>ID of the resource.</p>"
        },

```
      "ResourceType":{
        "shape":"ResourceType",
        "documentation":"<p>Type of resource.</p>"
      },
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
      },
      "Platform":{
        "shape":"String",
        "documentation":"<p>Platform of the resource.</p>"
      },
      "PlatformVersion":{
        "shape":"String",
        "documentation":"<p>Platform version of the resource in the inventory.</p>"
      },
      "ResourceOwningAccountId":{
        "shape":"String",
        "documentation":"<p>ID of the account that owns the resource.</p>"
      }
    },
    "documentation":"<p>Details about a resource.</p>"
  },
  "ResourceInventoryList":{
    "type":"list",
    "member":{"shape":"ResourceInventory"}
  },
  "ResourceLimitExceededException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>Your resource limits have been exceeded.</p>",
    "exception":true
  },
  "ResourceNotFoundException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>The resource cannot be found.</p>",
    "exception":true
  },
  "ResourceType":{
    "type":"string",
    "enum":[
      "EC2_INSTANCE",
      "EC2_HOST",
```

```
    "EC2_AMI",
    "RDS",
    "SYSTEMS_MANAGER_MANAGED_INSTANCE"
  ]
},
"S3Location":{
 "type":"structure",
 "members":{
   "bucket":{
     "shape":"String",
     "documentation":"<p>Name of the S3 bucket reports are published to.</p>"
   },
   "keyPrefix":{
     "shape":"String",
     "documentation":"<p>Prefix of the S3 bucket reports are published to.</p>"
   }
 },
 "documentation":"<p>Details of the S3 bucket that report generator reports are published to.</p>"
},
"ServerInternalException":{
 "type":"structure",
 "members":{
   "Message":{"shape":"Message"}
 },
 "documentation":"<p>The server experienced an internal error. Try again.</p>",
  "exception":true,
 "fault":true
},
"SignedToken":{
 "type":"string",
 "min":4096
},
"StatusReasonMessage":{
 "type":"string",
 "max":400,
 "pattern":"[\\s\\S]+"
},
"String":{"type":"string"},
"StringList":{
 "type":"list",
 "member":{"shape":"String"}
},
"Tag":{
 "type":"structure",
 "members":{
   "Key":{
     "shape":"String",
     "documentation":"<p>Tag key.</p>"
```

        },
        "Value":{
          "shape":"String",
          "documentation":"<p>Tag value.</p>"
        }
      },
      "documentation":"<p>Details about a tag for a license configuration.</p>"
    },
    "TagKeyList":{
      "type":"list",
      "member":{"shape":"String"}
    },
    "TagList":{
      "type":"list",
      "member":{"shape":"Tag"}
    },
    "TagResourceRequest":{
      "type":"structure",
      "required":[
        "ResourceArn",
        "Tags"
      ],
      "members":{
        "ResourceArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        },
        "Tags":{
          "shape":"TagList",
          "documentation":"<p>One or more tags.</p>"
        }
      }
    },
    "TagResourceResponse":{
      "type":"structure",
      "members":{
      }
    },
    "TokenData":{
      "type":"structure",
      "members":{
        "TokenId":{
          "shape":"String",
          "documentation":"<p>Token ID.</p>"
        },
        "TokenType":{
          "shape":"String",
          "documentation":"<p>Type of token generated. The supported value is

```
<code>REFRESH_TOKEN</code>.</p>"
    },
    "LicenseArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
    },
    "ExpirationTime":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>Token expiration time, in ISO8601-UTC format.</p>"
    },
    "TokenProperties":{
      "shape":"MaxSize3StringList",
      "documentation":"<p>Data specified by the caller.</p>"
    },
    "RoleArns":{
      "shape":"ArnList",
      "documentation":"<p>Amazon Resource Names (ARN) of the roles included in the token.</p>"
    },
    "Status":{
      "shape":"String",
      "documentation":"<p>Token status. The possible values are <code>AVAILABLE</code> and
<code>DELETED</code>.</p>"
    }
    },
    "documentation":"<p>Describes a token.</p>"
  },
  "TokenList":{
   "type":"list",
   "member":{"shape":"TokenData"}
  },
  "TokenString":{
   "type":"string",
   "max":4096,
   "pattern":"\\S+"
  },
  "TokenType":{
   "type":"string",
   "enum":["REFRESH_TOKEN"]
  },
  "UnsupportedDigitalSignatureMethodException":{
   "type":"structure",
   "members":{
     "Message":{"shape":"Message"}
   },
   "documentation":"<p>The digital signature method is unsupported.
Try your request again.</p>",
   "exception":true
  },
```

```
   "UntagResourceRequest":{
    "type":"structure",
    "required":[
      "ResourceArn",
      "TagKeys"
    ],
    "members":{
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      },
      "TagKeys":{
        "shape":"TagKeyList",
        "documentation":"<p>Keys identifying the tags to remove.</p>"
      }
    }
  },
  "UntagResourceResponse":{
    "type":"structure",
    "members":{
    }
  },
  "UpdateLicenseConfigurationRequest":{
    "type":"structure",
    "required":["LicenseConfigurationArn"],
    "members":{
      "LicenseConfigurationArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      },
      "LicenseConfigurationStatus":{
        "shape":"LicenseConfigurationStatus",
        "documentation":"<p>New
status of the license configuration.</p>"
      },
      "LicenseRules":{
        "shape":"StringList",
        "documentation":"<p>New license rule. The only rule that you can add after you create a license configuration
is licenseAffinityToHost.</p>"
      },
      "LicenseCount":{
        "shape":"BoxLong",
        "documentation":"<p>New number of licenses managed by the license configuration.</p>"
      },
      "LicenseCountHardLimit":{
        "shape":"BoxBoolean",
        "documentation":"<p>New hard limit of the number of available licenses.</p>"
      },
```

```
      "Name":{
        "shape":"String",
        "documentation":"<p>New name of the license configuration.</p>"
      },
      "Description":{
        "shape":"String",
        "documentation":"<p>New description of the license configuration.</p>"
      },
      "ProductInformationList":{
        "shape":"ProductInformationList",
        "documentation":"<p>New
product information.</p>"
      },
      "DisassociateWhenNotFound":{
        "shape":"BoxBoolean",
        "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
      }
    }
  },
  "UpdateLicenseConfigurationResponse":{
    "type":"structure",
    "members":{
    }
  },
  "UpdateLicenseManagerReportGeneratorRequest":{
    "type":"structure",
    "required":[
      "LicenseManagerReportGeneratorArn",
      "ReportGeneratorName",
      "Type",
      "ReportContext",
      "ReportFrequency",
      "ClientToken"
    ],
    "members":{
      "LicenseManagerReportGeneratorArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the report generator to update.</p>"
      },
      "ReportGeneratorName":{
        "shape":"ReportGeneratorName",
        "documentation":"<p>Name of the report generator.</p>"
      },
      "Type":{
        "shape":"ReportTypeList",
        "documentation":"<p>Type of reports to generate. The following report types are supported:</p> <ul> <li>
<p>License configuration report - Reports the number and details of consumed licenses for a license
configuration.</p> </li> <li> <p>Resource report - Reports the tracked licenses and resource consumption for a
```

license configuration.</p> "
        },
        "ReportContext":{
          "shape":"ReportContext",
          "documentation":"<p>The report context.</p>"
        },
        "ReportFrequency":{
          "shape":"ReportFrequency",
          "documentation":"<p>Frequency by which reports are generated.</p>"
        },
        "ClientToken":{
          "shape":"ClientRequestToken",
          "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the request.</p>"
        },
        "Description":{
          "shape":"String",
          "documentation":"<p>Description of the report generator.</p>"

      }
     }
    },
    "UpdateLicenseManagerReportGeneratorResponse":{
      "type":"structure",
      "members":{
      }
    },
    "UpdateLicenseSpecificationsForResourceRequest":{
      "type":"structure",
      "required":["ResourceArn"],
      "members":{
        "ResourceArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the Amazon Web Services resource.</p>"
        },
        "AddLicenseSpecifications":{
          "shape":"LicenseSpecifications",
          "documentation":"<p>ARNs of the license configurations to add.</p>"
        },
        "RemoveLicenseSpecifications":{
          "shape":"LicenseSpecifications",
          "documentation":"<p>ARNs of the license configurations to remove.</p>"
        }
      }
    },
    "UpdateLicenseSpecificationsForResourceResponse":{
      "type":"structure",
      "members":{

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      }
    },
    "UpdateServiceSettingsRequest":{
     "type":"structure",
     "members":{
      "S3BucketArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the Amazon S3 bucket where the License Manager
information is stored.</p>"
      },
      "SnsTopicArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the Amazon SNS topic used for License Manager
alerts.</p>"
      },
      "OrganizationConfiguration":{
        "shape":"OrganizationConfiguration",
        "documentation":"<p>Enables integration with Organizations for cross-account discovery.</p>"
      },
      "EnableCrossAccountsDiscovery":{
        "shape":"BoxBoolean",
        "documentation":"<p>Activates cross-account discovery.</p>"
      }
     }
    },
    "UpdateServiceSettingsResponse":{
     "type":"structure",
     "members":{
     }
    },
    "UsageOperation":{
     "type":"string",
     "max":50
    },
    "ValidationException":{
     "type":"structure",
     "members":{
      "Message":{"shape":"Message"}
     },
     "documentation":"<p>The provided input is not valid. Try your request again.</p>",
     "exception":true
    }
  },
  "documentation":"<p>License Manager makes it easier to manage licenses from software vendors across multiple
Amazon Web Services accounts and on-premises servers.</p>"
}
{
   "testCases": [
```

```
        {
          "documentation": "For region us-east-1 with FIPS enabled and DualStack enabled",
          "expect": {
            "endpoint": {
              "url": "https://license-manager-user-subscriptions-fips.us-east-1.api.aws"
            }
          },
          "params": {
            "Region": "us-east-1",
            "UseFIPS": true,
            "UseDualStack": true
          }
        },
        {
          "documentation": "For region us-east-1 with FIPS enabled and DualStack disabled",
          "expect": {
            "endpoint": {
              "url": "https://license-manager-user-subscriptions-fips.us-east-1.amazonaws.com"
            }
          },
          "params": {
            "Region": "us-east-1",
            "UseFIPS": true,
            "UseDualStack": false
          }
        },
        {
          "documentation": "For region us-east-1 with FIPS disabled and DualStack
enabled",
          "expect": {
            "endpoint": {
              "url": "https://license-manager-user-subscriptions.us-east-1.api.aws"
            }
          },
          "params": {
            "Region": "us-east-1",
            "UseFIPS": false,
            "UseDualStack": true
          }
        },
        {
          "documentation": "For region us-east-1 with FIPS disabled and DualStack disabled",
          "expect": {
            "endpoint": {
              "url": "https://license-manager-user-subscriptions.us-east-1.amazonaws.com"
            }
          },
          "params": {
```

```
          "Region": "us-east-1",
          "UseFIPS": false,
          "UseDualStack": false
        }
      },
      {
        "documentation": "For region cn-north-1 with FIPS enabled and DualStack enabled",
        "expect": {
          "endpoint": {
            "url": "https://license-manager-user-subscriptions-fips.cn-north-1.api.amazonwebservices.com.cn"
          }
        },
        "params": {
          "Region": "cn-north-1",
          "UseFIPS": true,
          "UseDualStack": true
        }
      },
      {
        "documentation": "For region cn-north-1 with FIPS enabled and DualStack disabled",
        "expect": {
          "endpoint": {
            "url": "https://license-manager-user-subscriptions-fips.cn-north-1.amazonaws.com.cn"
          }
        },
        "params": {
          "Region": "cn-north-1",
          "UseFIPS": true,
          "UseDualStack": false
        }
      },
      {
        "documentation": "For region cn-north-1 with FIPS disabled and DualStack enabled",
        "expect": {
          "endpoint": {
            "url": "https://license-manager-user-subscriptions.cn-north-1.api.amazonwebservices.com.cn"

          }
        },
        "params": {
          "Region": "cn-north-1",
          "UseFIPS": false,
          "UseDualStack": true
        }
      },
      {
        "documentation": "For region cn-north-1 with FIPS disabled and DualStack disabled",
        "expect": {
```

```
      "endpoint": {
        "url": "https://license-manager-user-subscriptions.cn-north-1.amazonaws.com.cn"
      }
    },
    "params": {
      "Region": "cn-north-1",
      "UseFIPS": false,
      "UseDualStack": false
    }
  },
  {
    "documentation": "For region us-gov-east-1 with FIPS enabled and DualStack enabled",
    "expect": {
      "endpoint": {
        "url": "https://license-manager-user-subscriptions-fips.us-gov-east-1.api.aws"
      }
    },
    "params": {
      "Region": "us-gov-east-1",
      "UseFIPS": true,
      "UseDualStack": true
    }
  },
  {
    "documentation": "For region us-gov-east-1 with FIPS enabled and DualStack disabled",
    "expect": {
      "endpoint": {
        "url": "https://license-manager-user-subscriptions-fips.us-gov-east-1.amazonaws.com"
      }
    },
    "params": {
      "Region": "us-gov-east-1",
      "UseFIPS": true,
      "UseDualStack": false
    }
  },
  {
    "documentation": "For region us-gov-east-1 with FIPS disabled and DualStack enabled",
    "expect": {
      "endpoint": {
        "url": "https://license-manager-user-subscriptions.us-gov-east-1.api.aws"
      }
    },
    "params": {
      "Region": "us-gov-east-1",
      "UseFIPS": false,
      "UseDualStack": true
```

```
      }
    },
    {
      "documentation": "For region us-gov-east-1 with FIPS disabled and DualStack disabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-user-subscriptions.us-gov-east-1.amazonaws.com"
        }
      },
      "params": {
        "Region": "us-gov-east-1",
        "UseFIPS": false,
        "UseDualStack": false
      }
    },
    {
      "documentation": "For region us-iso-east-1 with FIPS enabled and DualStack enabled",
      "expect": {
        "error": "FIPS and DualStack are enabled, but this partition does not support one or both"
      },
      "params": {
        "Region": "us-iso-east-1",
        "UseFIPS": true,
        "UseDualStack": true
      }
    },
    {
      "documentation": "For region us-iso-east-1 with FIPS enabled and DualStack disabled",

      "expect": {
        "endpoint": {
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        "UseDualStack": false
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AWS Signature Version 4 Test Suite

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{
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 "metadata":{
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  "protocols":["rest-json"],
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  "serviceId":"License Manager User Subscriptions",
  "signatureVersion":"v4",
  "signingName":"license-manager-user-subscriptions",
  "uid":"license-manager-user-subscriptions-2018-05-10",
  "auth":["aws.auth#sigv4"]
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    "requestUri":"/user/AssociateUser",
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    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
     {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>Associates the user to an EC2 instance to utilize user-based subscriptions.</p> <note>
<p>Your estimated bill for charges on the number of users and related costs will take 48 hours to appear for billing
periods that haven't closed (marked as <b>Pending</b> billing status) in Amazon Web Services Billing. For more
information, see <a href=\"https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/invoice.html\">Viewing
your monthly charges</a> in the <i>Amazon Web Services Billing User Guide</i>.</p> </note>",
   "idempotent":true
  },
  "CreateLicenseServerEndpoint":{
   "name":"CreateLicenseServerEndpoint",
   "http":{
    "method":"POST",
    "requestUri":"/license-server/CreateLicenseServerEndpoint",
    "responseCode":200
   },
   "input":{"shape":"CreateLicenseServerEndpointRequest"},
   "output":{"shape":"CreateLicenseServerEndpointResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
```

```
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>Creates a network endpoint for the Remote Desktop Services (RDS) license server.</p>",
   "idempotent":true
  },
  "DeleteLicenseServerEndpoint":{
   "name":"DeleteLicenseServerEndpoint",
   "http":{
    "method":"POST",
    "requestUri":"/license-server/DeleteLicenseServerEndpoint",
    "responseCode":200
   },
   "input":{"shape":"DeleteLicenseServerEndpointRequest"},
   "output":{"shape":"DeleteLicenseServerEndpointResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>Deletes a <code>LicenseServerEndpoint</code> resource.</p>",
   "idempotent":true
  },
  "DeregisterIdentityProvider":{
   "name":"DeregisterIdentityProvider",
   "http":{
    "method":"POST",
    "requestUri":"/identity-provider/DeregisterIdentityProvider",
    "responseCode":200
   },
   "input":{"shape":"DeregisterIdentityProviderRequest"},
   "output":{"shape":"DeregisterIdentityProviderResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
```

```
      ],
      "documentation":"<p>Deregisters the Active Directory identity provider from License Manager user-based
subscriptions.</p>",
      "idempotent":true
    },
    "DisassociateUser":{
      "name":"DisassociateUser",
      "http":{
        "method":"POST",
        "requestUri":"/user/DisassociateUser",
        "responseCode":200
      },
      "input":{"shape":"DisassociateUserRequest"},
      "output":{"shape":"DisassociateUserResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Disassociates the user from an EC2 instance providing user-based subscriptions.</p>",
      "idempotent":true
    },
    "ListIdentityProviders":{
      "name":"ListIdentityProviders",

      "http":{
        "method":"POST",
        "requestUri":"/identity-provider/ListIdentityProviders",
        "responseCode":200
      },
      "input":{"shape":"ListIdentityProvidersRequest"},
      "output":{"shape":"ListIdentityProvidersResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Lists the Active Directory identity providers for user-based subscriptions.</p>"
    },
    "ListInstances":{
```

```
  "name":"ListInstances",
  "http":{
    "method":"POST",
    "requestUri":"/instance/ListInstances",
    "responseCode":200
  },
  "input":{"shape":"ListInstancesRequest"},
  "output":{"shape":"ListInstancesResponse"},
  "errors":[
    {"shape":"ServiceQuotaExceededException"},
     {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
  ],
  "documentation":"<p>Lists the EC2 instances providing user-based subscriptions.</p>"
},
"ListLicenseServerEndpoints":{
  "name":"ListLicenseServerEndpoints",
  "http":{
    "method":"POST",
    "requestUri":"/license-server/ListLicenseServerEndpoints",
    "responseCode":200
  },
  "input":{"shape":"ListLicenseServerEndpointsRequest"},
  "output":{"shape":"ListLicenseServerEndpointsResponse"},
  "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"AccessDeniedException"}
  ],
  "documentation":"<p>List the Remote Desktop Services (RDS) License Server endpoints </p>"
},
"ListProductSubscriptions":{
  "name":"ListProductSubscriptions",
  "http":{
    "method":"POST",
    "requestUri":"/user/ListProductSubscriptions",
    "responseCode":200
  },
  "input":{"shape":"ListProductSubscriptionsRequest"},
  "output":{"shape":"ListProductSubscriptionsResponse"},
  "errors":[
```

        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Lists the user-based subscription products available from an identity provider.</p>"
    },
    "ListTagsForResource":{
      "name":"ListTagsForResource",
      "http":{
        "method":"GET",
        "requestUri":"/tags/{ResourceArn}",
        "responseCode":200
      },
      "input":{"shape":"ListTagsForResourceRequest"},
      "output":{"shape":"ListTagsForResourceResponse"},
      "errors":[
        {"shape":"ValidationException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"}
      ],
      "documentation":"<p>Returns the list of tags for the specified resource.</p>"
    },
    "ListUserAssociations":{
      "name":"ListUserAssociations",
      "http":{
        "method":"POST",
        "requestUri":"/user/ListUserAssociations",
        "responseCode":200
      },
      "input":{"shape":"ListUserAssociationsRequest"},
      "output":{"shape":"ListUserAssociationsResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Lists user associations for an identity provider.</p>"
    },
    "RegisterIdentityProvider":{
      "name":"RegisterIdentityProvider",

```
    "http":{
      "method":"POST",
      "requestUri":"/identity-provider/RegisterIdentityProvider",
      "responseCode":200
    },
    "input":{"shape":"RegisterIdentityProviderRequest"},
    "output":{"shape":"RegisterIdentityProviderResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Registers an identity provider for user-based subscriptions.</p>",
    "idempotent":true
  },
  "StartProductSubscription":{
    "name":"StartProductSubscription",
    "http":{
      "method":"POST",
      "requestUri":"/user/StartProductSubscription",
      "responseCode":200
    },
    "input":{"shape":"StartProductSubscriptionRequest"},
    "output":{"shape":"StartProductSubscriptionResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Starts a product subscription for a user with the specified identity provider.</p> <note>
<p>Your estimated bill for charges on the number of users and related costs will take 48 hours to appear for billing
periods that haven't closed (marked as <b>Pending</b> billing status) in Amazon Web Services Billing. For more
information, see <a href=\"https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/invoice.html\">Viewing
 your monthly charges</a> in the <i>Amazon Web Services Billing User Guide</i>.</p> </note>"
  },
  "StopProductSubscription":{
    "name":"StopProductSubscription",
    "http":{
      "method":"POST",
      "requestUri":"/user/StopProductSubscription",
```

```
      "responseCode":200
    },
    "input":{"shape":"StopProductSubscriptionRequest"},
    "output":{"shape":"StopProductSubscriptionResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Stops a product subscription for a user with the specified identity provider.</p>"
  },
  "TagResource":{
    "name":"TagResource",

    "http":{
      "method":"PUT",
      "requestUri":"/tags/{ResourceArn}",
      "responseCode":200
    },
    "input":{"shape":"TagResourceRequest"},
    "output":{"shape":"TagResourceResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Adds tags to a resource.</p>",
    "idempotent":true
  },
  "UntagResource":{
    "name":"UntagResource",
    "http":{
      "method":"DELETE",
      "requestUri":"/tags/{ResourceArn}",
      "responseCode":200
    },
    "input":{"shape":"UntagResourceRequest"},
    "output":{"shape":"UntagResourceResponse"},
    "errors":[
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Removes tags from a resource.</p>",
    "idempotent":true
```

```
    },
  "UpdateIdentityProviderSettings":{
    "name":"UpdateIdentityProviderSettings",
     "http":{
      "method":"POST",
      "requestUri":"/identity-provider/UpdateIdentityProviderSettings",
      "responseCode":200
    },
    "input":{"shape":"UpdateIdentityProviderSettingsRequest"},
    "output":{"shape":"UpdateIdentityProviderSettingsResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Updates additional product configuration settings for the registered identity
provider.</p>",
    "idempotent":true
  }
 },
 "shapes":{
  "AccessDeniedException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>You don't have sufficient access to perform this action.</p>",
    "exception":true
  },
  "ActiveDirectoryIdentityProvider":{
    "type":"structure",
    "members":{

 "ActiveDirectorySettings":{
      "shape":"ActiveDirectorySettings",
      "documentation":"<p>The <code>ActiveDirectorySettings</code> resource contains details about the Active
Directory, including network access details such as domain name and IP addresses, and the credential provider for
user administration.</p>"
    },
    "ActiveDirectoryType":{
      "shape":"ActiveDirectoryType",
      "documentation":"<p>The type of Active Directory  either a self-managed Active Directory or an Amazon
Web Services Managed Active Directory.</p>"
    },
    "DirectoryId":{
      "shape":"Directory",
      "documentation":"<p>The directory ID for an Active Directory identity provider.</p>"
```

```
      }
    },
    "documentation":"<p>Details about an Active Directory identity provider.</p>"
  },
  "ActiveDirectorySettings":{
   "type":"structure",
   "members":{
     "DomainCredentialsProvider":{
       "shape":"CredentialsProvider",

   "documentation":"<p>Points to the <code>CredentialsProvider</code> resource that contains information about
the credential provider for user administration.</p>"
     },
     "DomainIpv4List":{
       "shape":"ActiveDirectorySettingsDomainIpv4ListList",
       "documentation":"<p>A list of domain IPv4 addresses that are used for the Active Directory.</p>"
     },
     "DomainName":{
       "shape":"String",
       "documentation":"<p>The domain name for the Active Directory.</p>"
     },
     "DomainNetworkSettings":{
       "shape":"DomainNetworkSettings",
       "documentation":"<p>The <code>DomainNetworkSettings</code> resource contains an array of subnets that
apply for the Active Directory.</p>"
     }
    },
    "documentation":"<p>Contains network access and credential details that are needed for user administration in
the Active Directory.</p>"
  },
  "ActiveDirectorySettingsDomainIpv4ListList":{
   "type":"list",
   "member":{"shape":"IpV4"},
    "max":2,
   "min":1
  },
  "ActiveDirectoryType":{
   "type":"string",
   "enum":[
     "SELF_MANAGED",
     "AWS_MANAGED"
   ]
  },
  "Arn":{
   "type":"string",
   "pattern":"^arn:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-zA-Z0-9-
\\.]{1,510}/[a-zA-Z0-9-\\.]{1,510}$"
  },
```

```
 "AssociateUserRequest":{
  "type":"structure",
  "required":[
   "IdentityProvider",
   "InstanceId",
   "Username"
  ],
  "members":{
   "Domain":{
    "shape":"String",
    "documentation":"<p>The domain name of the Active Directory that contains information for the user to
associate.</p>"
   },
   "IdentityProvider":{
    "shape":"IdentityProvider",
    "documentation":"<p>The identity provider for the user.</p>"
   },
   "InstanceId":{
    "shape":"String",
    "documentation":"<p>The ID of the EC2 instance that provides
the user-based subscription.</p>"
   },
   "Tags":{
    "shape":"Tags",
    "documentation":"<p>The tags that apply for the user association.</p>"
   },
   "Username":{
    "shape":"String",
    "documentation":"<p>The user name from the identity provider.</p>"
   }
  }
 },
 "AssociateUserResponse":{
  "type":"structure",
  "required":["InstanceUserSummary"],
  "members":{
   "InstanceUserSummary":{
    "shape":"InstanceUserSummary",
    "documentation":"<p>Metadata that describes the associate user operation.</p>"
   }
  }
 },
 "BoxInteger":{
  "type":"integer",
  "box":true
 },
 "ConflictException":{
  "type":"structure",
```

```
    "members":{
     "message":{"shape":"String"}
    },
    "documentation":"<p>The request couldn't be completed because it conflicted with the current state of the
resource.</p>",
    "exception":true,
    "fault":true
   },
   "CreateLicenseServerEndpointRequest":{
    "type":"structure",
    "required":[
     "IdentityProviderArn",
     "LicenseServerSettings"
    ],
    "members":{
     "IdentityProviderArn":{
       "shape":"Arn",
       "documentation":"<p>The Amazon Resource Name (ARN) that identifies the <code>IdentityProvider</code>
resource that contains details about a registered identity provider. In the case of Active Directory, that can be a self-
managed Active Directory or an Amazon Web Services Managed Active Directory that contains user identity
details.</p>"
     },
     "LicenseServerSettings":{
       "shape":"LicenseServerSettings",
       "documentation":"<p>The <code>LicenseServerSettings</code> resource to create for the endpoint. The
settings include the type of license server and the Secrets Manager secret that enables administrators to add or
remove users associated with the license server.</p>"
     },
     "Tags":{
      "shape":"Tags",
       "documentation":"<p>The tags that apply for the license server endpoint.</p>"
     }
    }
   },
   "CreateLicenseServerEndpointResponse":{
    "type":"structure",
    "members":{
     "IdentityProviderArn":{
       "shape":"Arn",
       "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider specified in the
request.</p>"
     },
     "LicenseServerEndpointArn":{
       "shape":"Arn",
       "documentation":"<p>The ARN of the <code>LicenseServerEndpoint</code> resource.</p>"
     }
    }
   },
```

```
"CredentialsProvider":{
  "type":"structure",
  "members":{
    "SecretsManagerCredentialsProvider":{
      "shape":"SecretsManagerCredentialsProvider",
      "documentation":"<p>Identifies the Secrets Manager secret that contains credentials needed for user
administration in the Active Directory.</p>"
    }
  },
  "documentation":"<p>Contains information about the credential provider for user
administration.</p>",
  "union":true
},
"DeleteLicenseServerEndpointRequest":{
  "type":"structure",
  "required":[
    "LicenseServerEndpointArn",
    "ServerType"
  ],
  "members":{
    "LicenseServerEndpointArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) that identifies the
<code>LicenseServerEndpoint</code> resource to delete.</p>"
    },
    "ServerType":{
      "shape":"ServerType",
      "documentation":"<p>The type of License Server that the delete request refers to.</p>"
    }
  }
},
"DeleteLicenseServerEndpointResponse":{
  "type":"structure",
  "members":{
    "LicenseServerEndpoint":{
      "shape":"LicenseServerEndpoint",
      "documentation":"<p>Shows details from the <code>LicenseServerEndpoint</code> resource that was
deleted.</p>"
    }
  }
},
"DeregisterIdentityProviderRequest":{
  "type":"structure",
  "members":{
    "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentration":"<p>An object that specifies details for the Active Directory identity provider.</p>"
    },
```

"IdentityProviderArn":{
    "shape":"Arn",
    "documentation":"<p>The Amazon Resource Name (ARN) that identifies the identity provider to deregister.</p>"
    },
    "Product":{
    "shape":"String",
    "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values: <code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> | <code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
    }
    }
  },
  "DeregisterIdentityProviderResponse":{
   "type":"structure",
   "required":["IdentityProviderSummary"],
   "members":{
    "IdentityProviderSummary":{
     "shape":"IdentityProviderSummary",
     "documentation":"<p>Metadata that describes the results
 of an identity provider operation.</p>"
    }
   }
  },
  "Directory":{
   "type":"string",
   "pattern":"^(d|sd)-[0-9a-f]{10}$"
  },
  "DisassociateUserRequest":{
   "type":"structure",
   "members":{
    "Domain":{
     "shape":"String",
     "documentation":"<p>The domain name of the Active Directory that contains information for the user to disassociate.</p>"
    },
    "IdentityProvider":{
     "shape":"IdentityProvider",
     "documentation":"<p>An object that specifies details for the Active Directory identity provider.</p>"
    },
    "InstanceId":{
     "shape":"String",
     "documentation":"<p>The ID of the EC2 instance which provides user-based subscriptions.</p>"
    },
    "InstanceUserArn":{
     "shape":"Arn",
     "documentation":"<p>The Amazon Resource Name (ARN) of the user to disassociate from the EC2 instance.</p>"

```
      },
      "Username":{
        "shape":"String",
        "documentation":"<p>The user name from the Active Directory identity provider for the user.</p>"
      }
    }
  },
  "DisassociateUserResponse":{
   "type":"structure",
   "required":["InstanceUserSummary"],
   "members":{
     "InstanceUserSummary":{
       "shape":"InstanceUserSummary",
       "documentation":"<p>Metadata that describes the associate user operation.</p>"
     }
   }
  },
  "DomainNetworkSettings":{
   "type":"structure",
   "required":["Subnets"],
   "members":{
     "Subnets":{
       "shape":"DomainNetworkSettingsSubnetsList",
       "documentation":"<p>Contains a list of subnets that apply for the Active Directory domain.</p>"
     }
   },
   "documentation":"<p>Contains network settings for the Active Directory domain.</p>"
  },
  "DomainNetworkSettingsSubnetsList":{
   "type":"list",
   "member":{"shape":"Subnet"},
   "min":1
  },
  "Filter":{
   "type":"structure",
    "members":{
     "Attribute":{
       "shape":"String",
       "documentation":"<p>The name of an attribute to use as a filter.</p>"
     },
     "Operation":{
       "shape":"String",
       "documentation":"<p>The type of search (For example, eq, geq, leq)</p>"
     },
     "Value":{
       "shape":"String",
       "documentation":"<p>Value of the filter.</p>"
     }
```

      },
     "documentation":"<p>A filter name and value pair that is used to return more specific results from a describe or
list operation. You can use filters can be used to match a set of resources by specific criteria, such as tags, attributes,
or IDs.</p>"
    },
   "FilterList":{
    "type":"list",
    "member":{"shape":"Filter"}
    },
   "IdentityProvider":{
    "type":"structure",
    "members":{
     "ActiveDirectoryIdentityProvider":{
      "shape":"ActiveDirectoryIdentityProvider",
      "documentation":"<p>The <code>ActiveDirectoryIdentityProvider</code>
resource contains settings and other details about a specific Active Directory identity provider.</p>"
     }
    },
    "documentation":"<p>Refers to an identity provider.</p>",
    "union":true
    },
   "IdentityProviderSummary":{
    "type":"structure",
    "required":[
     "IdentityProvider",
     "Product",
     "Settings",
     "Status"
    ],
    "members":{
     "FailureMessage":{
      "shape":"String",
      "documentation":"<p>The failure message associated with an identity provider.</p>"
     },
     "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>The <code>IdentityProvider</code> resource contains information about an identity
provider.</p>"
     },
     "IdentityProviderArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider.</p>"
     },
     "Product":{
      "shape":"String",
      "documentation":"<p>The
name of the user-based subscription product.</p>"
     },

```
      "Settings":{
        "shape":"Settings",
        "documentation":"<p>The <code>Settings</code> resource contains details about the registered identity
providers product related configuration settings, such as the subnets to provision VPC endpoints.</p>"
      },
      "Status":{
        "shape":"String",
        "documentation":"<p>The status of the identity provider.</p>"
      }
    },
    "documentation":"<p>Describes an identity provider.</p>"
  },
  "IdentityProviderSummaryList":{
    "type":"list",
    "member":{"shape":"IdentityProviderSummary"}
  },
  "InstanceSummary":{
    "type":"structure",
    "required":[
      "InstanceId",
      "Products",
      "Status"
    ],
    "members":{
      "InstanceId":{
        "shape":"String",
        "documentation":"<p>The ID of the EC2 instance, which provides user-based subscriptions.</p>"
      },
      "LastStatusCheckDate":{
        "shape":"String",
        "documentation":"<p>The date of the last status check.</p>"
      },
      "Products":{
        "shape":"StringList",
        "documentation":"<p>A list of provided user-based subscription products.</p>"
      },
      "Status":{
        "shape":"String",
        "documentation":"<p>The status of an EC2 instance resource.</p>"
      },
      "StatusMessage":{
        "shape":"String",
        "documentation":"<p>The status message for an EC2 instance.</p>"
      }
    },
    "documentation":"<p>Describes an EC2 instance providing user-based subscriptions.</p>"
  },
  "InstanceSummaryList":{
```

```
    "type":"list",
    "member":{"shape":"InstanceSummary"}
  },
  "InstanceUserSummary":{
   "type":"structure",
   "required":[
     "IdentityProvider",
     "InstanceId",
     "Status",
     "Username"
   ],
   "members":{
     "AssociationDate":{

 "shape":"String",
       "documentation":"<p>The date a user was associated with an EC2 instance.</p>"
     },
     "DisassociationDate":{
       "shape":"String",
       "documentation":"<p>The date a user was disassociated from an EC2 instance.</p>"
     },
     "Domain":{
       "shape":"String",
       "documentation":"<p>The domain name of the Active Directory that contains the user information for the
product subscription.</p>"
     },
     "IdentityProvider":{
       "shape":"IdentityProvider",
       "documentation":"<p>The <code>IdentityProvider</code> resource specifies details about the identity
provider.</p>"
     },
     "InstanceId":{
       "shape":"String",
       "documentation":"<p>The ID of the EC2 instance that provides user-based subscriptions.</p>"
     },
     "InstanceUserArn":{
       "shape":"Arn",
       "documentation":"<p>The Amazon Resource Name (ARN) that identifies the instance user.</p>"

     },
     "Status":{
       "shape":"String",
       "documentation":"<p>The status of a user associated with an EC2 instance.</p>"
     },
     "StatusMessage":{
       "shape":"String",
       "documentation":"<p>The status message for users of an EC2 instance.</p>"
     },
```

```
      "Username":{
        "shape":"String",
        "documentation":"<p>The user name from the identity provider for the user.</p>"
      }
    },
    "documentation":"<p>Describes users of an EC2 instance providing user-based subscriptions.</p>"
  },
  "InstanceUserSummaryList":{
    "type":"list",
    "member":{"shape":"InstanceUserSummary"}
  },
  "InternalServerException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>An exception occurred with the service.</p>",
    "error":{"httpStatusCode":500},
    "exception":true,
    "fault":true
  },
  "IpV4":{
    "type":"string",

    "pattern":"^(?:(25[0-5]|2[0-4][0-9]|1[0-9][0-9]|[1-9][0-9]|[0-9])(\\.(?!$)|$)){4}$"
  },
  "LicenseServer":{
    "type":"structure",
    "members":{
      "HealthStatus":{
        "shape":"LicenseServerHealthStatus",
        "documentation":"<p>The health status of the RDS license server.</p>"
      },
      "Ipv4Address":{
        "shape":"String",
        "documentation":"<p>A list of domain IPv4 addresses that are used for the RDS license server.</p>"
      },
      "ProvisioningStatus":{
        "shape":"LicenseServerEndpointProvisioningStatus",
        "documentation":"<p>The current state of the provisioning process for the RDS license server.</p>"
      }
    },
    "documentation":"<p>Information about a Remote Desktop Services (RDS) license server.</p>"
  },
  "LicenseServerEndpoint":{
    "type":"structure",
    "members":{
      "CreationTime":{
```

        "shape":"Timestamp",
        "documentation":"<p>The timestamp when License
 Manager created the license server endpoint.</p>"
      },
      "IdentityProviderArn":{
        "shape":"String",
        "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider that's associated with the
 RDS license server endpoint.</p>"
      },
      "LicenseServerEndpointArn":{
        "shape":"Arn",
        "documentation":"<p>The ARN of the <code>ServerEndpoint</code> resource for the RDS license
 server.</p>"
      },
      "LicenseServerEndpointId":{
        "shape":"LicenseServerEndpointId",
        "documentation":"<p>The ID of the license server endpoint.</p>"
      },
      "LicenseServerEndpointProvisioningStatus":{
        "shape":"LicenseServerEndpointProvisioningStatus",
        "documentation":"<p>The current state of the provisioning process for the RDS license server endpoint</p>"
      },
      "LicenseServers":{
        "shape":"LicenseServerList",
        "documentation":"<p>An array of <code>LicenseServer</code>
 resources that represent the license servers that are accessed through this endpoint.</p>"
      },
      "ServerEndpoint":{
        "shape":"ServerEndpoint",
        "documentation":"<p>The <code>ServerEndpoint</code> resource contains the network address of the RDS
 license server endpoint.</p>"
      },
      "ServerType":{
        "shape":"ServerType",
        "documentation":"<p>The type of license server.</p>"
      },
      "StatusMessage":{
        "shape":"String",
        "documentation":"<p>The message associated with the provisioning status, if there is one.</p>"
      }
    },
    "documentation":"<p>Contains details about a network endpoint for a Remote Desktop Services (RDS) license
 server.</p>"
  },
  "LicenseServerEndpointId":{"type":"string"},
  "LicenseServerEndpointList":{
   "type":"list",
   "member":{"shape":"LicenseServerEndpoint"}

```
        },
        "LicenseServerEndpointProvisioningStatus":{
         "type":"string",
         "enum":[
          "PROVISIONING",
          "PROVISIONING_FAILED",
          "PROVISIONED",
          "DELETING",
          "DELETION_FAILED",
          "DELETED"
         ]
        },
        "LicenseServerHealthStatus":{
         "type":"string",
         "enum":[
          "HEALTHY",
          "UNHEALTHY",
          "NOT_APPLICABLE"
         ]
        },
        "LicenseServerList":{
         "type":"list",
         "member":{"shape":"LicenseServer"}
        },
        "LicenseServerSettings":{
         "type":"structure",
         "required":[
          "ServerSettings",
          "ServerType"
         ],
         "members":{
          "ServerSettings":{
           "shape":"ServerSettings",
           "documentation":"<p>The <code>ServerSettings</code> resource contains the settings for your server.</p>"
          },
          "ServerType":{
           "shape":"ServerType",
           "documentation":"<p>The type of license server.</p>"
          }
         },
         "documentation":"<p>The settings to configure your license server.</p>"
        },
        "ListIdentityProvidersRequest":{
         "type":"structure",
         "members":{
          "Filters":{
           "shape":"FilterList",
           "documentation":"<p>You can use the following filters to streamline results:</p> <ul> <li> <p>Product</p>
```

  <p>DirectoryId</p> "
      },
      "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>The maximum number of results to return from a single request.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
      }
     }
    },
    "ListIdentityProvidersResponse":{
     "type":"structure",
     "required":["IdentityProviderSummaries"],
     "members":{
      "IdentityProviderSummaries":{
       "shape":"IdentityProviderSummaryList",
       "documentation":"<p>An array of <code>IdentityProviderSummary</code> resources that contain details
about the
 Active Directory identity providers that meet the request criteria.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
      }
     }
    },
    "ListInstancesRequest":{
     "type":"structure",
     "members":{
      "Filters":{
       "shape":"FilterList",
       "documentation":"<p>You can use the following filters to streamline results:</p>   <p>Status</p>
  <p>InstanceId</p> "
      },
      "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>The maximum number of results to return from a single request.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>A token to specify where to start paginating.
 This is the nextToken from a previously truncated response.</p>"
      }

```
        }
      },
    "ListInstancesResponse":{
      "type":"structure",
      "members":{
        "InstanceSummaries":{
          "shape":"InstanceSummaryList",
          "documentation":"<p>An array of <code>InstanceSummary</code> resources that contain details about the
instances that provide user-based subscriptions and also meet the request criteria.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
        }
      }
    },
    "ListLicenseServerEndpointsRequest":{
      "type":"structure",
      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>You can use the following filters to streamline results:</p>
 <ul> <li> <p>IdentityProviderArn</p> </li> </ul>"
        },
        "MaxResults":{
          "shape":"ListLicenseServerEndpointsRequestMaxResultsInteger",
          "documentation":"<p>The maximum number of results to return from a single request.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
        }
      }
    },
    "ListLicenseServerEndpointsRequestMaxResultsInteger":{
      "type":"integer",
      "box":true,
      "max":100,
      "min":1
    },
    "ListLicenseServerEndpointsResponse":{
      "type":"structure",
      "members":{
        "LicenseServerEndpoints":{
          "shape":"LicenseServerEndpointList",
```

"documentation":"<p>An array of <code>LicenseServerEndpoint</code> resources that contain detailed information about the RDS License Servers that meet the request criteria.</p>"
      },

     "NextToken":{
       "shape":"String",
       "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
      }
     }
    },
   "ListProductSubscriptionsRequest":{
    "type":"structure",
    "required":["IdentityProvider"],
    "members":{
     "Filters":{
       "shape":"FilterList",
       "documentation":"<p>You can use the following filters to streamline results:</p>   <p>Status</p>   <p>Username</p>   <p>Domain</p> "
      },
     "IdentityProvider":{
       "shape":"IdentityProvider",
       "documentation":"<p>An object that specifies details for the identity provider.</p>"
      },
     "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>The maximum number of results to return from a single request.</p>"
      },
     "NextToken":{
       "shape":"String",
       "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>"
      },
     "Product":{
       "shape":"String",
       "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values: <code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> | <code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
      }
     }
    },
   "ListProductSubscriptionsResponse":{
    "type":"structure",
    "members":{
     "NextToken":{
       "shape":"String",

```
        "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
      },
     "ProductUserSummaries":{
       "shape":"ProductUserSummaryList",
       "documentation":"<p>Metadata that describes the list product subscriptions operation.</p>"
      }
     }
    },
   "ListTagsForResourceRequest":{
    "type":"structure",
    "required":["ResourceArn"],
    "members":{
     "ResourceArn":{
      "shape":"ResourceArn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the resource whose tags you want to
retrieve.</p>",
      "location":"uri",
      "locationName":"ResourceArn"
      }
     }
    },
   "ListTagsForResourceResponse":{
    "type":"structure",
    "members":{
     "Tags":{
      "shape":"Tags",
      "documentation":"<p>The tags for the specified resource.</p>"
      }
     }
    },
   "ListUserAssociationsRequest":{
    "type":"structure",
    "required":[
     "IdentityProvider",
     "InstanceId"
    ],
    "members":{
     "Filters":{
      "shape":"FilterList",
      "documentation":"<p>You
can use the following filters to streamline results:</p> <ul> <li> <p>Status</p> </li> <li> <p>Username</p> </li>
<li> <p>Domain</p> </li> </ul>"
      },
     "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>An object that specifies details for the identity provider.</p>"
```

```
      },
      "InstanceId":{
        "shape":"String",
        "documentation":"<p>The ID of the EC2 instance, which provides user-based subscriptions.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>The maximum number of results to return from a single request.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>"
      }
    }
  },
  "ListUserAssociationsResponse":{
    "type":"structure",
    "members":{
      "InstanceUserSummaries":{
        "shape":"InstanceUserSummaryList",
        "documentation":"<p>Metadata that describes the list user association operation.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
      }
    }
  },
  "ProductUserSummary":{
    "type":"structure",
    "required":[
      "IdentityProvider",
      "Product",
      "Status",
      "Username"
    ],
    "members":{
      "Domain":{
        "shape":"String",
        "documentation":"<p>The domain name of the Active Directory that contains the user information for the product subscription.</p>"
      },
      "IdentityProvider":{
        "shape":"IdentityProvider",
        "documentation":"<p>An object that specifies
```

```
    details for the identity provider.</p>"
        },
        "Product":{
          "shape":"String",
          "documentation":"<p>The name of the user-based subscription product.</p>"
        },
        "ProductUserArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) for this product user.</p>"
        },
        "Status":{
          "shape":"String",
          "documentation":"<p>The status of a product for this user.</p>"
        },
        "StatusMessage":{
          "shape":"String",
          "documentation":"<p>The status message for a product for this user.</p>"
        },
        "SubscriptionEndDate":{
          "shape":"String",
          "documentation":"<p>The end date of a subscription.</p>"
        },
        "SubscriptionStartDate":{
          "shape":"String",
          "documentation":"<p>The start date of a subscription.</p>"
        },
        "Username":{
          "shape":"String",
          "documentation":"<p>The user name
from the identity provider for this product user.</p>"
        }
      },
      "documentation":"<p>A summary of the user-based subscription products for a specific user.</p>"
    },
    "ProductUserSummaryList":{
      "type":"list",
      "member":{"shape":"ProductUserSummary"}
    },
    "RdsSalSettings":{
      "type":"structure",
      "required":["RdsSalCredentialsProvider"],
      "members":{
        "RdsSalCredentialsProvider":{
          "shape":"CredentialsProvider",
          "documentation":"<p>The <code>CredentialsProvider</code> resource contains a reference to the credentials
provider that's used for RDS license server user administration.</p>"
        }
      },
```

      "documentation":"<p>Server settings that are specific to a Remote Desktop Services (RDS) license server.</p>"
    },
    "RegisterIdentityProviderRequest":{
      "type":"structure",
      "required":[
        "IdentityProvider",
        "Product"
      ],
      "members":{
        "IdentityProvider":{

          "shape":"IdentityProvider",
          "documentation":"<p>An object that specifies details for the identity provider to register.</p>"
        },
        "Product":{
          "shape":"String",
          "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
        },
        "Settings":{
          "shape":"Settings",
          "documentation":"<p>The registered identity providers product related configuration settings such as the
subnets to provision VPC endpoints.</p>"
        },
        "Tags":{
          "shape":"Tags",
          "documentation":"<p>The tags that apply to the identity provider's registration.</p>"
        }
      }
    },
    "RegisterIdentityProviderResponse":{
      "type":"structure",
      "required":["IdentityProviderSummary"],
      "members":{
        "IdentityProviderSummary":{
          "shape":"IdentityProviderSummary",
          "documentation":"<p>Metadata that describes the results of an identity provider operation.</p>"
        }
      }
    },
    "ResourceArn":{
      "type":"string",
      "pattern":"^arn:([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-
\\.]{1,510})/([a-z0-9-\\.]{1,510})$"
    },
    "ResourceNotFoundException":{
      "type":"structure",

```
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>The resource couldn't be found.</p>",
    "error":{
      "httpStatusCode":404,
      "senderFault":true
    },
    "exception":true
  },
  "SecretsManagerCredentialsProvider":{
    "type":"structure",
    "members":{
      "SecretId":{
        "shape":"SecretsManagerCredentialsProviderSecretIdString",
        "documentation":"<p>The ID of the Secrets Manager secret that contains credentials.</p>"
      }
    },

    "documentation":"<p>Contains a credentials secret that's stored in Secrets Manager.</p>"
  },
  "SecretsManagerCredentialsProviderSecretIdString":{
    "type":"string",
    "min":1
  },
  "SecurityGroup":{
    "type":"string",
    "max":200,
    "min":5,
    "pattern":"^sg-(([0-9a-z]{8})|([0-9a-z]{17}))$"
  },
  "ServerEndpoint":{
    "type":"structure",
    "members":{
      "Endpoint":{
        "shape":"String",
        "documentation":"<p>The network address of the endpoint.</p>"
      }
    },
    "documentation":"<p>A network endpoint through which you can access one or more servers.</p>"
  },
  "ServerSettings":{
    "type":"structure",
    "members":{
      "RdsSalSettings":{
        "shape":"RdsSalSettings",
        "documentation":"<p>The <code>RdsSalSettings</code> resource contains settings to configure a specific
Remote Desktop Services (RDS) license server.</p>"
```

```
        }
      },
      "documentation":"<p>Contains
 settings for a specific server.</p>",
      "union":true
    },
    "ServerType":{
      "type":"string",
      "enum":["RDS_SAL"]
    },
    "ServiceQuotaExceededException":{
      "type":"structure",
      "members":{
        "message":{"shape":"String"}
      },
      "documentation":"<p>The request failed because a service quota is exceeded.</p>",
      "exception":true
    },
    "Settings":{
      "type":"structure",
      "required":[
        "SecurityGroupId",
        "Subnets"
      ],
      "members":{
        "SecurityGroupId":{
          "shape":"SecurityGroup",
          "documentation":"<p>A security group ID that allows inbound TCP port 1688 communication between
resources in your VPC and the VPC endpoint for activation servers.</p>"
        },
        "Subnets":{
          "shape":"SettingsSubnetsList",
          "documentation":"<p>The subnets defined for the registered identity provider.</p>"
        }
      },
      "documentation":"<p>The registered identity providers
 product related configuration settings such as the subnets to provision VPC endpoints, and the security group ID
that is associated with the VPC endpoints. The security group should permit inbound TCP port 1688 communication
from resources in the VPC.</p>"
    },
    "SettingsSubnetsList":{
      "type":"list",
      "member":{"shape":"Subnet"},
      "min":1
    },
    "StartProductSubscriptionRequest":{
      "type":"structure",
      "required":[
```

```
      "IdentityProvider",
      "Product",
      "Username"
    ],
    "members":{
      "Domain":{
        "shape":"String",
        "documentation":"<p>The domain name of the Active Directory that contains the user for whom to start the
product subscription.</p>"
      },
      "IdentityProvider":{
        "shape":"IdentityProvider",
        "documentation":"<p>An object that specifies details for the identity provider.</p>"
      },
      "Product":{
        "shape":"String",
        "documentation":"<p>The
 name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
      },
      "Tags":{
        "shape":"Tags",
        "documentation":"<p>The tags that apply to the product subscription.</p>"
      },
      "Username":{
        "shape":"String",
        "documentation":"<p>The user name from the identity provider of the user.</p>"
      }
    }
  },
  "StartProductSubscriptionResponse":{
    "type":"structure",
    "required":["ProductUserSummary"],
    "members":{
      "ProductUserSummary":{
        "shape":"ProductUserSummary",
        "documentation":"<p>Metadata that describes the start product subscription operation.</p>"
      }
    }
  },
  "StopProductSubscriptionRequest":{
    "type":"structure",
    "members":{
      "Domain":{
        "shape":"String",
        "documentation":"<p>The domain name of the Active Directory that contains the user for whom to stop the
product subscription.</p>"
```

```
        },
        "IdentityProvider":{
          "shape":"IdentityProvider",
          "documentation":"<p>An object that specifies details for the identity provider.</p>"
        },
        "Product":{
          "shape":"String",
          "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
        },
        "ProductUserArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the product user.</p>"
        },
        "Username":{
          "shape":"String",
          "documentation":"<p>The user name from the identity provider for the user.</p>"
        }
      }
    },
    "StopProductSubscriptionResponse":{
      "type":"structure",
      "required":["ProductUserSummary"],
      "members":{
        "ProductUserSummary":{
          "shape":"ProductUserSummary",
          "documentation":"<p>Metadata that describes the start product subscription operation.</p>"
        }
      }
    },
    "String":{"type":"string"},
    "StringList":{
      "type":"list",
      "member":{"shape":"String"}
    },
    "Subnet":{
      "type":"string",
      "pattern":"^subnet-[a-z0-9]{8,17}"
    },
    "Subnets":{
      "type":"list",
      "member":{"shape":"Subnet"}
    },
    "TagKeyList":{
      "type":"list",
      "member":{"shape":"String"},
      "max":50,
```

```
      "min":0,
      "sensitive":true
    },
    "TagResourceRequest":{
     "type":"structure",
     "required":[
       "ResourceArn",
       "Tags"
     ],
     "members":{
       "ResourceArn":{
         "shape":"ResourceArn",
         "documentation":"<p>The Amazon Resource Name (ARN) of the resource that you want to tag.</p>",

         "location":"uri",
         "locationName":"ResourceArn"
       },
       "Tags":{
         "shape":"Tags",
         "documentation":"<p>The tags to apply to the specified resource.</p>"
       }
     }
    },
    "TagResourceResponse":{
     "type":"structure",
     "members":{
     }
    },
    "Tags":{
     "type":"map",
     "key":{"shape":"String"},
     "value":{"shape":"String"},
     "max":50,
     "min":0,
     "sensitive":true
    },
    "ThrottlingException":{
     "type":"structure",
     "members":{
       "message":{"shape":"String"}
     },
     "documentation":"<p>The request was denied because of request throttling. Retry the request.</p>",
     "exception":true
    },
    "Timestamp":{"type":"timestamp"},
    "UntagResourceRequest":{
     "type":"structure",
     "required":[
```

```
      "ResourceArn",
      "TagKeys"
    ],
    "members":{
      "ResourceArn":{
        "shape":"ResourceArn",
        "documentation":"<p>The Amazon
Resource Name (ARN) of the resource that you want to remove tags from.</p>",
        "location":"uri",
        "locationName":"ResourceArn"
      },
      "TagKeys":{
        "shape":"TagKeyList",
        "documentation":"<p>The tag keys to remove from the resource.</p>",
        "location":"querystring",
        "locationName":"tagKeys"
      }
    }
  },
  "UntagResourceResponse":{
    "type":"structure",
    "members":{
    }
  },
  "UpdateIdentityProviderSettingsRequest":{
    "type":"structure",
    "required":["UpdateSettings"],
    "members":{
      "IdentityProvider":{"shape":"IdentityProvider"},
      "IdentityProviderArn":{
        "shape":"Arn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider to update.</p>"
      },
      "Product":{
        "shape":"String",
        "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code>
| <code>VISUAL_STUDIO_PROFESSIONAL</code> | <code>OFFICE_PROFESSIONAL_PLUS</code> |
<code>REMOTE_DESKTOP_SERVICES</code> </p>"
      },
      "UpdateSettings":{
        "shape":"UpdateSettings",
        "documentation":"<p>Updates the registered identity providers product related configuration settings. You can
update any combination of settings in a single operation such as the:</p> <ul> <li> <p>Subnets which you want to
add to provision VPC endpoints.</p> </li> <li> <p>Subnets which you want to remove the VPC endpoints
from.</p> </li> <li> <p>Security group ID which permits traffic to the VPC endpoints.</p> </li> </ul>"
      }
    }
```

```
    },
   "UpdateIdentityProviderSettingsResponse":{
    "type":"structure",
    "required":["IdentityProviderSummary"],
    "members":{
      "IdentityProviderSummary":{"shape":"IdentityProviderSummary"}
    }
   },
   "UpdateSettings":{
    "type":"structure",
    "required":[
     "AddSubnets",
     "RemoveSubnets"
    ],
    "members":{
     "AddSubnets":{
      "shape":"Subnets",
      "documentation":"<p>The ID of one or more subnets in which License Manager will create a VPC endpoint
for products that require connectivity to activation servers.</p>"
     },
     "RemoveSubnets":{
      "shape":"Subnets",
      "documentation":"<p>The ID of one or more subnets to remove.</p>"
     },
     "SecurityGroupId":{
      "shape":"SecurityGroup",
      "documentation":"<p>A security group ID that allows inbound TCP port 1688 communication between
resources in your VPC and the VPC endpoints for activation servers.</p>"
     }
    },
    "documentation":"<p>Updates the registered identity providers product related configuration settings such as the
subnets to provision VPC endpoints.</p>"
   },
   "ValidationException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>A parameter
is not valid.</p>",
    "exception":true
   }
  },
  "documentation":"<p>With License Manager, you can create user-based subscriptions to utilize licensed software
with a per user subscription fee on Amazon EC2 instances.</p>"
 }
{
  "version": "1.0",
```

```
"parameters": {
  "Region": {
    "builtIn": "AWS::Region",
    "required": false,
    "documentation": "The AWS region used to dispatch the request.",
    "type": "String"
  },
  "UseDualStack": {
    "builtIn": "AWS::UseDualStack",
    "required": true,
    "default": false,
    "documentation": "When true, use the dual-stack endpoint. If the configured endpoint does not support dual-stack, dispatching the request MAY return an error.",
    "type": "Boolean"
  },
  "UseFIPS": {
    "builtIn": "AWS::UseFIPS",
    "required": true,
    "default": false,
    "documentation": "When true, send this request to the FIPS-compliant regional endpoint. If the configured endpoint does not have a FIPS compliant endpoint, dispatching the request will return an error.",
    "type": "Boolean"
  },
  "Endpoint": {

    "builtIn": "SDK::Endpoint",
    "required": false,
    "documentation": "Override the endpoint used to send this request",
    "type": "String"
  }
},
"rules": [
  {
    "conditions": [
      {
        "fn": "isSet",
        "argv": [
          {
            "ref": "Endpoint"
          }
        ]
      }
    ],
    "rules": [
      {
        "conditions": [
          {
            "fn": "booleanEquals",
```

```
                    "argv": [
                        {
                            "ref": "UseFIPS"
                        },
                        true
                    ]
                }
            ],
            "error": "Invalid Configuration: FIPS and custom endpoint are not supported",
            "type": "error"
        },
        {
            "conditions": [],
            "rules": [
                {
                    "conditions": [
                        {
                            "fn": "booleanEquals",
                            "argv": [
                                {
                                    "ref": "UseDualStack"
                                },
                                true
                            ]
                        }
                    ],
                    "error": "Invalid Configuration: Dualstack and custom endpoint are not supported",
                    "type": "error"
                },
                {
                    "conditions": [],
                    "endpoint": {
                        "url": {

                        "ref": "Endpoint"
                        },
                        "properties": {},
                        "headers": {}
                    },
                    "type": "endpoint"
                }
            ],
            "type": "tree"
        }
    ],
    "type": "tree"
},
{
```

```json
      "conditions": [],
      "rules": [
        {
          "conditions": [
            {
              "fn": "isSet",
              "argv": [
                {
                  "ref": "Region"
                }
              ]
            }
          ],
          "rules": [
            {
              "conditions": [
                {

                  "fn": "aws.partition",
                  "argv": [
                    {
                      "ref": "Region"
                    }
                  ],
                  "assign": "PartitionResult"
                }
              ],
              "rules": [
                {
                  "conditions": [
                    {
                      "fn": "booleanEquals",
                      "argv": [
                        {
                          "ref": "UseFIPS"
                        },
                        true
                      ]
                    },

                    {
                      "fn": "booleanEquals",
                      "argv": [
                        {
                          "ref": "UseDualStack"
                        },
                        true
                      ]
```

```
                    }
                ],
                "rules": [
                    {
                        "conditions": [
                            {
                                "fn": "booleanEquals",
                                "argv": [
                                    true,
                                    {
                                        "fn": "getAttr",
                                        "argv": [
                                            {
                                                "ref": "PartitionResult"
                                            },
                                            "supportsFIPS"
                                        ]
                                    }
                                ]
                            },
                            {
                                "fn": "booleanEquals",
                                "argv": [
                                    true,
                                    {
                                        "fn": "getAttr",
                                        "argv": [
                                            {
                                                "ref": "PartitionResult"
                                            },
                                            "supportsDualStack"
                                        ]
                                    }
                                ]
                            }
                        ],
                        "rules": [
                            {
                                "conditions": [],
                                "rules": [
                                    {
                                        "conditions": [],
                                        "endpoint": {
                                            "url": "https://license-manager-linux-subscriptions-fips.{Region}.{PartitionResult#dualStackDnsSuffix}",
```

```
                                    "properties": { },
                                    "headers": { }
                                 },
                                 "type": "endpoint"
                              }
                          ],
                          "type": "tree"
                       }
                   ],
                   "type": "tree"
                },

      {

                   "conditions": [],
                   "error": "FIPS and DualStack are enabled, but this partition does not support one or
both",
                   "type": "error"
                }
             ],
             "type": "tree"
          },
          {
             "conditions": [
                {
                   "fn": "booleanEquals",
                   "argv": [
                      {
                         "ref": "UseFIPS"
                      },
                      true
                   ]
                }

             ],
             "rules": [
                {
                   "conditions": [
                      {
                         "fn": "booleanEquals",
                         "argv": [
                            {
                               "fn": "getAttr",
                               "argv": [
                                  {
                                     "ref": "PartitionResult"
                                  },
                                  "supportsFIPS"
                               ]
```

```
                },
                                            true
                                  ]
                            }
                      ],
                      "rules": [
                        {
                            "conditions": [],
                            "rules": [
                              {
                                  "conditions": [],
                                  "endpoint": {
                                      "url": "https://license-manager-linux-subscriptions-
fips.{Region}.{PartitionResult#dnsSuffix}",
                                      "properties": {},
                                      "headers": {}

                                  },
                                      "type": "endpoint"
                                  }
                              ],
                              "type": "tree"
                          }
                      ],
                      "type": "tree"
                  },
                  {
                      "conditions": [],
                      "error": "FIPS is enabled but this partition does not support FIPS",
                      "type": "error"
                  }
              ],
              "type": "tree"
          },
          {

    "conditions": [
              {
                  "fn": "booleanEquals",
                  "argv": [
                    {
                        "ref": "UseDualStack"
                    },
                      true
                  ]
              }
          ],
```

```json
          "rules": [
            {
              "conditions": [
                {
                  "fn": "booleanEquals",
                  "argv": [
                    true,

                    {
                      "fn": "getAttr",
                      "argv": [
                        {
                          "ref": "PartitionResult"
                        },
                        "supportsDualStack"
                      ]
                    }
                  ]
                }
              ],
              "rules": [
                {
                  "conditions": [],
                  "rules": [

                    {
                      "conditions": [],
                      "endpoint": {
                        "url": "https://license-manager-linux-subscriptions.{Region}.{PartitionResult#dualStackDnsSuffix}",
                        "properties": {},
                        "headers": {}
                      },
                      "type": "endpoint"
                    }
                  ],
                  "type": "tree"
                }
              ],
              "type": "tree"

            },
            {
              "conditions": [],
              "error": "DualStack is enabled but this partition does not support DualStack",
              "type": "error"
            }
          ],
```

```
                                 "type": "tree"
                              },
                              {
                                 "conditions": [],
                                 "rules": [
                                    {
                                       "conditions": [],
                                       "endpoint": {
                                          "url": "https://license-manager-linux-
subscriptions.{Region}.{PartitionResult#dnsSuffix}",
                                          "properties": {},

                                "headers": {}
                                       },
                                       "type": "endpoint"
                                    }
                                 ],
                                 "type": "tree"
                              }
                           ],
                           "type": "tree"
                        }
                     ],
                     "type": "tree"
                  },
                  {
                     "conditions": [],
                     "error": "Invalid Configuration: Missing Region",
                     "type": "error"
                  }
               ],
               "type": "tree"
            }
         ]
      }
{
   "pagination": {
      "ListAssociationsForLicenseConfiguration": {
         "input_token": "NextToken",
         "limit_key": "MaxResults",
         "output_token": "NextToken",
         "result_key": "LicenseConfigurationAssociations"
      },
      "ListLicenseConfigurations": {
         "input_token": "NextToken",
         "limit_key": "MaxResults",
         "output_token": "NextToken",
         "result_key": "LicenseConfigurations"
```

```
      },
      "ListLicenseSpecificationsForResource": {
        "input_token": "NextToken",
        "limit_key": "MaxResults",
        "output_token": "NextToken",
        "result_key": "LicenseSpecifications"
      },
      "ListResourceInventory": {
        "input_token": "NextToken",
        "limit_key": "MaxResults",
        "output_token": "NextToken",
        "result_key": "ResourceInventoryList"
      },
      "ListUsageForLicenseConfiguration": {
        "input_token": "NextToken",
        "limit_key": "MaxResults",
        "output_token": "NextToken",
        "result_key": "LicenseConfigurationUsageList"
      }
    }
}
{
  "pagination": {
    "ListLinuxSubscriptionInstances": {
      "input_token": "NextToken",
      "output_token": "NextToken",
      "limit_key": "MaxResults",
      "result_key": "Instances"
    },
    "ListLinuxSubscriptions": {
      "input_token": "NextToken",
      "output_token": "NextToken",
      "limit_key": "MaxResults",
      "result_key": "Subscriptions"
    },
    "ListRegisteredSubscriptionProviders": {
      "input_token": "NextToken",
      "output_token": "NextToken",
      "limit_key": "MaxResults",
      "result_key": "RegisteredSubscriptionProviders"
    }
  }
}
{
  "version":"2.0",
  "metadata":{
    "apiVersion":"2018-05-10",
    "endpointPrefix":"license-manager-linux-subscriptions",
```

```
    "jsonVersion":"1.1",
    "protocol":"rest-json",
    "protocols":["rest-json"],
    "serviceFullName":"AWS License Manager Linux Subscriptions",
    "serviceId":"License Manager Linux Subscriptions",
    "signatureVersion":"v4",
    "signingName":"license-manager-linux-subscriptions",
    "uid":"license-manager-linux-subscriptions-2018-05-10",
    "auth":["aws.auth#sigv4"]
  },
  "operations":{
    "DeregisterSubscriptionProvider":{
      "name":"DeregisterSubscriptionProvider",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/DeregisterSubscriptionProvider",
        "responseCode":200
      },
      "input":{"shape":"DeregisterSubscriptionProviderRequest"},
      "output":{"shape":"DeregisterSubscriptionProviderResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Remove a third-party subscription provider from the Bring Your Own License (BYOL)
subscriptions registered to your account.</p>",
      "idempotent":true
    },
    "GetRegisteredSubscriptionProvider":{
      "name":"GetRegisteredSubscriptionProvider",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/GetRegisteredSubscriptionProvider",
        "responseCode":200
      },
      "input":{"shape":"GetRegisteredSubscriptionProviderRequest"},
      "output":{"shape":"GetRegisteredSubscriptionProviderResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Get details for a Bring Your Own License (BYOL) subscription that's registered to your
account.</p>",
      "idempotent":true
```

```
      },
    "GetServiceSettings":{
      "name":"GetServiceSettings",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/GetServiceSettings",
        "responseCode":200
      },
      "input":{"shape":"GetServiceSettingsRequest"},
      "output":{"shape":"GetServiceSettingsResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Lists the Linux subscriptions service settings for your account.</p>",
      "idempotent":true
    },
    "ListLinuxSubscriptionInstances":{
      "name":"ListLinuxSubscriptionInstances",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/ListLinuxSubscriptionInstances",
        "responseCode":200
      },
      "input":{"shape":"ListLinuxSubscriptionInstancesRequest"},
      "output":{"shape":"ListLinuxSubscriptionInstancesResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Lists the running Amazon EC2 instances that were discovered with commercial Linux subscriptions.</p>",
      "idempotent":true
    },
    "ListLinuxSubscriptions":{
      "name":"ListLinuxSubscriptions",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/ListLinuxSubscriptions",
        "responseCode":200
      },
      "input":{"shape":"ListLinuxSubscriptionsRequest"},
      "output":{"shape":"ListLinuxSubscriptionsResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
```

```
      {"shape":"ValidationException"}
    ],
    "documentation":"<p>Lists the Linux subscriptions that have been discovered. If you have linked your
organization, the returned results will include data aggregated across your accounts in Organizations.</p>",
    "idempotent":true
  },
  "ListRegisteredSubscriptionProviders":{
    "name":"ListRegisteredSubscriptionProviders",
    "http":{
      "method":"POST",
      "requestUri":"/subscription/ListRegisteredSubscriptionProviders",
      "responseCode":200
    },
    "input":{"shape":"ListRegisteredSubscriptionProvidersRequest"},
    "output":{"shape":"ListRegisteredSubscriptionProvidersResponse"},
    "errors":[
      {"shape":"InternalServerException"},
      {"shape":"ThrottlingException"},
      {"shape":"ValidationException"}
    ],
    "documentation":"<p>List Bring Your Own License (BYOL) subscription registration resources for your
account.</p>",
    "idempotent":true
  },
  "ListTagsForResource":{
    "name":"ListTagsForResource",
    "http":{
      "method":"GET",
      "requestUri":"/tags/{resourceArn}",
      "responseCode":200
    },
    "input":{"shape":"ListTagsForResourceRequest"},
    "output":{"shape":"ListTagsForResourceResponse"},
    "errors":[

    {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"ValidationException"}
    ],
    "documentation":"<p>List the metadata tags that are assigned to the specified Amazon Web Services
resource.</p>"
  },
  "RegisterSubscriptionProvider":{
    "name":"RegisterSubscriptionProvider",
    "http":{
      "method":"POST",
      "requestUri":"/subscription/RegisterSubscriptionProvider",
      "responseCode":200
```

        },
      "input":{"shape":"RegisterSubscriptionProviderRequest"},
      "output":{"shape":"RegisterSubscriptionProviderResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Register the supported third-party subscription provider for your Bring Your Own License (BYOL) subscription.</p>",
      "idempotent":true
    },
    "TagResource":{
      "name":"TagResource",
      "http":{
        "method":"PUT",
        "requestUri":"/tags/{resourceArn}",
        "responseCode":200
      },
      "input":{"shape":"TagResourceRequest"},
      "output":{"shape":"TagResourceResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Add metadata tags to the specified Amazon Web Services resource.</p>",
      "idempotent":true
    },
    "UntagResource":{
      "name":"UntagResource",
      "http":{
        "method":"DELETE",
        "requestUri":"/tags/{resourceArn}",
        "responseCode":200
      },
      "input":{"shape":"UntagResourceRequest"},
      "output":{"shape":"UntagResourceResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"}
      ],
      "documentation":"<p>Remove one or more metadata tag from the specified Amazon Web Services resource.</p>",
      "idempotent":true
    },
    "UpdateServiceSettings":{
      "name":"UpdateServiceSettings",

```
    "http":{
      "method":"POST",
      "requestUri":"/subscription/UpdateServiceSettings",
      "responseCode":200
    },
    "input":{"shape":"UpdateServiceSettingsRequest"},
    "output":{"shape":"UpdateServiceSettingsResponse"},
    "errors":[
      {"shape":"InternalServerException"},
      {"shape":"ThrottlingException"},
      {"shape":"ValidationException"}
    ],
    "documentation":"<p>Updates the service settings for Linux subscriptions.</p>",
    "idempotent":true
    }
  },
  "shapes":{
    "Boolean":{
      "type":"boolean",
      "box":true
    },
    "BoxInteger":{
      "type":"integer",
      "box":true
    },
    "BoxLong":{
      "type":"long",
      "box":true
    },
    "DeregisterSubscriptionProviderRequest":{
      "type":"structure",
      "required":["SubscriptionProviderArn"],
      "members":{
        "SubscriptionProviderArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the subscription provider resource to
deregister.</p>"
        }
      }
    },
    "DeregisterSubscriptionProviderResponse":{
      "type":"structure",
      "members":{
      }
    },
    "Filter":{
      "type":"structure",
      "members":{
```

```
    "Name":{
      "shape":"String",
      "documentation":"<p>The type of name to filter by.</p>"
    },
    "Operator":{
      "shape":"Operator",
      "documentation":"<p>An operator for filtering results.</p>"
    },
    "Values":{
      "shape":"StringList",
      "documentation":"<p>One or more values for the name to filter by.</p>"
    }
  },
    "documentation":"<p>A filter object that is used to return more specific results from a describe operation. Filters
can be used to match a set of resources by specific criteria.</p>"
  },
  "FilterList":{
    "type":"list",
    "member":{"shape":"Filter"}
  },
  "GetRegisteredSubscriptionProviderRequest":{
    "type":"structure",
    "required":["SubscriptionProviderArn"],
    "members":{
      "SubscriptionProviderArn":{
        "shape":"SubscriptionProviderArn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the BYOL registration resource to get details
for.</p>"
      }
    }
  },
  "GetRegisteredSubscriptionProviderResponse":{
    "type":"structure",
    "members":{
      "LastSuccessfulDataRetrievalTime":{
        "shape":"String",
        "documentation":"<p>The timestamp from the last time License Manager retrieved subscription details from
your registered third-party Linux subscription provider.</p>"
      },
      "SecretArn":{
        "shape":"SecretArn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the third-party access secret stored in Secrets
Manager for the BYOL registration resource specified in the request.</p>"
      },

  "SubscriptionProviderArn":{
        "shape":"SubscriptionProviderArn",
        "documentation":"<p>The Amazon Resource Name (ARN) for the BYOL registration resource specified in
```

the request.</p>"
      },
      "SubscriptionProviderSource":{
        "shape":"SubscriptionProviderSource",
        "documentation":"<p>The subscription provider for the BYOL registration resource specified in the request.</p>"
      },
      "SubscriptionProviderStatus":{
        "shape":"SubscriptionProviderStatus",
        "documentation":"<p>The status of the Linux subscription provider access token from the last successful subscription data request.</p>"
      },
      "SubscriptionProviderStatusMessage":{
        "shape":"String",
        "documentation":"<p>The detailed message from your subscription provider token status.</p>"
      }
    }
  },
  "GetServiceSettingsRequest":{
    "type":"structure",
    "members":{
    }
  },
  "GetServiceSettingsResponse":{
    "type":"structure",
    "members":{
      "HomeRegions":{
        "shape":"StringList",
        "documentation":"<p>The Region in which License Manager displays the aggregated data for Linux subscriptions.</p>"
      },
      "LinuxSubscriptionsDiscovery":{
        "shape":"LinuxSubscriptionsDiscovery",
        "documentation":"<p>Lists if discovery has been enabled for Linux subscriptions.</p>"
      },
      "LinuxSubscriptionsDiscoverySettings":{
        "shape":"LinuxSubscriptionsDiscoverySettings",
        "documentation":"<p>Lists the settings defined for Linux subscriptions discovery. The settings include if Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
      },
      "Status":{
        "shape":"Status",
        "documentation":"<p>Indicates the status of Linux subscriptions settings being applied.</p>"
      },
      "StatusMessage":{
        "shape":"StringMap",
        "documentation":"<p>A

message which details the Linux subscriptions service settings current status.</p>"
    }
   }
  },
  "Instance":{
   "type":"structure",
   "members":{
    "AccountID":{
     "shape":"String",
     "documentation":"<p>The account ID which owns the instance.</p>"
    },
    "AmiId":{
     "shape":"String",
     "documentation":"<p>The AMI ID used to launch the instance.</p>"
    },
    "DualSubscription":{
     "shape":"String",
     "documentation":"<p>Indicates that you have two different license subscriptions for the same software on your instance.</p>"
    },
    "InstanceID":{
     "shape":"String",
     "documentation":"<p>The instance ID of the resource.</p>"
    },
    "InstanceType":{
     "shape":"String",
     "documentation":"<p>The instance type of the resource.</p>"
    },
    "LastUpdatedTime":{
     "shape":"String",
     "documentation":"<p>The
time in which the last discovery updated the instance details.</p>"
    },
    "OsVersion":{
     "shape":"String",
     "documentation":"<p>The operating system software version that runs on your instance.</p>"
    },
    "ProductCode":{
     "shape":"ProductCodeList",
     "documentation":"<p>The product code for the instance. For more information, see <a
href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/linux-subscriptions-usage-
operation.html\">Usage operation values in the <i>License Manager User Guide</i> .</p>"
    },
    "Region":{
     "shape":"String",
     "documentation":"<p>The Region the instance is running in.</p>"
    },
    "RegisteredWithSubscriptionProvider":{

        "shape":"String",
        "documentation":"<p>Indicates that your instance uses a BYOL license subscription from a third-party Linux
subscription provider that you've registered with License Manager.</p>"
      },
      "Status":{
        "shape":"String",
        "documentation":"<p>The status of the instance.</p>"
      },
      "SubscriptionName":{
        "shape":"String",
        "documentation":"<p>The name of the license subscription that the instance uses.</p>"
      },
      "SubscriptionProviderCreateTime":{
        "shape":"String",
        "documentation":"<p>The timestamp when you registered the third-party Linux subscription provider for the
subscription that the instance uses.</p>"
      },
      "SubscriptionProviderUpdateTime":{
        "shape":"String",
        "documentation":"<p>The timestamp from the last time that the instance synced with the registered third-party
Linux subscription provider.</p>"
      },
      "UsageOperation":{
        "shape":"String",
        "documentation":"<p>The usage operation of the instance. For more information, see For more information,
see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/linux-subscriptions-usage-
operation.html\">Usage
 operation values in the <i>License Manager User Guide</i>.</p>"
      }
    },
    "documentation":"<p>Details discovered information about a running instance using Linux subscriptions.</p>"
    },
    "InstanceList":{
      "type":"list",
      "member":{"shape":"Instance"}
    },
    "InternalServerException":{
      "type":"structure",
      "members":{
        "message":{"shape":"String"}
      },
      "documentation":"<p>An exception occurred with the service.</p>",
      "exception":true,
      "fault":true
    },
    "LinuxSubscriptionsDiscovery":{
      "type":"string",
      "enum":[

          "Enabled",
          "Disabled"
        ]
      },
      "LinuxSubscriptionsDiscoverySettings":{
        "type":"structure",
        "required":[
          "OrganizationIntegration",
          "SourceRegions"
        ],
        "members":{
          "OrganizationIntegration":{
            "shape":"OrganizationIntegration",
            "documentation":"<p>Details
if you have enabled resource discovery across your accounts in Organizations.</p>"
          },
          "SourceRegions":{
            "shape":"StringList",
            "documentation":"<p>The Regions in which to discover data for Linux subscriptions.</p>"
          }
        },
        "documentation":"<p>Lists the settings defined for discovering Linux subscriptions.</p>"
      },
      "ListLinuxSubscriptionInstancesRequest":{
        "type":"structure",
        "members":{
          "Filters":{
            "shape":"FilterList",
            "documentation":"<p>An array of structures that you can use to filter the results by your specified criteria. For
example, you can specify <code>Region</code> in the <code>Name</code>, with the <code>contains</code>
operator to list all subscriptions that match a partial string in the <code>Value</code>, such as <code>us-
west</code>.</p> <p>For each filter, you can specify one of the following values for the <code>Name</code> key
to streamline results:</p>
   <p> <code>AccountID</code> </p>   <p> <code>AmiID</code> </p>   <p>
<code>DualSubscription</code> </p>   <p> <code>InstanceID</code> </p>   <p>
<code>InstanceType</code> </p>   <p> <code>ProductCode</code> </p>   <p>
<code>Region</code> </p>   <p> <code>Status</code> </p>   <p>
<code>UsageOperation</code> </p>   <p>For each filter, you can use one of the following
<code>Operator</code> values to define the behavior of the filter:</p>   <p> <code>contains</code> </p>
  <p> <code>equals</code> </p>   <p> <code>Notequal</code> </p> "
          },
          "MaxResults":{
            "shape":"BoxInteger",
            "documentation":"<p>The maximum items to return in a request.</p>"
          },
          "NextToken":{
            "shape":"ListLinuxSubscriptionInstancesRequestNextTokenString",
            "documentation":"<p>A token to specify where to start paginating.

This is the nextToken from a previously truncated response.</p>"
      }
    },
   "documentation":"<p>NextToken length limit is half of ddb accepted limit. Increase this limit if parameters in request increases.</p>"
  },
 "ListLinuxSubscriptionInstancesRequestNextTokenString":{
  "type":"string",
  "max":16384,
  "min":1
 },
 "ListLinuxSubscriptionInstancesResponse":{
  "type":"structure",
  "members":{
   "Instances":{
    "shape":"InstanceList",
    "documentation":"<p>An array that contains instance objects.</p>"
   },
   "NextToken":{
    "shape":"String",
    "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
   }
  }
 },
 "ListLinuxSubscriptionsRequest":{
  "type":"structure",
  "members":{
   "Filters":{
    "shape":"FilterList",
    "documentation":"<p>An array of structures that you can use to filter the results to those that match one or more sets of key-value pairs that you specify. For example, you can filter by the name of <code>Subscription</code> with an optional operator to see subscriptions that match, partially match, or don't match a certain subscription's name.</p> <p>The valid names for this filter are:</p>   <p> <code>Subscription</code> </p>   <p>The valid Operators for this filter are:</p>   <p> <code>contains</code> </p>   <p> <code>equals</code> </p>   <p> <code>Notequal</code> </p> "
   },
   "MaxResults":{
    "shape":"BoxInteger",
    "documentation":"<p>The maximum items to return in a request.</p>"
   },
   "NextToken":{
    "shape":"ListLinuxSubscriptionsRequestNextTokenString",
    "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>"
   }

```
      },
    "documentation":"<p>NextToken length limit is half of ddb accepted limit. Increase this limit if parameters in
request increases.</p>"
    },
  "ListLinuxSubscriptionsRequestNextTokenString":{
    "type":"string",
    "max":16384,
    "min":1
  },
  "ListLinuxSubscriptionsResponse":{
    "type":"structure",
    "members":{
      "NextToken":{
        "shape":"String",
        "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
      },
      "Subscriptions":{
        "shape":"SubscriptionList",
        "documentation":"<p>An array that contains subscription objects.</p>"
      }
    }
  },
  "ListRegisteredSubscriptionProvidersRequest":{
    "type":"structure",
    "members":{
      "MaxResults":{
        "shape":"ListRegisteredSubscriptionProvidersRequestMaxResultsInteger",
        "documentation":"<p>The maximum items to return in a request.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
      },
      "SubscriptionProviderSources":{
        "shape":"SubscriptionProviderSourceList",
        "documentation":"<p>To filter your results, specify which subscription providers to return in the list.</p>"
      }
    }
  },
  "ListRegisteredSubscriptionProvidersRequestMaxResultsInteger":{
    "type":"integer",
    "box":true,
    "max":100,
    "min":1
  },
```

```
    "ListRegisteredSubscriptionProvidersResponse":{
      "type":"structure",
      "members":{
        "NextToken":{
          "shape":"String",
          "documentation":"<p>The next token
 used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't
included in this request. Use this token with the next request to retrieve additional objects.</p>"
        },
        "RegisteredSubscriptionProviders":{
          "shape":"RegisteredSubscriptionProviderList",
          "documentation":"<p>The list of BYOL registration resources that fit the criteria you specified in the
request.</p>"
        }
      }
    },
    "ListTagsForResourceRequest":{
      "type":"structure",
      "required":["resourceArn"],
      "members":{
        "resourceArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the resource for which to list metadata
tags.</p>",
          "location":"uri",
          "locationName":"resourceArn"
        }
      }
    },
    "ListTagsForResourceResponse":{
      "type":"structure",
      "members":{
        "tags":{
          "shape":"Tags",

  "documentation":"<p>The metadata tags for the requested resource.</p>"
        }
      }
    },
    "Operator":{
      "type":"string",
      "enum":[
        "Equal",
        "NotEqual",
        "Contains"
      ],
      "max":20,
      "min":1
```

```
      },
    "OrganizationIntegration":{
     "type":"string",
     "enum":[
       "Enabled",
       "Disabled"
     ]
    },
    "ProductCodeList":{
     "type":"list",
     "member":{"shape":"String"}
    },
    "RegisterSubscriptionProviderRequest":{
     "type":"structure",
     "required":[
       "SecretArn",
       "SubscriptionProviderSource"
     ],
     "members":{
       "SecretArn":{
         "shape":"SecretArn",
         "documentation":"<p>The Amazon Resource Name (ARN) of the secret where you've stored your subscription
provider's access token. For RHEL subscriptions managed through the Red Hat Subscription Manager (RHSM), the
secret contains your Red Hat Offline token.</p>"
       },
       "SubscriptionProviderSource":{
         "shape":"SubscriptionProviderSource",
         "documentation":"<p>The supported Linux subscription provider to register.</p>"
       },
       "Tags":{
         "shape":"Tags",
         "documentation":"<p>The metadata tags to assign to your registered Linux subscription provider
resource.</p>"
       }
     }
    },
    "RegisterSubscriptionProviderResponse":{
     "type":"structure",
     "members":{
       "SubscriptionProviderArn":{
         "shape":"String",
         "documentation":"<p>The Amazon Resource Name (ARN) of the Linux subscription provider resource that
you registered.</p>"
       },
       "SubscriptionProviderSource":{
         "shape":"SubscriptionProviderSource",
         "documentation":"<p>The Linux subscription provider that you registered.</p>"
       },
```

```
      "SubscriptionProviderStatus":{
        "shape":"SubscriptionProviderStatus",
        "documentation":"<p>Indicates the status of the registration action for
 the Linux subscription provider that you requested.</p>"
      }
    }
  },
    "RegisteredSubscriptionProvider":{
     "type":"structure",
     "members":{
       "LastSuccessfulDataRetrievalTime":{
         "shape":"String",
         "documentation":"<p>The timestamp from the last time that License Manager accessed third-party
subscription data for your account from your registered Linux subscription provider.</p>"
       },
       "SecretArn":{
         "shape":"SecretArn",
         "documentation":"<p>The Amazon Resource Name (ARN) of the Secrets Manager secret that stores your
registered Linux subscription provider access token. For RHEL account subscriptions, this is the offline token.</p>"
       },
       "SubscriptionProviderArn":{
         "shape":"SubscriptionProviderArn",
         "documentation":"<p>The Amazon Resource Name (ARN) of the Linux subscription provider resource that
you registered.</p>"
       },
       "SubscriptionProviderSource":{

    "shape":"SubscriptionProviderSource",
         "documentation":"<p>A supported third-party Linux subscription provider. License Manager currently
supports Red Hat subscriptions.</p>"
       },
       "SubscriptionProviderStatus":{
         "shape":"SubscriptionProviderStatus",
         "documentation":"<p>Indicates the status of your registered Linux subscription provider access token from the
last time License Manager retrieved subscription data. For RHEL account subscriptions, this is the status of the
offline token.</p>"
       },
       "SubscriptionProviderStatusMessage":{
         "shape":"String",
         "documentation":"<p>A detailed message that's associated with your BYOL subscription provider token
status.</p>"
       }
     },
     "documentation":"<p>A third-party provider for operating system (OS) platform software and license
subscriptions, such as Red Hat. When you register a third-party Linux subscription provider, License Manager can
get subscription
 data from the registered provider.</p>"
   },
```

"RegisteredSubscriptionProviderList":{
 "type":"list",
 "member":{"shape":"RegisteredSubscriptionProvider"}
},
"ResourceNotFoundException":{
 "type":"structure",
 "members":{
  "message":{"shape":"String"}
 },
 "documentation":"<p>Unable to find the requested Amazon Web Services resource.</p>",
 "exception":true
},
"SecretArn":{
 "type":"string",
 "pattern":"^arn:[a-z0-9-\\.]{1,63}:secretsmanager:[a-z0-9-\\.]{0,63}:[a-z0-9-\\.]{0,63}:secret:[^/]{1,1023}$"
},
"Status":{
 "type":"string",
 "enum":[
  "InProgress",
  "Completed",
  "Successful",
  "Failed"
 ]
},
"String":{"type":"string"},
"StringList":{
 "type":"list",
 "member":{"shape":"StringListMemberString"},
 "max":100,
 "min":1
},
"StringListMemberString":{
 "type":"string",
 "max":100,
 "min":1
},
"StringMap":{
 "type":"map",
 "key":{"shape":"String"},
 "value":{"shape":"String"}
},
"Subscription":{
 "type":"structure",
 "members":{
  "InstanceCount":{
   "shape":"BoxLong",
   "documentation":"<p>The total amount of running instances using this subscription.</p>"

```
      },
      "Name":{
        "shape":"String",
        "documentation":"<p>The name of the subscription.</p>"
      },
      "Type":{
        "shape":"String",
        "documentation":"<p>The type of subscription. The type can be subscription-included with Amazon EC2,
Bring Your Own Subscription model (BYOS), or from the Amazon Web Services Marketplace. Certain
subscriptions may use licensing from the Amazon Web Services Marketplace as well as OS licensing from Amazon
EC2 or BYOS.</p>"
      }
    },
    "documentation":"<p>An object which details a discovered Linux subscription.</p>"
  },
  "SubscriptionList":{
    "type":"list",
    "member":{"shape":"Subscription"}
  },
  "SubscriptionProviderArn":{
    "type":"string",
    "pattern":"^arn:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,510}/[a-
z0-9-\\.]{1,510}$"
  },
  "SubscriptionProviderSource":{
    "type":"string",
    "enum":["RedHat"]
  },
  "SubscriptionProviderSourceList":{
    "type":"list",
    "member":{"shape":"SubscriptionProviderSource"}
  },
  "SubscriptionProviderStatus":{
    "type":"string",
    "enum":[
      "ACTIVE",
      "INVALID",
      "PENDING"
    ]
  },
  "TagKeyList":{
    "type":"list",
    "member":{"shape":"String"},
    "max":50,
    "min":0,
    "sensitive":true
  },
  "TagResourceRequest":{
```

```
    "type":"structure",
    "required":[
      "resourceArn",
      "tags"
    ],
    "members":{
      "resourceArn":{
        "shape":"SubscriptionProviderArn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the Amazon
 Web Services resource to which to add the specified metadata tags.</p>",
        "location":"uri",
        "locationName":"resourceArn"
      },
      "tags":{
        "shape":"Tags",
        "documentation":"<p>The metadata tags to assign to the Amazon Web Services resource. Tags are formatted
as key value pairs.</p>"
      }
    }
  },
  "TagResourceResponse":{
    "type":"structure",
    "members":{
    }
  },
  "Tags":{
    "type":"map",
    "key":{"shape":"String"},
    "value":{"shape":"String"},
    "max":50,
    "min":0,
    "sensitive":true
  },
  "ThrottlingException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>The request was denied due to request throttling.</p>",
    "exception":true
  },
  "UntagResourceRequest":{
    "type":"structure",
    "required":[
      "resourceArn",
      "tagKeys"
    ],
    "members":{
```

```
      "resourceArn":{
        "shape":"SubscriptionProviderArn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the Amazon Web Services resource to remove
the metadata tags from.</p>",
        "location":"uri",
        "locationName":"resourceArn"
      },
      "tagKeys":{
       "shape":"TagKeyList",
       "documentation":"<p>A list of metadata tag keys to remove from the requested resource.</p>",
       "location":"querystring",
       "locationName":"tagKeys"
      }
     }
    },
    "UntagResourceResponse":{
     "type":"structure",
     "members":{
     }
    },
    "UpdateServiceSettingsRequest":{
     "type":"structure",
     "required":[
      "LinuxSubscriptionsDiscovery",
      "LinuxSubscriptionsDiscoverySettings"
     ],
     "members":{
      "AllowUpdate":{
        "shape":"Boolean",
        "documentation":"<p>Describes if updates are allowed to the service settings for Linux subscriptions. If you
allow updates, you can aggregate
 Linux subscription data in more than one home Region.</p>"
      },
      "LinuxSubscriptionsDiscovery":{
        "shape":"LinuxSubscriptionsDiscovery",
        "documentation":"<p>Describes if the discovery of Linux subscriptions is enabled.</p>"
      },
      "LinuxSubscriptionsDiscoverySettings":{
        "shape":"LinuxSubscriptionsDiscoverySettings",
        "documentation":"<p>The settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
      }
     }
    },
    "UpdateServiceSettingsResponse":{
     "type":"structure",
     "members":{
      "HomeRegions":{
```

```
      "shape":"StringList",
      "documentation":"<p>The Region in which License Manager displays the aggregated data for Linux
subscriptions.</p>"
    },
    "LinuxSubscriptionsDiscovery":{
      "shape":"LinuxSubscriptionsDiscovery",
      "documentation":"<p>Lists
 if discovery has been enabled for Linux subscriptions.</p>"
    },
    "LinuxSubscriptionsDiscoverySettings":{
      "shape":"LinuxSubscriptionsDiscoverySettings",
      "documentation":"<p>The settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
    },
    "Status":{
      "shape":"Status",
      "documentation":"<p>Indicates the status of Linux subscriptions settings being applied.</p>"
    },
    "StatusMessage":{
      "shape":"StringMap",
      "documentation":"<p>A message which details the Linux subscriptions service settings current status.</p>"
    }
    }
  },
  "ValidationException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>The provided input is not valid. Try your request again.</p>",
    "exception":true
  }

 },
 "documentation":"<p>With License Manager, you can discover and track your commercial Linux subscriptions on
running Amazon EC2 instances.</p>"
}
{
  "ResponseMetadata": {
    "RequestId": "9a285199-c8d6-47c2-bdb2-314cb47d599d"
  }
}
{
 "version": "1.0",
 "examples": {
 }
}
```

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==============================

```
{
 "pagination": {
  "ListIdentityProviders": {
    "input_token": "NextToken",
    "output_token": "NextToken",
    "limit_key": "MaxResults",
    "result_key": "IdentityProviderSummaries"
  },
  "ListInstances": {
    "input_token": "NextToken",
    "output_token": "NextToken",
    "limit_key": "MaxResults",
    "result_key": "InstanceSummaries"
  },
  "ListProductSubscriptions": {
   "input_token": "NextToken",
   "output_token": "NextToken",
   "limit_key": "MaxResults",
   "result_key": "ProductUserSummaries"
  },
  "ListUserAssociations": {
   "input_token": "NextToken",
   "output_token": "NextToken",
   "limit_key": "MaxResults",
   "result_key": "InstanceUserSummaries"
  },
  "ListLicenseServerEndpoints": {
   "input_token": "NextToken",
   "output_token": "NextToken",
   "limit_key": "MaxResults",
   "result_key": "LicenseServerEndpoints"
  }
 }
}
```

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```

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      "UseFIPS": false,
      "UseDualStack": false
    }
  },
  {
    "documentation": "For region us-isob-east-1 with FIPS enabled and DualStack enabled",
    "expect": {
      "error": "FIPS and DualStack are enabled, but this partition does not support one or both"
    },
    "params": {
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      "UseFIPS": true,
      "UseDualStack": true
    }
  },
  {
    "documentation": "For region us-isob-east-1 with FIPS enabled and DualStack disabled",
    "expect": {
      "endpoint": {
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      }
    },
    "params": {
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      "UseFIPS": true,
      "UseDualStack": false
    }
  },
  {
    "documentation": "For region us-isob-east-1 with FIPS disabled and DualStack enabled",
    "expect": {
      "error": "DualStack is enabled but this partition does not support DualStack"
```

```
    },
    "params": {
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      "UseFIPS": false,
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  },
  {
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    "expect": {
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      }
    },
    "params": {
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      "UseFIPS": false,
      "UseDualStack": false
    }
  },
  {

    "documentation": "For custom endpoint with region set and fips disabled and dualstack disabled",
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        "url": "https://example.com"
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    },
    "params": {
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      "UseFIPS": false,
      "UseDualStack": false,
      "Endpoint": "https://example.com"
    }
  },
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    "documentation": "For custom endpoint with region not set and fips disabled and dualstack disabled",
    "expect": {
      "endpoint": {
        "url": "https://example.com"
      }
    },
    "params": {
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      "UseDualStack": false,
      "Endpoint": "https://example.com"
    }
  },
```

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    {
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        "expect":
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            "error": "Invalid Configuration: FIPS and custom endpoint are not supported"
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            "UseFIPS": true,
            "UseDualStack": false,
            "Endpoint": "https://example.com"
        }
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        "expect": {
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            "UseDualStack": true,
            "Endpoint": "https://example.com"
        }
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    {
        "documentation": "Missing region",
        "expect": {
            "error": "Invalid Configuration: Missing Region"
        }
    }
  ],
  "version": "1.0"
}
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1.218 boto3 1.37.21

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1.219 botocore 1.37.21

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{
 "version":"2.0",
 "metadata":{
   "apiVersion":"2018-08-01",
   "endpointPrefix":"license-manager",
   "jsonVersion":"1.1",
   "protocol":"json",
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        ],
        "documentation":"<p>Checks in the specified license. Check in a license when it is no longer in use.</p>"
      },
      "CheckoutBorrowLicense":{
        "name":"CheckoutBorrowLicense",
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```
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      "requestUri":"/"
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     "input":{"shape":"CheckoutBorrowLicenseRequest"},
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     "documentation":"<p>Checks out the specified license for offline use.</p>"
    },
    "CheckoutLicense":{
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     "documentation":"<p>Checks out the specified license.</p> <note> <p>If the account that created the license is the same that is performing the check out, you must specify the account as the beneficiary.</p> </note>"
    },
    "CreateGrant":{
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     "http":{
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      "requestUri":"/"
```

```
    },
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      {"shape":"RateLimitExceededException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Creates a grant for the specified license. A grant shares the use of license entitlements with
a specific Amazon Web Services account, an organization, or an organizational unit (OU). For more information,
see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/granted-licenses.html\">Granted
licenses in License Manager</a> in the <i>License Manager User Guide</i>.</p>"
  },
  "CreateGrantVersion":{
    "name":"CreateGrantVersion",
    "http":{
      "method":"POST",
      "requestUri":"/"
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    "input":{"shape":"CreateGrantVersionRequest"},
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    ],
    "documentation":"<p>Creates a new version of the specified grant. For more information, see <a
href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/granted-licenses.html\">Granted licenses in
License Manager</a> in the <i>License Manager User Guide</i>.</p>"
  },
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     ],
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    "CreateLicenseConfiguration":{
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      "requestUri":"/"
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      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Creates a license configuration.</p> <p>A license configuration is an abstraction of a customer license agreement that can be consumed and enforced by License Manager. Components include specifications for the license type (licensing by instance, socket, CPU, or vCPU), allowed tenancy (shared tenancy, Dedicated Instance,
 Dedicated Host, or all of these), license affinity to host (how long a license must be associated with a host), and the number of licenses purchased and used.</p>"
    },
    "CreateLicenseConversionTaskForResource":{
     "name":"CreateLicenseConversionTaskForResource",
     "http":{
      "method":"POST",
      "requestUri":"/"
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     "input":{"shape":"CreateLicenseConversionTaskForResourceRequest"},
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      {"shape":"ValidationException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],

      "documentation":"<p>Creates a new license conversion task.</p>"
    },
    "CreateLicenseManagerReportGenerator":{
      "name":"CreateLicenseManagerReportGenerator",
      "http":{
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        "requestUri":"/"
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        {"shape":"RateLimitExceededException"},
        {"shape":"AccessDeniedException"},
        {"shape":"ResourceNotFoundException"}
      ],
      "documentation":"<p>Creates a report generator.</p>"
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      "name":"CreateLicenseVersion",
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        "method":"POST",
        "requestUri":"/"
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        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Creates a new version of the specified license.</p>"
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      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"RedirectException"}
    ],
    "documentation":"<p>Creates a long-lived
 token.</p> <p>A refresh token is a JWT token used to get an access token. With an access token, you can call
AssumeRoleWithWebIdentity to get role credentials that you can use to call License Manager to manage the
specified license.</p>"
  },
  "DeleteGrant":{
    "name":"DeleteGrant",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"DeleteGrantRequest"},
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      {"shape":"AccessDeniedException"},
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      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"}
    ],
    "documentation":"<p>Deletes the specified grant.</p>"
  },
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    "name":"DeleteLicense",
    "http":{
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      "requestUri":"/"
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    "input":{"shape":"DeleteLicenseRequest"},
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    "http":{
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    "errors":[
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      {"shape":"AccessDeniedException"},
       {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Deletes the specified license configuration.</p> <p>You cannot delete a license
configuration that is in use.</p>"
  },
  "DeleteLicenseManagerReportGenerator":{
    "name":"DeleteLicenseManagerReportGenerator",
    "http":{
      "method":"POST",
      "requestUri":"/"
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      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Deletes the specified report
generator.</p> <p>This action deletes the report generator, which stops it from generating future reports. The
action cannot be reversed. It has no effect on the previous reports from this generator.</p>"
  },
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 "documentation":"<p>Deletes the specified token. Must be called in the license home Region.</p>"
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"ExtendLicenseConsumption":{
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 "http":{
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 "documentation":"<p>Extends the expiration date for license consumption.</p>"
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      ],
      "documentation":"<p>Gets detailed information about the specified license.</p>"
    },
    "GetLicenseConfiguration":{
      "name":"GetLicenseConfiguration",
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```
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      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"RateLimitExceededException"},
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      {"shape":"AccessDeniedException"},
      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Gets information about the specified report generator.</p>"
  },
  "GetLicenseUsage":{
    "name":"GetLicenseUsage",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"GetLicenseUsageRequest"},
    "output":{"shape":"GetLicenseUsageResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"}
    ],
    "documentation":"<p>Gets detailed information about the usage of the specified license.</p>"
  },
  "GetServiceSettings":{
    "name":"GetServiceSettings",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"GetServiceSettingsRequest"},
    "output":{"shape":"GetServiceSettingsResponse"},
    "errors":[
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      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Gets the License Manager settings for the current Region.</p>"
  },
  "ListAssociationsForLicenseConfiguration":{
    "name":"ListAssociationsForLicenseConfiguration",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListAssociationsForLicenseConfigurationRequest"},
    "output":{"shape":"ListAssociationsForLicenseConfigurationResponse"},
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　　　　{"shape":"AccessDeniedException"},
　　　　{"shape":"RateLimitExceededException"}
　　　],
　　　"documentation":"<p>Lists the resource associations for the specified license configuration.</p> <p>Resource associations need not consume licenses from a license configuration. For example, an AMI or a stopped instance might not consume a license (depending on the license rules).</p>"
　　},
　　"ListDistributedGrants":{
　　　"name":"ListDistributedGrants",
　　　"http":{
　　　　"method":"POST",
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　　　"input":{"shape":"ListDistributedGrantsRequest"},
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　　　　{"shape":"RateLimitExceededException"}
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　　　"documentation":"<p>Lists the grants distributed for the specified license.</p>"
　　},
　　"ListFailuresForLicenseConfigurationOperations":{
　　　"name":"ListFailuresForLicenseConfigurationOperations",
　　　"http":{
　　　　"method":"POST",
　　　　"requestUri":"/"
　　　},
　　　"input":{"shape":"ListFailuresForLicenseConfigurationOperationsRequest"},
　　　"output":{"shape":"ListFailuresForLicenseConfigurationOperationsResponse"},
　　　"errors":[
　　　　{"shape":"InvalidParameterValueException"},
　　　　{"shape":"ServerInternalException"},
　　　　{"shape":"AuthorizationException"},
　　　　{"shape":"AccessDeniedException"},
　　　　{"shape":"RateLimitExceededException"}
　　　],
　　　"documentation":"<p>Lists the license configuration operations that failed.</p>"

      },
    "ListLicenseConfigurations":{
      "name":"ListLicenseConfigurations",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"ListLicenseConfigurationsRequest"},
      "output":{"shape":"ListLicenseConfigurationsResponse"},
      "errors":[
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        {"shape":"ServerInternalException"},
        {"shape":"FilterLimitExceededException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Lists the license configurations for your account.</p>"
    },
    "ListLicenseConversionTasks":{
      "name":"ListLicenseConversionTasks",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"ListLicenseConversionTasksRequest"},
      "output":{"shape":"ListLicenseConversionTasksResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Lists the license type conversion tasks for your account.</p>"
    },
    "ListLicenseManagerReportGenerators":{
      "name":"ListLicenseManagerReportGenerators",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"ListLicenseManagerReportGeneratorsRequest"},
      "output":{"shape":"ListLicenseManagerReportGeneratorsResponse"},
      "errors":[
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        {"shape":"InvalidParameterValueException"},
        {"shape":"ResourceLimitExceededException"},

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          {"shape":"ServerInternalException"},
          {"shape":"AuthorizationException"},
          {"shape":"RateLimitExceededException"},
          {"shape":"AccessDeniedException"},
          {"shape":"ResourceNotFoundException"}
        ],
        "documentation":"<p>Lists the report generators for your account.</p>"
      },
      "ListLicenseSpecificationsForResource":{
        "name":"ListLicenseSpecificationsForResource",
        "http":{
          "method":"POST",
          "requestUri":"/"
        },
        "input":{"shape":"ListLicenseSpecificationsForResourceRequest"},
        "output":{"shape":"ListLicenseSpecificationsForResourceResponse"},
        "errors":[
          {"shape":"InvalidParameterValueException"},
          {"shape":"ServerInternalException"},
          {"shape":"AuthorizationException"},
          {"shape":"AccessDeniedException"},
          {"shape":"RateLimitExceededException"}
        ],
        "documentation":"<p>Describes the license configurations for the specified resource.</p>"
      },
      "ListLicenseVersions":{
        "name":"ListLicenseVersions",
        "http":{
          "method":"POST",
          "requestUri":"/"
        },
        "input":{"shape":"ListLicenseVersionsRequest"},
        "output":{"shape":"ListLicenseVersionsResponse"},
        "errors":[
          {"shape":"InvalidParameterValueException"},
          {"shape":"AuthorizationException"},
          {"shape":"AccessDeniedException"},
          {"shape":"RateLimitExceededException"},
          {"shape":"ServerInternalException"}
        ],
        "documentation":"<p>Lists all versions of the specified license.</p>"
      },
      "ListLicenses":{
        "name":"ListLicenses",
        "http":{
          "method":"POST",
          "requestUri":"/"
        },
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"input":{"shape":"ListLicensesRequest"},
"output":{"shape":"ListLicensesResponse"},
"errors":[
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  {"shape":"InvalidParameterValueException"},
  {"shape":"AuthorizationException"},
  {"shape":"AccessDeniedException"},
  {"shape":"RateLimitExceededException"},
  {"shape":"ServerInternalException"}
],
"documentation":"<p>Lists the licenses for your account.</p>"
},
"ListReceivedGrants":{
"name":"ListReceivedGrants",
"http":{
  "method":"POST",
  "requestUri":"/"
},
"input":{"shape":"ListReceivedGrantsRequest"},
"output":{"shape":"ListReceivedGrantsResponse"},
"errors":[
  {"shape":"ValidationException"},
  {"shape":"InvalidParameterValueException"},
  {"shape":"ResourceLimitExceededException"},
  {"shape":"ServerInternalException"},
  {"shape":"AuthorizationException"},
  {"shape":"AccessDeniedException"},
  {"shape":"RateLimitExceededException"}
],
"documentation":"<p>Lists grants that are received. Received grants are grants created while specifying the recipient as this Amazon Web Services account, your organization, or an organizational unit (OU) to which this member account belongs.</p>"
},
"ListReceivedGrantsForOrganization":{
"name":"ListReceivedGrantsForOrganization",
"http":{
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  "requestUri":"/"
},
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  {"shape":"InvalidParameterValueException"},
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  {"shape":"ServerInternalException"},
  {"shape":"AuthorizationException"},
  {"shape":"AccessDeniedException"},

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    {"shape":"RateLimitExceededException"}
   ],
   "documentation":"<p>Lists the grants received for all accounts in the organization.</p>"
  },
  "ListReceivedLicenses":{
   "name":"ListReceivedLicenses",
   "http":{
    "method":"POST",
    "requestUri":"/"
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    {"shape":"ResourceLimitExceededException"},
    {"shape":"ServerInternalException"},
     {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
   ],
   "documentation":"<p>Lists received licenses.</p>"
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  "ListReceivedLicensesForOrganization":{
   "name":"ListReceivedLicensesForOrganization",
   "http":{
    "method":"POST",
    "requestUri":"/"
   },
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   "output":{"shape":"ListReceivedLicensesForOrganizationResponse"},
   "errors":[
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    {"shape":"InvalidParameterValueException"},
    {"shape":"ResourceLimitExceededException"},
    {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
   ],
   "documentation":"<p>Lists the licenses received for all accounts in the organization.</p>"
  },
  "ListResourceInventory":{
   "name":"ListResourceInventory",
   "http":{
    "method":"POST",
    "requestUri":"/"
   },
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    "input":{"shape":"ListResourceInventoryRequest"},
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      {"shape":"FilterLimitExceededException"},
      {"shape":"FailedDependencyException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists resources managed using Systems Manager inventory.</p>"
  },
  "ListTagsForResource":{
    "name":"ListTagsForResource",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListTagsForResourceRequest"},
    "output":{"shape":"ListTagsForResourceResponse"},
    "errors":[
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      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists the tags for the specified license configuration.</p>"
  },
  "ListTokens":{
    "name":"ListTokens",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListTokensRequest"},
    "output":{"shape":"ListTokensResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"}
    ],
    "documentation":"<p>Lists your tokens.</p>"
  },
  "ListUsageForLicenseConfiguration":{
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    "name":"ListUsageForLicenseConfiguration",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListUsageForLicenseConfigurationRequest"},
    "output":{"shape":"ListUsageForLicenseConfigurationResponse"},
    "errors":[
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      {"shape":"FilterLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists all license usage records for a license configuration, displaying license consumption
details by resource at a selected point in time. Use this action to audit the current license consumption for any
license inventory and configuration.</p>"
  },
  "RejectGrant":{
    "name":"RejectGrant",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"RejectGrantRequest"},
    "output":{"shape":"RejectGrantResponse"},
    "errors":[
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      {"shape":"InvalidParameterValueException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"}
    ],
    "documentation":"<p>Rejects the specified grant.</p>"
  },
  "TagResource":{
    "name":"TagResource",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"TagResourceRequest"},
    "output":{"shape":"TagResourceResponse"},
    "errors":[
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      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Adds the specified tags to the specified license configuration.</p>"
  },
  "UntagResource":{
    "name":"UntagResource",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"UntagResourceRequest"},
    "output":{"shape":"UntagResourceResponse"},
    "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Removes the specified tags from the specified license configuration.</p>"
  },
  "UpdateLicenseConfiguration":{
    "name":"UpdateLicenseConfiguration",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"UpdateLicenseConfigurationRequest"},
    "output":{"shape":"UpdateLicenseConfigurationResponse"},
    "errors":[
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      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ResourceLimitExceededException"}
    ],
    "documentation":"<p>Modifies the attributes of an existing license configuration.</p>"
  },
  "UpdateLicenseManagerReportGenerator":{
    "name":"UpdateLicenseManagerReportGenerator",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },

"input":{"shape":"UpdateLicenseManagerReportGeneratorRequest"},
    "output":{"shape":"UpdateLicenseManagerReportGeneratorResponse"},
    "errors":[
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      {"shape":"InvalidParameterValueException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"ResourceLimitExceededException"}
    ],
    "documentation":"<p>Updates a report generator.</p> <p>After you make changes to a report generator, it starts generating new reports within 60 minutes of being updated.</p>"
  },
  "UpdateLicenseSpecificationsForResource":{
    "name":"UpdateLicenseSpecificationsForResource",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"UpdateLicenseSpecificationsForResourceRequest"},
    "output":{"shape":"UpdateLicenseSpecificationsForResourceResponse"},
    "errors":[
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      {"shape":"InvalidResourceStateException"},
      {"shape":"LicenseUsageException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Adds or removes the specified license configurations for the specified Amazon Web Services resource.</p> <p>You can update the license specifications of AMIs, instances, and hosts. You cannot update the license specifications
 for launch templates and CloudFormation templates, as they send license configurations to the operation that creates the resource.</p>"
  },
  "UpdateServiceSettings":{
    "name":"UpdateServiceSettings",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"UpdateServiceSettingsRequest"},
    "output":{"shape":"UpdateServiceSettingsResponse"},
    "errors":[
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        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Updates License Manager settings for the current Region.</p>"
    }
  },
  "shapes":{
    "AcceptGrantRequest":{
      "type":"structure",
      "required":["GrantArn"],
      "members":{
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
        }
      }
    },
    "AcceptGrantResponse":{
      "type":"structure",
      "members":{
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Grant ARN.</p>"
        },
        "Status":{
          "shape":"GrantStatus",
          "documentation":"<p>Grant status.</p>"
        },
        "Version":{
          "shape":"String",
          "documentation":"<p>Grant version.</p>"
        }
      }
    },
    "AccessDeniedException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>Access to resource denied.</p>",
      "exception":true
    },
    "ActivationOverrideBehavior":{
      "type":"string",
      "enum":[
        "DISTRIBUTED_GRANTS_ONLY",
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      "ALL_GRANTS_PERMITTED_BY_ISSUER"
    ]
  },
  "AllowedOperation":{
   "type":"string",
   "enum":[
     "CreateGrant",
     "CheckoutLicense",
     "CheckoutBorrowLicense",
     "CheckInLicense",
     "ExtendConsumptionLicense",
      "ListPurchasedLicenses",
     "CreateToken"
   ]
  },
  "AllowedOperationList":{
   "type":"list",
   "member":{"shape":"AllowedOperation"},
   "max":7,
   "min":1
  },
  "Arn":{
   "type":"string",
   "max":2048,
   "pattern":"^arn:aws(-(cn|us-gov|iso-b|iso-c|iso-d))?:[A-Za-z0-9][A-Za-z0-9_/.-]{0,62}:[A-Za-z0-9_/.-]{0,63}:[A-
Za-z0-9_/.-]{0,63}:[A-Za-z0-9][A-Za-z0-9:_/+=,@.-]{0,1023}$"
  },
  "ArnList":{
   "type":"list",
   "member":{"shape":"Arn"}
  },
  "AuthorizationException":{
   "type":"structure",
   "members":{
     "Message":{"shape":"Message"}
   },
   "documentation":"<p>The Amazon Web Services user account does not have permission to perform the action.
Check the IAM policy associated with this account.</p>",
   "exception":true
  },
  "AutomatedDiscoveryInformation":{
   "type":"structure",
   "members":{
     "LastRunTime":{
       "shape":"DateTime",
       "documentation":"<p>Time
that automated discovery last ran.</p>"
     }
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      },
      "documentation":"<p>Describes automated discovery.</p>"
    },
    "Boolean":{"type":"boolean"},
    "BorrowConfiguration":{
      "type":"structure",
      "required":[
        "AllowEarlyCheckIn",
        "MaxTimeToLiveInMinutes"
      ],
      "members":{
        "AllowEarlyCheckIn":{
          "shape":"BoxBoolean",
          "documentation":"<p>Indicates whether early check-ins are allowed.</p>"
        },
        "MaxTimeToLiveInMinutes":{
          "shape":"BoxInteger",
          "documentation":"<p>Maximum time for the borrow configuration, in minutes.</p>"
        }
      },
      "documentation":"<p>Details about a borrow configuration.</p>"
    },
    "BoxBoolean":{"type":"boolean"},
    "BoxInteger":{"type":"integer"},
    "BoxLong":{"type":"long"},
    "CheckInLicenseRequest":{
      "type":"structure",
      "required":["LicenseConsumptionToken"],
      "members":{
        "LicenseConsumptionToken":{
          "shape":"String",
          "documentation":"<p>License consumption token.</p>"
        },
        "Beneficiary":{
          "shape":"String",
          "documentation":"<p>License beneficiary.</p>"
        }
      }
    },
    "CheckInLicenseResponse":{
      "type":"structure",
      "members":{
      }
    },
    "CheckoutBorrowLicenseRequest":{
      "type":"structure",
      "required":[
        "LicenseArn",

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      "Entitlements",
      "DigitalSignatureMethod",
      "ClientToken"
     ],
     "members":{
      "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license. The license must use the borrow
consumption configuration.</p>"
      },
      "Entitlements":{
       "shape":"EntitlementDataList",
       "documentation":"<p>License entitlements. Partial checkouts are not supported.</p>"
      },
      "DigitalSignatureMethod":{
       "shape":"DigitalSignatureMethod",

     "documentation":"<p>Digital signature method. The possible value is JSON Web Signature (JWS) algorithm
PS384. For more information, see <a href=\"https://tools.ietf.org/html/rfc7518#section-3.5\">RFC 7518 Digital
Signature with RSASSA-PSS</a>.</p>"
      },
      "NodeId":{
       "shape":"String",
       "documentation":"<p>Node ID.</p>"
      },
      "CheckoutMetadata":{
       "shape":"MetadataList",
       "documentation":"<p>Information about constraints.</p>"
      },
      "ClientToken":{
       "shape":"ClientToken",
       "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      }
     }
    },
    "CheckoutBorrowLicenseResponse":{
     "type":"structure",
     "members":{
      "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "LicenseConsumptionToken":{
       "shape":"String",
        "documentation":"<p>License consumption token.</p>"
      },
      "EntitlementsAllowed":{
```

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        "shape":"EntitlementDataList",
        "documentation":"<p>Allowed license entitlements.</p>"
       },
       "NodeId":{
        "shape":"String",
        "documentation":"<p>Node ID.</p>"
       },
       "SignedToken":{
        "shape":"SignedToken",
        "documentation":"<p>Signed token.</p>"
       },
       "IssuedAt":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>Date and time at which the license checkout is issued.</p>"
       },
       "Expiration":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>Date and time at which the license checkout expires.</p>"
       },
       "CheckoutMetadata":{
        "shape":"MetadataList",
        "documentation":"<p>Information about constraints.</p>"
       }
      }
     },
     "CheckoutLicenseRequest":{
      "type":"structure",
      "required":[
       "ProductSKU",
        "CheckoutType",
       "KeyFingerprint",
       "Entitlements",
       "ClientToken"
      ],
      "members":{
       "ProductSKU":{
        "shape":"String",
        "documentation":"<p>Product SKU.</p>"
       },
       "CheckoutType":{
        "shape":"CheckoutType",
        "documentation":"<p>Checkout type.</p>"
       },
       "KeyFingerprint":{
        "shape":"String",
        "documentation":"<p>Key fingerprint identifying the license.</p>"
       },
       "Entitlements":{
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      "shape":"EntitlementDataList",
      "documentation":"<p>License entitlements.</p>"
    },
    "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
    },
    "Beneficiary":{
      "shape":"String",
      "documentation":"<p>License beneficiary.</p>"
    },
    "NodeId":{
      "shape":"String",
      "documentation":"<p>Node ID.</p>"
    }
  }
},
"CheckoutLicenseResponse":{
  "type":"structure",
  "members":{
    "CheckoutType":{
      "shape":"CheckoutType",
      "documentation":"<p>Checkout type.</p>"
    },
    "LicenseConsumptionToken":{
      "shape":"String",
      "documentation":"<p>License consumption token.</p>"
    },
    "EntitlementsAllowed":{
      "shape":"EntitlementDataList",
      "documentation":"<p>Allowed license entitlements.</p>"
    },
    "SignedToken":{
      "shape":"SignedToken",
      "documentation":"<p>Signed token.</p>"
    },
    "NodeId":{
      "shape":"String",
      "documentation":"<p>Node ID.</p>"
    },
    "IssuedAt":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>Date and time at which the license checkout is issued.</p>"
    },
    "Expiration":{
      "shape":"ISO8601DateTime",
```

"documentation":"<p>Date and time at which the license checkout expires.</p>"
    },
    "LicenseArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the checkout license.</p>"
    }
  }
},
"CheckoutType":{
  "type":"string",
  "enum":[
    "PROVISIONAL",
    "PERPETUAL"
  ]
},
"ClientRequestToken":{
  "type":"string",
  "max":36,
  "min":1
},
"ClientToken":{
  "type":"string",
  "max":2048,
  "pattern":"\\S+"
},
"ConflictException":{
  "type":"structure",
  "members":{
    "Message":{"shape":"Message"}
  },
  "documentation":"<p>There was a conflict processing the request. Try your request again.</p>",
  "exception":true
},
"ConsumedLicenseSummary":{
  "type":"structure",
  "members":{
    "ResourceType":{
      "shape":"ResourceType",
      "documentation":"<p>Resource type of the resource consuming a
license.</p>"
    },
    "ConsumedLicenses":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses consumed by the resource.</p>"
    }
  },
  "documentation":"<p>Details about license consumption.</p>"
},

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"ConsumedLicenseSummaryList":{
 "type":"list",
 "member":{"shape":"ConsumedLicenseSummary"}
},
"ConsumptionConfiguration":{
 "type":"structure",
 "members":{
  "RenewType":{
   "shape":"RenewType",
   "documentation":"<p>Renewal frequency.</p>"
  },
  "ProvisionalConfiguration":{
   "shape":"ProvisionalConfiguration",
   "documentation":"<p>Details about a provisional configuration.</p>"
  },
  "BorrowConfiguration":{
   "shape":"BorrowConfiguration",
   "documentation":"<p>Details about a borrow configuration.</p>"
  }
 },
 "documentation":"<p>Details about a consumption configuration.</p>"
},
"CreateGrantRequest":{
 "type":"structure",
 "required":[
  "ClientToken",
  "GrantName",
  "LicenseArn",
  "Principals",
  "HomeRegion",
  "AllowedOperations"
 ],
 "members":{
  "ClientToken":{
   "shape":"ClientToken",
   "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
  },
  "GrantName":{
   "shape":"String",
   "documentation":"<p>Grant name.</p>"
  },
  "LicenseArn":{
   "shape":"Arn",
   "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
  },
  "Principals":{
   "shape":"PrincipalArnList",
```

```
        "documentation":"<p>The grant principals. You can specify one of the following as an Amazon Resource
Name (ARN):</p> <ul> <li> <p>An Amazon Web Services account, which includes only the account
specified.</p> </li> </ul> <ul> <li> <p>An organizational unit (OU), which
 includes all accounts in the OU.</p> </li> </ul> <ul> <li> <p>An organization, which will include all accounts
across your organization.</p> </li> </ul>"
        },
      "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region of the grant.</p>"
        },
      "AllowedOperations":{
        "shape":"AllowedOperationList",
        "documentation":"<p>Allowed operations for the grant.</p>"
        }
      }
    },
  "CreateGrantResponse":{
    "type":"structure",
    "members":{
      "GrantArn":{
        "shape":"Arn",
        "documentation":"<p>Grant ARN.</p>"
        },
      "Status":{
        "shape":"GrantStatus",
        "documentation":"<p>Grant status.</p>"
        },
      "Version":{
        "shape":"String",
        "documentation":"<p>Grant version.</p>"
        }
      }
    },
  "CreateGrantVersionRequest":{
    "type":"structure",
    "required":[
      "ClientToken",
      "GrantArn"
    ],

"members":{
    "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      },
    "GrantArn":{
      "shape":"Arn",
```

```
        "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
      },
      "GrantName":{
        "shape":"String",
        "documentation":"<p>Grant name.</p>"
      },
      "AllowedOperations":{
        "shape":"AllowedOperationList",
        "documentation":"<p>Allowed operations for the grant.</p>"
      },
      "Status":{
        "shape":"GrantStatus",
        "documentation":"<p>Grant status.</p>"
      },
      "StatusReason":{
        "shape":"StatusReasonMessage",
        "documentation":"<p>Grant status reason.</p>"
      },
      "SourceVersion":{
        "shape":"String",
        "documentation":"<p>Current version of the grant.</p>"
      },
      "Options":{

        "shape":"Options",
        "documentation":"<p>The options specified for the grant.</p>"
      }
    }
  },
  "CreateGrantVersionResponse":{
    "type":"structure",
    "members":{
      "GrantArn":{
        "shape":"Arn",
        "documentation":"<p>Grant ARN.</p>"
      },
      "Status":{
        "shape":"GrantStatus",
        "documentation":"<p>Grant status.</p>"
      },
      "Version":{
        "shape":"String",
        "documentation":"<p>New version of the grant.</p>"
      }
    }
  },
  "CreateLicenseConfigurationRequest":{
    "type":"structure",
```

```
"required":[
  "Name",
  "LicenseCountingType"
],
"members":{
  "Name":{
    "shape":"String",
    "documentation":"<p>Name of the license configuration.</p>"
  },
  "Description":{
    "shape":"String",
    "documentation":"<p>Description of the license configuration.</p>"
  },
  "LicenseCountingType":{
    "shape":"LicenseCountingType",
    "documentation":"<p>Dimension used to track the license inventory.</p>"
  },
  "LicenseCount":{
    "shape":"BoxLong",
    "documentation":"<p>Number of licenses managed by the license configuration.</p>"
  },
  "LicenseCountHardLimit":{
    "shape":"BoxBoolean",
    "documentation":"<p>Indicates whether hard or soft license enforcement is used. Exceeding a hard limit blocks the launch of new instances.</p>"
  },
  "LicenseRules":{
    "shape":"StringList",
    "documentation":"<p>License rules. The syntax is #name=value (for example, #allowedTenancy=EC2-DedicatedHost). The available rules vary by dimension, as follows.</p> <ul> <li> <p> <code>Cores</code> dimension: <code>allowedTenancy</code> | <code>licenseAffinityToHost</code> | <code>maximumCores</code> | <code>minimumCores</code> </p> </li> <li> <p> <code>Instances</code> dimension: <code>allowedTenancy</code> | <code>maximumCores</code> | <code>minimumCores</code> | <code>maximumSockets</code> | <code>minimumSockets</code> | <code>maximumVcpus</code> | <code>minimumVcpus</code> </p> </li> <li> <p> <code>Sockets</code> dimension: <code>allowedTenancy</code> | <code>licenseAffinityToHost</code> | <code>maximumSockets</code> | <code>minimumSockets</code> </p> </li> <li> <p> <code>vCPUs</code> dimension: <code>allowedTenancy</code> | <code>honorVcpuOptimization</code> | <code>maximumVcpus</code> | <code>minimumVcpus</code> </p> </li> </ul> <p>The unit for <code>licenseAffinityToHost</code> is days and the range is 1 to 180. The possible values for <code>allowedTenancy</code> are <code>EC2-Default</code>, <code>EC2-DedicatedHost</code>, and <code>EC2-DedicatedInstance</code>. The possible values for <code>honorVcpuOptimization</code> are <code>True</code> and <code>False</code>.</p>"
  },
  "Tags":{
    "shape":"TagList",
    "documentation":"<p>Tags to add to the
```

```
        license configuration.</p>"
      },
      "DisassociateWhenNotFound":{
        "shape":"BoxBoolean",
        "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
      },
      "ProductInformationList":{
        "shape":"ProductInformationList",
        "documentation":"<p>Product information.</p>"
      }
    }
  },
  "CreateLicenseConfigurationResponse":{
   "type":"structure",
   "members":{
     "LicenseConfigurationArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
     }
   }
  },
  "CreateLicenseConversionTaskForResourceRequest":{
   "type":"structure",
   "required":[
     "ResourceArn",
     "SourceLicenseContext",
     "DestinationLicenseContext"
   ],
   "members":{
     "ResourceArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the resource you are converting
the license type for.</p>"
     },
     "SourceLicenseContext":{
       "shape":"LicenseConversionContext",
       "documentation":"<p>Information that identifies the license type you are converting from. For the structure of
the source license, see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/conversion-
procedures.html#conversion-cli\">Convert a license type using the CLI </a> in the <i>License Manager User
Guide</i>.</p>"
     },
     "DestinationLicenseContext":{
       "shape":"LicenseConversionContext",
       "documentation":"<p>Information that identifies the license type you are converting to. For the structure of the
destination license, see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/conversion-
procedures.html#conversion-cli\">Convert a license type using the CLI </a> in the <i>License Manager User
Guide</i>.</p>"
     }
```

```
        }
      },
    "CreateLicenseConversionTaskForResourceResponse":{
      "type":"structure",
      "members":{
       "LicenseConversionTaskId":{
        "shape":"LicenseConversionTaskId",
        "documentation":"<p>The ID of the created license type conversion task.</p>"
       }
      }
    },
    "CreateLicenseManagerReportGeneratorRequest":{
     "type":"structure",
     "required":[
       "ReportGeneratorName",
       "Type",
       "ReportContext",
       "ReportFrequency",
       "ClientToken"
     ],
     "members":{
       "ReportGeneratorName":{
        "shape":"ReportGeneratorName",
        "documentation":"<p>Name of the report generator.</p>"
       },
       "Type":{
        "shape":"ReportTypeList",
        "documentation":"<p>Type of reports to generate. The following report types an be generated:</p> <ul> <li>
<p>License configuration report - Reports the number and details of consumed licenses for a license
configuration.</p> </li> <li> <p>Resource report - Reports the tracked licenses and resource consumption
 for a license configuration.</p> </li> </ul>"
       },
       "ReportContext":{
        "shape":"ReportContext",
        "documentation":"<p>Defines the type of license configuration the report generator tracks.</p>"
       },
       "ReportFrequency":{
        "shape":"ReportFrequency",
        "documentation":"<p>Frequency by which reports are generated. Reports can be generated daily, monthly, or
weekly.</p>"
       },
       "ClientToken":{
        "shape":"ClientRequestToken",
        "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
       },
       "Description":{
        "shape":"String",
```

```
      "documentation":"<p>Description of the report generator.</p>"
     },
    "Tags":{
      "shape":"TagList",
      "documentation":"<p>Tags to add to the report generator.</p>"
     }
   }
  },
  "CreateLicenseManagerReportGeneratorResponse":{
   "type":"structure",
   "members":{
    "LicenseManagerReportGeneratorArn":{
      "shape":"String",
      "documentation":"<p>The Amazon Resource Name (ARN) of the new report generator.</p>"
     }
   }
  },
  "CreateLicenseRequest":{
   "type":"structure",
   "required":[
    "LicenseName",
    "ProductName",
    "ProductSKU",
    "Issuer",
    "HomeRegion",
    "Validity",
    "Entitlements",
    "Beneficiary",
    "ConsumptionConfiguration",
    "ClientToken"
   ],
   "members":{
    "LicenseName":{
      "shape":"String",
      "documentation":"<p>License name.</p>"
     },
    "ProductName":{
      "shape":"String",
      "documentation":"<p>Product name.</p>"
     },
    "ProductSKU":{
      "shape":"String",
      "documentation":"<p>Product SKU.</p>"
     },
    "Issuer":{
      "shape":"Issuer",
      "documentation":"<p>License issuer.</p>"
     },
```

```
    "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region for the license.</p>"
    },
    "Validity":{
      "shape":"DatetimeRange",
      "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
    },
    "Entitlements":{
      "shape":"EntitlementList",
      "documentation":"<p>License entitlements.</p>"
    },
    "Beneficiary":{
      "shape":"String",
      "documentation":"<p>License beneficiary.</p>"
    },
    "ConsumptionConfiguration":{
      "shape":"ConsumptionConfiguration",
      "documentation":"<p>Configuration for consumption of the license. Choose a provisional configuration for
workloads running with continuous connectivity. Choose a borrow configuration for workloads with offline
usage.</p>"
    },
    "LicenseMetadata":{
      "shape":"MetadataList",
      "documentation":"<p>Information about the license.</p>"
    },
    "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
    }
  }
},
  "CreateLicenseResponse":{
   "type":"structure",
   "members":{
    "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
    },
    "Status":{
      "shape":"LicenseStatus",
      "documentation":"<p>License status.</p>"
    },
    "Version":{
      "shape":"String",
      "documentation":"<p>License version.</p>"
```

```
            }
          }
        },
        "CreateLicenseVersionRequest":{
          "type":"structure",
          "required":[
            "LicenseArn",
            "LicenseName",
            "ProductName",
            "Issuer",
            "HomeRegion",
            "Validity",
            "Entitlements",
            "ConsumptionConfiguration",
            "Status",
            "ClientToken"
          ],

        "members":{
            "LicenseArn":{
              "shape":"Arn",
              "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
            },
            "LicenseName":{
              "shape":"String",
              "documentation":"<p>License name.</p>"
            },
            "ProductName":{
              "shape":"String",
              "documentation":"<p>Product name.</p>"
            },
            "Issuer":{
              "shape":"Issuer",
              "documentation":"<p>License issuer.</p>"
            },
            "HomeRegion":{
              "shape":"String",
              "documentation":"<p>Home Region of the license.</p>"
            },
            "Validity":{
              "shape":"DatetimeRange",
              "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
            },
            "LicenseMetadata":{
              "shape":"MetadataList",
              "documentation":"<p>Information about the license.</p>"
            },
            "Entitlements":{
```

```
      "shape":"EntitlementList",
      "documentation":"<p>License
entitlements.</p>"
     },
     "ConsumptionConfiguration":{
      "shape":"ConsumptionConfiguration",
      "documentation":"<p>Configuration for consumption of the license. Choose a provisional configuration for
workloads running with continuous connectivity. Choose a borrow configuration for workloads with offline
usage.</p>"
     },
     "Status":{
      "shape":"LicenseStatus",
      "documentation":"<p>License status.</p>"
     },
     "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
     },
     "SourceVersion":{
      "shape":"String",
      "documentation":"<p>Current version of the license.</p>"
     }
    }
   },
   "CreateLicenseVersionResponse":{
    "type":"structure",
    "members":{
     "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>License
ARN.</p>"
     },
     "Version":{
      "shape":"String",
      "documentation":"<p>New version of the license.</p>"
     },
     "Status":{
      "shape":"LicenseStatus",
      "documentation":"<p>License status.</p>"
     }
    }
   },
   "CreateTokenRequest":{
    "type":"structure",
    "required":[
     "LicenseArn",
     "ClientToken"
```

      ],
      "members":{
        "LicenseArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the license. The ARN is mapped to the aud claim of the JWT token.</p>"
        },
        "RoleArns":{
          "shape":"ArnList",
          "documentation":"<p>Amazon Resource Name (ARN) of the IAM roles to embed in the token. License Manager does not check whether the roles are in use.</p>"
        },
        "ExpirationInDays":{
          "shape":"Integer",
          "documentation":"<p>Token expiration, in days, counted from token creation. The default is 365 days.</p>"
        },
        "TokenProperties":{
          "shape":"MaxSize3StringList",
          "documentation":"<p>Data specified by the caller to be included in the JWT token. The data is mapped to the amr claim of the JWT token.</p>"
        },
        "ClientToken":{
          "shape":"ClientToken",
          "documentation":"<p>Idempotency token, valid for 10 minutes.</p>"
        }
      }
    },
    "CreateTokenResponse":{
      "type":"structure",
      "members":{
        "TokenId":{
          "shape":"String",
          "documentation":"<p>Token ID.</p>"
        },
        "TokenType":{
          "shape":"TokenType",
          "documentation":"<p>Token type.</p>"
        },
        "Token":{
          "shape":"TokenString",
          "documentation":"<p>Refresh token, encoded as a JWT token.</p>"
        }
      }
    },
    "DateTime":{"type":"timestamp"},
    "DatetimeRange":{
      "type":"structure",

```
   "required":["Begin"],
  "members":{
   "Begin":{


   "shape":"ISO8601DateTime",
    "documentation":"<p>Start of the time range.</p>"
   },
   "End":{
    "shape":"ISO8601DateTime",
    "documentation":"<p>End of the time range.</p>"
   }
  },
  "documentation":"<p>Describes a time range, in ISO8601-UTC format.</p>"
 },
 "DeleteGrantRequest":{
  "type":"structure",
  "required":[
   "GrantArn",
   "Version"
  ],
  "members":{
   "GrantArn":{
    "shape":"Arn",
    "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
   },
   "StatusReason":{
    "shape":"StatusReasonMessage",
    "documentation":"<p>The Status reason for the delete request.</p>"
   },
   "Version":{
    "shape":"String",
    "documentation":"<p>Current version of the grant.</p>"
   }
  }
 },
 "DeleteGrantResponse":{
  "type":"structure",
  "members":{
   "GrantArn":{
    "shape":"Arn",
     "documentation":"<p>Grant ARN.</p>"
   },
   "Status":{
    "shape":"GrantStatus",
    "documentation":"<p>Grant status.</p>"
   },
   "Version":{
    "shape":"String",
```

```
        "documentation":"<p>Grant version.</p>"
      }
    }
  },
  "DeleteLicenseConfigurationRequest":{
   "type":"structure",
   "required":["LicenseConfigurationArn"],
   "members":{
    "LicenseConfigurationArn":{
      "shape":"String",
      "documentation":"<p>ID of the license configuration.</p>"
    }
   }
  },
  "DeleteLicenseConfigurationResponse":{
   "type":"structure",
   "members":{
   }
  },
  "DeleteLicenseManagerReportGeneratorRequest":{
   "type":"structure",
   "required":["LicenseManagerReportGeneratorArn"],
   "members":{
    "LicenseManagerReportGeneratorArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the report generator to be deleted.</p>"
     }
   }
  },
  "DeleteLicenseManagerReportGeneratorResponse":{
   "type":"structure",
   "members":{
   }
  },
  "DeleteLicenseRequest":{
   "type":"structure",
   "required":[
    "LicenseArn",
    "SourceVersion"
   ],
   "members":{
    "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
    },
    "SourceVersion":{
      "shape":"String",
      "documentation":"<p>Current version of the license.</p>"
```

```
        }
      }
    },
    "DeleteLicenseResponse":{
     "type":"structure",
     "members":{
      "Status":{
       "shape":"LicenseDeletionStatus",
       "documentation":"<p>License status.</p>"
      },
      "DeletionDate":{
       "shape":"ISO8601DateTime",
       "documentation":"<p>Date when the license is deleted.</p>"
      }
     }
    },
    "DeleteTokenRequest":{
     "type":"structure",
     "required":["TokenId"],
     "members":{
      "TokenId":{
       "shape":"String",
       "documentation":"<p>Token ID.</p>"
      }
     }
    },
    "DeleteTokenResponse":{
     "type":"structure",
     "members":{
     }
    },
    "DigitalSignatureMethod":{
     "type":"string",
     "enum":["JWT_PS384"]
    },
    "Entitlement":{
     "type":"structure",
     "required":[
      "Name",
      "Unit"
     ],
     "members":{
      "Name":{
       "shape":"String",
       "documentation":"<p>Entitlement name.</p>"
      },
      "Value":{
       "shape":"String",
```

          "documentation":"<p>Entitlement resource. Use only if the unit is None.</p>"
        },
        "MaxCount":{
          "shape":"Long",
          "documentation":"<p>Maximum entitlement count. Use if the unit is not None.</p>"
        },
        "Overage":{
          "shape":"BoxBoolean",
          "documentation":"<p>Indicates whether overages are allowed.</p>"
        },
        "Unit":{
          "shape":"EntitlementUnit",
          "documentation":"<p>Entitlement unit.</p>"
        },
        "AllowCheckIn":{
          "shape":"BoxBoolean",
          "documentation":"<p>Indicates whether check-ins are allowed.</p>"
        }
      },
      "documentation":"<p>Describes a resource entitled for use with a license.</p>"
    },
    "EntitlementData":{
      "type":"structure",
      "required":[
        "Name",
        "Unit"
      ],
      "members":{
        "Name":{
          "shape":"String",
          "documentation":"<p>Entitlement data name.</p>"
        },
        "Value":{
          "shape":"String",
          "documentation":"<p>Entitlement data value.</p>"
        },
        "Unit":{
          "shape":"EntitlementDataUnit",
          "documentation":"<p>Entitlement data unit.</p>"
        }
      },
      "documentation":"<p>Data associated with an entitlement resource.</p>"
    },
    "EntitlementDataList":{
      "type":"list",
      "member":{"shape":"EntitlementData"}
    },
    "EntitlementDataUnit":{

```
   "type":"string",
   "enum":[
    "Count",
    "None",
    "Seconds",
    "Microseconds",
    "Milliseconds",
    "Bytes",
    "Kilobytes",
    "Megabytes",
    "Gigabytes",
    "Terabytes",
    "Bits",
    "Kilobits",
    "Megabits",
    "Gigabits",
    "Terabits",
    "Percent",
    "Bytes/Second",
    "Kilobytes/Second",
    "Megabytes/Second",
    "Gigabytes/Second",
    "Terabytes/Second",
    "Bits/Second",
    "Kilobits/Second",
    "Megabits/Second",
    "Gigabits/Second",
    "Terabits/Second",
    "Count/Second"
   ]
  },
  "EntitlementList":{
   "type":"list",
   "member":{"shape":"Entitlement"}
  },
  "EntitlementNotAllowedException":{
   "type":"structure",
   "members":{
    "Message":{"shape":"Message"}
   },
   "documentation":"<p>The entitlement is not allowed.</p>",
   "exception":true
  },
  "EntitlementUnit":{
   "type":"string",
   "enum":[
    "Count",
    "None",
```

        "Seconds",
        "Microseconds",
        "Milliseconds",
        "Bytes",
        "Kilobytes",
        "Megabytes",
        "Gigabytes",
        "Terabytes",
        "Bits",
        "Kilobits",
        "Megabits",
        "Gigabits",
        "Terabits",
        "Percent",
        "Bytes/Second",
        "Kilobytes/Second",
        "Megabytes/Second",
        "Gigabytes/Second",
        "Terabytes/Second",
        "Bits/Second",
        "Kilobits/Second",
        "Megabits/Second",
        "Gigabits/Second",
        "Terabits/Second",
        "Count/Second"
      ]
    },
    "EntitlementUsage":{
      "type":"structure",
      "required":[
        "Name",
        "ConsumedValue",
        "Unit"
      ],
      "members":{
        "Name":{
          "shape":"String",
          "documentation":"<p>Entitlement usage name.</p>"
        },
        "ConsumedValue":{
          "shape":"String",
          "documentation":"<p>Resource usage consumed.</p>"
        },
        "MaxCount":{
          "shape":"String",
          "documentation":"<p>Maximum entitlement usage count.</p>"
        },
        "Unit":{

```
       "shape":"EntitlementDataUnit",
       "documentation":"<p>Entitlement usage unit.</p>"
      }
     },
     "documentation":"<p>Usage associated with an entitlement resource.</p>"
    },
    "EntitlementUsageList":{
     "type":"list",
     "member":{"shape":"EntitlementUsage"}
    },
    "ExtendLicenseConsumptionRequest":{
     "type":"structure",
     "required":["LicenseConsumptionToken"],
     "members":{
      "LicenseConsumptionToken":{
       "shape":"String",
       "documentation":"<p>License consumption token.</p>"
      },
      "DryRun":{
       "shape":"Boolean",
       "documentation":"<p>Checks whether you have the required permissions for the action, without actually
making the request. Provides
 an error response if you do not have the required permissions.</p>"
      }
     }
    },
    "ExtendLicenseConsumptionResponse":{
     "type":"structure",
     "members":{
      "LicenseConsumptionToken":{
       "shape":"String",
       "documentation":"<p>License consumption token.</p>"
      },
      "Expiration":{
       "shape":"ISO8601DateTime",
       "documentation":"<p>Date and time at which the license consumption expires.</p>"
      }
     }
    },
    "FailedDependencyException":{
     "type":"structure",
     "members":{
      "Message":{"shape":"Message"},
      "ErrorCode":{"shape":"String"}
     },
     "documentation":"<p>A dependency required to run the API is missing.</p>",
     "exception":true
    },
```

```
    "Filter":{
      "type":"structure",
      "members":{
        "Name":{
          "shape":"FilterName",
          "documentation":"<p>Name of the filter. Filter names are case-sensitive.</p>"
        },
        "Values":{

          "shape":"FilterValues",
          "documentation":"<p>The value of the filter, which is case-sensitive. You can only specify one value for the
filter.</p>"
        }
      },
      "documentation":"<p>A filter name and value pair that is used to return more specific results from a describe
operation. Filters can be used to match a set of resources by specific criteria, such as tags, attributes, or IDs.</p>"
    },
    "FilterLimitExceededException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>The request uses too many filters or too many filter values.</p>",
      "exception":true
    },
    "FilterList":{
      "type":"list",
      "member":{"shape":"Filter"}
    },
    "FilterName":{"type":"string"},
    "FilterValue":{"type":"string"},
    "FilterValues":{
      "type":"list",
      "member":{"shape":"FilterValue"}
    },
    "Filters":{
      "type":"list",
      "member":{"shape":"Filter"}
    },

    "GetAccessTokenRequest":{
      "type":"structure",
      "required":["Token"],
      "members":{
        "Token":{
          "shape":"TokenString",
          "documentation":"<p>Refresh token, encoded as a JWT token.</p>"
        },
```

```
      "TokenProperties":{
        "shape":"MaxSize3StringList",
        "documentation":"<p>Token properties to validate against those present in the JWT token.</p>"
      }
    }
  },
  "GetAccessTokenResponse":{
   "type":"structure",
   "members":{
    "AccessToken":{
      "shape":"TokenString",
      "documentation":"<p>Temporary access token.</p>"
    }
   }
  },
  "GetGrantRequest":{
   "type":"structure",
   "required":["GrantArn"],
   "members":{
    "GrantArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
    },
    "Version":{
      "shape":"String",
      "documentation":"<p>Grant version.</p>"
    }
   }
  },
   "GetGrantResponse":{
   "type":"structure",
   "members":{
    "Grant":{
      "shape":"Grant",
      "documentation":"<p>Grant details.</p>"
    }
   }
  },
  "GetLicenseConfigurationRequest":{
   "type":"structure",
   "required":["LicenseConfigurationArn"],
   "members":{
    "LicenseConfigurationArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    }
   }
  },
```

```
"GetLicenseConfigurationResponse":{
 "type":"structure",
 "members":{
  "LicenseConfigurationId":{
   "shape":"String",
   "documentation":"<p>Unique ID for the license configuration.</p>"
  },
  "LicenseConfigurationArn":{
   "shape":"String",
   "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
  },
  "Name":{
   "shape":"String",
   "documentation":"<p>Name of the license configuration.</p>"
   },
  "Description":{
   "shape":"String",
   "documentation":"<p>Description of the license configuration.</p>"
  },
  "LicenseCountingType":{
   "shape":"LicenseCountingType",
   "documentation":"<p>Dimension for which the licenses are counted.</p>"
  },
  "LicenseRules":{
   "shape":"StringList",
   "documentation":"<p>License rules.</p>"
  },
  "LicenseCount":{
   "shape":"BoxLong",
   "documentation":"<p>Number of available licenses.</p>"
  },
  "LicenseCountHardLimit":{
   "shape":"BoxBoolean",
   "documentation":"<p>Sets the number of available licenses as a hard limit.</p>"
  },
  "ConsumedLicenses":{
   "shape":"BoxLong",
   "documentation":"<p>Number of licenses assigned to resources.</p>"
  },
  "Status":{
   "shape":"String",
   "documentation":"<p>License configuration status.</p>"
   },
  "OwnerAccountId":{
   "shape":"String",
   "documentation":"<p>Account ID of the owner of the license configuration.</p>"
  },
  "ConsumedLicenseSummaryList":{
```

```
      "shape":"ConsumedLicenseSummaryList",
      "documentation":"<p>Summaries of the licenses consumed by resources.</p>"
     },
     "ManagedResourceSummaryList":{
      "shape":"ManagedResourceSummaryList",
      "documentation":"<p>Summaries of the managed resources.</p>"
     },
     "Tags":{
      "shape":"TagList",
      "documentation":"<p>Tags for the license configuration.</p>"
     },
     "ProductInformationList":{
      "shape":"ProductInformationList",
      "documentation":"<p>Product information.</p>"
     },
     "AutomatedDiscoveryInformation":{
      "shape":"AutomatedDiscoveryInformation",
      "documentation":"<p>Automated discovery information.</p>"
     },
     "DisassociateWhenNotFound":{
       "shape":"BoxBoolean",
      "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
     }
    }
   },
   "GetLicenseConversionTaskRequest":{
    "type":"structure",
    "required":["LicenseConversionTaskId"],
    "members":{
     "LicenseConversionTaskId":{
      "shape":"LicenseConversionTaskId",
      "documentation":"<p>ID of the license type conversion task to retrieve information on.</p>"
     }
    }
   },
   "GetLicenseConversionTaskResponse":{
    "type":"structure",
    "members":{
     "LicenseConversionTaskId":{
      "shape":"LicenseConversionTaskId",
      "documentation":"<p>ID of the license type conversion task.</p>"
     },
     "ResourceArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Names (ARN) of the resources the license conversion task is
associated with.</p>"
     },
     "SourceLicenseContext":{
```

```
      "shape":"LicenseConversionContext",
       "documentation":"<p>Information about the license type converted from.</p>"
     },
    "DestinationLicenseContext":{
      "shape":"LicenseConversionContext",
      "documentation":"<p>Information about the license type converted to.</p>"
     },
    "StatusMessage":{
      "shape":"String",
      "documentation":"<p>The status message for the conversion task.</p>"
     },
    "Status":{
      "shape":"LicenseConversionTaskStatus",
      "documentation":"<p>Status of the license type conversion task.</p>"
     },
    "StartTime":{
      "shape":"DateTime",
      "documentation":"<p>Time at which the license type conversion task was started .</p>"
     },
    "LicenseConversionTime":{
      "shape":"DateTime",
      "documentation":"<p>Amount of time to complete the license type conversion.</p>"
     },
    "EndTime":{
      "shape":"DateTime",
      "documentation":"<p>Time
at which the license type conversion task was completed.</p>"
     }
    }
   },
  "GetLicenseManagerReportGeneratorRequest":{
    "type":"structure",
    "required":["LicenseManagerReportGeneratorArn"],
    "members":{
     "LicenseManagerReportGeneratorArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the report generator.</p>"
     }
    }
   },
  "GetLicenseManagerReportGeneratorResponse":{
    "type":"structure",
    "members":{
     "ReportGenerator":{
      "shape":"ReportGenerator",
      "documentation":"<p>A report generator that creates periodic reports about your license configurations.</p>"
     }
    }
```

```
    },
    "GetLicenseRequest":{
     "type":"structure",
     "required":["LicenseArn"],
     "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "Version":{

  "shape":"String",
        "documentation":"<p>License version.</p>"
      }
     }
    },
    "GetLicenseResponse":{
     "type":"structure",
     "members":{
      "License":{
        "shape":"License",
        "documentation":"<p>License details.</p>"
      }
     }
    },
    "GetLicenseUsageRequest":{
     "type":"structure",
     "required":["LicenseArn"],
     "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      }
     }
    },
    "GetLicenseUsageResponse":{
     "type":"structure",
     "members":{
      "LicenseUsage":{
        "shape":"LicenseUsage",
        "documentation":"<p>License usage details.</p>"
      }
     }
    },
    "GetServiceSettingsRequest":{
     "type":"structure",
     "members":{
     }
```

```
    },
  "GetServiceSettingsResponse":{
   "type":"structure",
   "members":{
    "S3BucketArn":{
      "shape":"String",

      "documentation":"<p>Regional S3 bucket path for storing reports, license trail event data, discovery data, and
so on.</p>"
     },
    "SnsTopicArn":{
      "shape":"String",
      "documentation":"<p>SNS topic configured to receive notifications from License Manager.</p>"
     },
    "OrganizationConfiguration":{
      "shape":"OrganizationConfiguration",
      "documentation":"<p>Indicates whether Organizations is integrated with License Manager for cross-account
discovery.</p>"
     },
    "EnableCrossAccountsDiscovery":{
      "shape":"BoxBoolean",
      "documentation":"<p>Indicates whether cross-account discovery is enabled.</p>"
     },
    "LicenseManagerResourceShareArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the resource share. The License Manager
management account provides member accounts with access to this share.</p>"
     }
    }
   },
  "Grant":{
   "type":"structure",
    "required":[
    "GrantArn",
    "GrantName",
    "ParentArn",
    "LicenseArn",
    "GranteePrincipalArn",
    "HomeRegion",
    "GrantStatus",
    "Version",
    "GrantedOperations"
   ],
   "members":{
    "GrantArn":{
     "shape":"Arn",
     "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
     },
```

```
    "GrantName":{
      "shape":"String",
      "documentation":"<p>Grant name.</p>"
    },
    "ParentArn":{
      "shape":"Arn",
      "documentation":"<p>Parent ARN.</p>"
    },
    "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>License ARN.</p>"
    },
    "GranteePrincipalArn":{
      "shape":"Arn",
      "documentation":"<p>The grantee principal ARN.</p>"
    },
    "HomeRegion":{
      "shape":"String",
      "documentation":"<p>Home Region of the grant.</p>"
    },
    "GrantStatus":{
      "shape":"GrantStatus",
      "documentation":"<p>Grant status.</p>"
    },
    "StatusReason":{
      "shape":"StatusReasonMessage",
      "documentation":"<p>Grant status reason.</p>"
    },
    "Version":{
      "shape":"String",
      "documentation":"<p>Grant version.</p>"
    },
    "GrantedOperations":{
      "shape":"AllowedOperationList",
      "documentation":"<p>Granted operations.</p>"
    },
    "Options":{
      "shape":"Options",
      "documentation":"<p>The options specified for the grant.</p>"
    }
  },
  "documentation":"<p>Describes a grant.</p>"
},
"GrantList":{
  "type":"list",
  "member":{"shape":"Grant"}
},
"GrantStatus":{
```

      "type":"string",
      "enum":[
       "PENDING_WORKFLOW",
       "PENDING_ACCEPT",
       "REJECTED",
       "ACTIVE",
       "FAILED_WORKFLOW",
       "DELETED",
       "PENDING_DELETE",
       "DISABLED",

  "WORKFLOW_COMPLETED"
       ]
      },
     "GrantedLicense":{
      "type":"structure",
      "members":{
       "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
       },
       "LicenseName":{
        "shape":"String",
        "documentation":"<p>License name.</p>"
       },
       "ProductName":{
        "shape":"String",
        "documentation":"<p>Product name.</p>"
       },
       "ProductSKU":{
        "shape":"String",
        "documentation":"<p>Product SKU.</p>"
       },
       "Issuer":{
        "shape":"IssuerDetails",
        "documentation":"<p>Granted license issuer.</p>"
       },
       "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region of the granted license.</p>"
       },
       "Status":{
        "shape":"LicenseStatus",
        "documentation":"<p>Granted license status.</p>"
       },
       "Validity":{
        "shape":"DatetimeRange",

      "documentation":"<p>Date and time range during which the granted license is valid, in ISO8601-UTC format.</p>"
    },
    "Beneficiary":{
      "shape":"String",
      "documentation":"<p>Granted license beneficiary.</p>"
    },
    "Entitlements":{
      "shape":"EntitlementList",
      "documentation":"<p>License entitlements.</p>"
    },
    "ConsumptionConfiguration":{
      "shape":"ConsumptionConfiguration",
      "documentation":"<p>Configuration for consumption of the license.</p>"
    },
    "LicenseMetadata":{
      "shape":"MetadataList",
      "documentation":"<p>Granted license metadata.</p>"
    },
    "CreateTime":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>Creation time of the granted license.</p>"
    },
    "Version":{
      "shape":"String",
      "documentation":"<p>Version of the granted license.</p>"
    },
    "ReceivedMetadata":{
      "shape":"ReceivedMetadata",
      "documentation":"<p>Granted license received metadata.</p>"
    }
  },
  "documentation":"<p>Describes a license that is granted to a grantee.</p>"
},
"GrantedLicenseList":{
  "type":"list",
  "member":{"shape":"GrantedLicense"}
},
"ISO8601DateTime":{
  "type":"string",
  "max":50,
  "pattern":"^(-?(?:[1-9][0-9]*)?[0-9]{4})-(1[0-2]|0[1-9])-(3[0-1]|0[1-9]|[1-2][0-9])T(2[0-3]|[0-1][0-9]):([0-5][0-9]):([0-5][0-9])(\\.[0-9]+)?(Z|[+-](?:2[0-3]|[0-1][0-9]):[0-5][0-9])+$"
},
"Integer":{"type":"integer"},
"InvalidParameterValueException":{
  "type":"structure",
  "members":{

```
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>One or more parameter values are not valid.</p>",
    "exception":true,
    "synthetic":true
   },
   "InvalidResourceStateException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}

   },
    "documentation":"<p>License Manager cannot allocate a license to a resource because of its state. </p> <p>For example, you cannot allocate a license to an instance in the process of shutting down.</p>",
    "exception":true
   },
   "InventoryFilter":{
    "type":"structure",
    "required":[
      "Name",
      "Condition"
    ],
    "members":{
      "Name":{
        "shape":"String",
        "documentation":"<p>Name of the filter.</p>"
      },
      "Condition":{
        "shape":"InventoryFilterCondition",
        "documentation":"<p>Condition of the filter.</p>"
      },
      "Value":{
        "shape":"String",
        "documentation":"<p>Value of the filter.</p>"
      }
    },
    "documentation":"<p>An inventory filter.</p>"
   },
   "InventoryFilterCondition":{
    "type":"string",
    "enum":[
      "EQUALS",
      "NOT_EQUALS",
      "BEGINS_WITH",
      "CONTAINS"
    ]
   },
   "InventoryFilterList":{
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    "type":"list",
    "member":{"shape":"InventoryFilter"}
  },
  "Issuer":{
   "type":"structure",
   "required":["Name"],
   "members":{
    "Name":{
     "shape":"String",
     "documentation":"<p>Issuer name.</p>"
    },
    "SignKey":{
     "shape":"String",
     "documentation":"<p>Asymmetric KMS key from Key Management Service. The KMS key must have a key usage of sign and verify, and support the RSASSA-PSS SHA-256 signing algorithm.</p>"
    }
   },
   "documentation":"<p>Details about the issuer of a license.</p>"
  },
  "IssuerDetails":{
   "type":"structure",
   "members":{
    "Name":{
     "shape":"String",
     "documentation":"<p>Issuer name.</p>"
    },
    "SignKey":{
     "shape":"String",
     "documentation":"<p>Asymmetric KMS key from Key Management Service. The KMS key must have a key usage of sign and verify, and support the RSASSA-PSS SHA-256 signing algorithm.</p>"
    },
    "KeyFingerprint":{
     "shape":"String",
     "documentation":"<p>Issuer key fingerprint.</p>"
    }
   },
   "documentation":"<p>Details associated with the issuer of a license.</p>"
  },
  "License":{
   "type":"structure",
   "members":{
    "LicenseArn":{
     "shape":"Arn",
     "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
    },
    "LicenseName":{
     "shape":"String",
     "documentation":"<p>License name.</p>"

```
    },
    "ProductName":{
      "shape":"String",
      "documentation":"<p>Product name.</p>"
    },
    "ProductSKU":{
      "shape":"String",
      "documentation":"<p>Product SKU.</p>"
    },
    "Issuer":{
      "shape":"IssuerDetails",
      "documentation":"<p>License issuer.</p>"
    },
    "HomeRegion":{
      "shape":"String",
      "documentation":"<p>Home Region of the license.</p>"
    },
    "Status":{
      "shape":"LicenseStatus",
      "documentation":"<p>License status.</p>"
    },
    "Validity":{
      "shape":"DatetimeRange",
      "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
    },
    "Beneficiary":{
      "shape":"String",
      "documentation":"<p>License beneficiary.</p>"
    },
    "Entitlements":{
      "shape":"EntitlementList",
      "documentation":"<p>License entitlements.</p>"
    },
    "ConsumptionConfiguration":{
      "shape":"ConsumptionConfiguration",
      "documentation":"<p>Configuration for consumption of the license.</p>"
    },
    "LicenseMetadata":{
      "shape":"MetadataList",
      "documentation":"<p>License metadata.</p>"
    },
    "CreateTime":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>License creation time.</p>"
    },
    "Version":{
      "shape":"String",
      "documentation":"<p>License version.</p>"
```

```
      }
    },
    "documentation":"<p>Software license that is managed in License Manager.</p>"
  },
  "LicenseConfiguration":{
    "type":"structure",
    "members":{
      "LicenseConfigurationId":{
        "shape":"String",
        "documentation":"<p>Unique ID of the license configuration.</p>"
      },
      "LicenseConfigurationArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      },
      "Name":{
        "shape":"String",
        "documentation":"<p>Name of the license configuration.</p>"
      },
      "Description":{
        "shape":"String",
        "documentation":"<p>Description of the license configuration.</p>"
      },
      "LicenseCountingType":{
        "shape":"LicenseCountingType",
        "documentation":"<p>Dimension to use to track the license inventory.</p>"
      },
      "LicenseRules":{
        "shape":"StringList",
        "documentation":"<p>License rules.</p>"
      },
      "LicenseCount":{
        "shape":"BoxLong",
        "documentation":"<p>Number of licenses managed by the license configuration.</p>"
      },
      "LicenseCountHardLimit":{
        "shape":"BoxBoolean",
        "documentation":"<p>Number of available licenses as a hard limit.</p>"
      },
      "DisassociateWhenNotFound":{
        "shape":"BoxBoolean",
        "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
      },
      "ConsumedLicenses":{
        "shape":"BoxLong",
        "documentation":"<p>Number of licenses consumed. </p>"
      },
      "Status":{
```

```
      "shape":"String",
      "documentation":"<p>Status of the license configuration.</p>"
    },
    "OwnerAccountId":{
      "shape":"String",
      "documentation":"<p>Account ID of the license
 configuration's owner.</p>"
    },
    "ConsumedLicenseSummaryList":{
      "shape":"ConsumedLicenseSummaryList",
      "documentation":"<p>Summaries for licenses consumed by various resources.</p>"
    },
    "ManagedResourceSummaryList":{
      "shape":"ManagedResourceSummaryList",
      "documentation":"<p>Summaries for managed resources.</p>"
    },
    "ProductInformationList":{
      "shape":"ProductInformationList",
      "documentation":"<p>Product information.</p>"
    },
    "AutomatedDiscoveryInformation":{
      "shape":"AutomatedDiscoveryInformation",
      "documentation":"<p>Automated discovery information.</p>"
    }
    },
    "documentation":"<p>A license configuration is an abstraction of a customer license agreement that can be
consumed and enforced by License Manager. Components include specifications for the license type (licensing by
instance, socket, CPU, or vCPU), allowed tenancy (shared
 tenancy, Dedicated Instance, Dedicated Host, or all of these), host affinity (how long a VM must be associated with
a host), and the number of licenses purchased and used.</p>"
  },
  "LicenseConfigurationAssociation":{
    "type":"structure",
    "members":{
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
      },
      "ResourceType":{
        "shape":"ResourceType",
        "documentation":"<p>Type of server resource.</p>"
      },
      "ResourceOwnerId":{
        "shape":"String",
        "documentation":"<p>ID of the Amazon Web Services account that owns the resource consuming
licenses.</p>"
      },
      "AssociationTime":{
```

```json
        "shape":"DateTime",
        "documentation":"<p>Time when the license configuration was associated with the resource.</p>"
      },
      "AmiAssociationScope":{
        "shape":"String",
        "documentation":"<p>Scope of
AMI associations. The possible value is <code>cross-account</code>.</p>"
      }
    },
    "documentation":"<p>Describes an association with a license configuration.</p>"
  },
  "LicenseConfigurationAssociations":{
    "type":"list",
    "member":{"shape":"LicenseConfigurationAssociation"}
  },
  "LicenseConfigurationStatus":{
    "type":"string",
    "enum":[
      "AVAILABLE",
      "DISABLED"
    ]
  },
  "LicenseConfigurationUsage":{
    "type":"structure",
    "members":{
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
      },
      "ResourceType":{
        "shape":"ResourceType",
        "documentation":"<p>Type of resource.</p>"
      },
      "ResourceStatus":{
        "shape":"String",
        "documentation":"<p>Status of the resource.</p>"
      },
      "ResourceOwnerId":{
        "shape":"String",
        "documentation":"<p>ID of
the account that owns the resource.</p>"
      },
      "AssociationTime":{
        "shape":"DateTime",
        "documentation":"<p>Time when the license configuration was initially associated with the resource.</p>"
      },
      "ConsumedLicenses":{
        "shape":"BoxLong",
```

          "documentation":"<p>Number of licenses consumed by the resource.</p>"
        }
      },
      "documentation":"<p>Details about the usage of a resource associated with a license configuration.</p>"
    },
    "LicenseConfigurationUsageList":{
      "type":"list",
      "member":{"shape":"LicenseConfigurationUsage"}
    },
    "LicenseConfigurations":{
      "type":"list",
      "member":{"shape":"LicenseConfiguration"}
    },
    "LicenseConversionContext":{
      "type":"structure",
      "members":{
        "UsageOperation":{
          "shape":"UsageOperation",
          "documentation":"<p>The Usage operation value that corresponds to the license type you are converting your resource
 from. For more information about which platforms correspond to which usage operation values see <a
href=\"https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/billing-info-fields.html#billing-info\">Sample
data: usage operation by platform </p>"
        }
      },
      "documentation":"<p>Information about a license type conversion task.</p>"
    },
    "LicenseConversionTask":{
      "type":"structure",
      "members":{
        "LicenseConversionTaskId":{
          "shape":"LicenseConversionTaskId",
          "documentation":"<p>The ID of the license type conversion task.</p>"
        },
        "ResourceArn":{
          "shape":"String",
          "documentation":"<p>The Amazon Resource Name (ARN) of the resource associated with the license type
conversion task.</p>"
        },
        "SourceLicenseContext":{
          "shape":"LicenseConversionContext",
          "documentation":"<p>Information about the license type this conversion task converted from.</p>"
        },

        "DestinationLicenseContext":{
          "shape":"LicenseConversionContext",
          "documentation":"<p>Information about the license type this conversion task converted to.</p>"
        },

```
      "Status":{
        "shape":"LicenseConversionTaskStatus",
        "documentation":"<p>The status of the conversion task.</p>"
      },
      "StatusMessage":{
        "shape":"String",
        "documentation":"<p>The status message for the conversion task.</p>"
      },
      "StartTime":{
        "shape":"DateTime",
        "documentation":"<p>The time the conversion task was started at.</p>"
      },
      "LicenseConversionTime":{
        "shape":"DateTime",
        "documentation":"<p>The time the usage operation value of the resource was changed.</p>"
      },
      "EndTime":{
        "shape":"DateTime",
        "documentation":"<p>The time the conversion task was completed.</p>"
      }
    },
    "documentation":"<p>Information about a
license type conversion task.</p>"
  },
  "LicenseConversionTaskId":{
    "type":"string",
    "max":50,
    "pattern":"^lct-[a-zA-Z0-9]*"
  },
  "LicenseConversionTaskStatus":{
    "type":"string",
    "enum":[
      "IN_PROGRESS",
      "SUCCEEDED",
      "FAILED"
    ]
  },
  "LicenseConversionTasks":{
    "type":"list",
    "member":{"shape":"LicenseConversionTask"}
  },
  "LicenseCountingType":{
    "type":"string",
    "enum":[
      "vCPU",
      "Instance",
      "Core",
      "Socket"
```

```
    ]
   },
   "LicenseDeletionStatus":{
    "type":"string",
    "enum":[
      "PENDING_DELETE",
      "DELETED"
    ]
   },
   "LicenseList":{
    "type":"list",
    "member":{"shape":"License"}
   },
   "LicenseOperationFailure":{
    "type":"structure",
    "members":{
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
      },

   "ResourceType":{
        "shape":"ResourceType",
        "documentation":"<p>Resource type.</p>"
      },
      "ErrorMessage":{
        "shape":"String",
        "documentation":"<p>Error message.</p>"
      },
      "FailureTime":{
        "shape":"DateTime",
        "documentation":"<p>Failure time.</p>"
      },
      "OperationName":{
        "shape":"String",
        "documentation":"<p>Name of the operation.</p>"
      },
      "ResourceOwnerId":{
        "shape":"String",
        "documentation":"<p>ID of the Amazon Web Services account that owns the resource.</p>"
      },
      "OperationRequestedBy":{
        "shape":"String",
        "documentation":"<p>The requester is \"License Manager Automated Discovery\".</p>"
      },
      "MetadataList":{
        "shape":"MetadataList",
        "documentation":"<p>Reserved.</p>"
```

```
        }
      },
      "documentation":"<p>Describes the failure of a license operation.</p>"
    },
    "LicenseOperationFailureList":{
      "type":"list",
      "member":{"shape":"LicenseOperationFailure"}
    },
    "LicenseSpecification":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        },
        "AmiAssociationScope":{
          "shape":"String",
          "documentation":"<p>Scope of AMI associations. The possible value is <code>cross-account</code>.</p>"
        }
      },
      "documentation":"<p>Details for associating a license configuration with a resource.</p>"
    },
    "LicenseSpecifications":{
      "type":"list",
      "member":{"shape":"LicenseSpecification"}
    },
    "LicenseStatus":{
      "type":"string",
      "enum":[
        "AVAILABLE",
        "PENDING_AVAILABLE",
        "DEACTIVATED",
        "SUSPENDED",
        "EXPIRED",
        "PENDING_DELETE",
        "DELETED"
      ]
    },
    "LicenseUsage":{
      "type":"structure",
      "members":{
        "EntitlementUsages":{
          "shape":"EntitlementUsageList",
          "documentation":"<p>License entitlement usages.</p>"
        }
      },
      "documentation":"<p>Describes the entitlement usage associated with a license.</p>"
```

```
        },
    "LicenseUsageException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>You do not have enough licenses available to support a new resource launch.</p>",
      "exception":true
    },
    "ListAssociationsForLicenseConfigurationRequest":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of a license configuration.</p>"
        },
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>Maximum
number of results to return in a single call.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListAssociationsForLicenseConfigurationResponse":{
      "type":"structure",
      "members":{
        "LicenseConfigurationAssociations":{
          "shape":"LicenseConfigurationAssociations",
          "documentation":"<p>Information about the associations for the license configuration.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListDistributedGrantsRequest":{
      "type":"structure",
      "members":{
        "GrantArns":{
          "shape":"ArnList",
          "documentation":"<p>Amazon Resource Names (ARNs) of the grants.</p>"
        },
```

```
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>Filters to scope the results.
 The following filters are supported:</p> <ul> <li> <p> <code>LicenseArn</code> </p> </li> <li> <p>
<code>GrantStatus</code> </p> </li> <li> <p> <code>GranteePrincipalARN</code> </p> </li> <li> <p>
<code>ProductSKU</code> </p> </li> <li> <p> <code>LicenseIssuerName</code> </p> </li> </ul>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListDistributedGrantsResponse":{
    "type":"structure",
    "members":{
      "Grants":{
        "shape":"GrantList",
        "documentation":"<p>Distributed grant details.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListFailuresForLicenseConfigurationOperationsRequest":{
    "type":"structure",
    "required":["LicenseConfigurationArn"],
    "members":{
      "LicenseConfigurationArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name of the license configuration.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
```

"ListFailuresForLicenseConfigurationOperationsResponse":{
  "type":"structure",
  "members":{
    "LicenseOperationFailureList":{
      "shape":"LicenseOperationFailureList",
      "documentation":"<p>License configuration operations that failed.</p>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    }
  }

},
  "ListLicenseConfigurationsRequest":{
  "type":"structure",
  "members":{
    "LicenseConfigurationArns":{
      "shape":"StringList",
      "documentation":"<p>Amazon Resource Names (ARN) of the license configurations.</p>"
    },
    "MaxResults":{
      "shape":"BoxInteger",
      "documentation":"<p>Maximum number of results to return in a single call.</p>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    },
    "Filters":{
      "shape":"Filters",
      "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p>   <p> <code>licenseCountingType</code> - The dimension for which licenses are counted.
Possible values are <code>vCPU</code> | <code>Instance</code> | <code>Core</code> | <code>Socket</code>.
Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p>
 <p> <code>enforceLicenseCount</code> - A Boolean value that indicates whether hard license enforcement is
used. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p>   <p>
<code>usagelimitExceeded</code> - A Boolean value that indicates whether the available licenses have been
exceeded. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> "
    }
  }
},
  "ListLicenseConfigurationsResponse":{
  "type":"structure",
  "members":{
    "LicenseConfigurations":{
      "shape":"LicenseConfigurations",
      "documentation":"<p>Information about the license configurations.</p>"

```
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    }
  }
},
"ListLicenseConversionTasksRequest":{
  "type":"structure",
  "members":{
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token
 for the next set of results.</p>"
    },
    "MaxResults":{
      "shape":"BoxInteger",
      "documentation":"<p>Maximum number of results to return in a single call.</p>"
    },
    "Filters":{
      "shape":"Filters",
      "documentation":"<p> Filters to scope the results. Valid filters are <code>ResourceArns</code> and
<code>Status</code>. </p>"
    }
  }
},
"ListLicenseConversionTasksResponse":{
  "type":"structure",
  "members":{
    "LicenseConversionTasks":{
      "shape":"LicenseConversionTasks",
      "documentation":"<p>Information about the license configuration tasks for your account.</p>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    }
  }
},
"ListLicenseManagerReportGeneratorsRequest":{
  "type":"structure",
  "members":{
    "Filters":{
      "shape":"FilterList",
      "documentation":"<p>Filters
 to scope the results. The following filters are supported: </p> <ul> <li> <p>
<code>LicenseConfigurationArn</code> </p> </li> </ul>"
    },
```

```
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
       "shape":"MaxSize100",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
   },
   "ListLicenseManagerReportGeneratorsResponse":{
    "type":"structure",
    "members":{
      "ReportGenerators":{
       "shape":"ReportGeneratorList",
       "documentation":"<p>A report generator that creates periodic reports about your license configurations.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
    }
   },
   "ListLicenseSpecificationsForResourceRequest":{
    "type":"structure",
    "required":["ResourceArn"],
    "members":{
      "ResourceArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Name (ARN) of a resource that has an associated license
configuration.</p>"
      },
      "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
    }
   },
   "ListLicenseSpecificationsForResourceResponse":{
    "type":"structure",
    "members":{
      "LicenseSpecifications":{
       "shape":"LicenseSpecifications",
       "documentation":"<p>License configurations associated with a resource.</p>"
```

```
        },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListLicenseVersionsRequest":{
    "type":"structure",

    "required":["LicenseArn"],
    "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListLicenseVersionsResponse":{
    "type":"structure",
    "members":{
      "Licenses":{
        "shape":"LicenseList",
        "documentation":"<p>License details.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListLicensesRequest":{
    "type":"structure",
    "members":{
      "LicenseArns":{
        "shape":"ArnList",
        "documentation":"<p>Amazon Resource Names
(ARNs) of the licenses.</p>"
      },
      "Filters":{
```

          "shape":"FilterList",
          "documentation":"<p>Filters to scope the results. The following filters are supported:</p>   <p> <code>Beneficiary</code> </p>   <p> <code>ProductSKU</code> </p>   <p> <code>Fingerprint</code> </p>   <p> <code>Status</code> </p> "
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "MaxResults":{
          "shape":"MaxSize100",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        }
      }
    },
    "ListLicensesResponse":{
      "type":"structure",
      "members":{
        "Licenses":{
          "shape":"LicenseList",
          "documentation":"<p>License details.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListReceivedGrantsForOrganizationRequest":{
      "type":"structure",
      "required":["LicenseArn"],
      "members":{
        "LicenseArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the received license.</p>"
        },
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>Filters to scope the results. The following filters are supported:</p>   <p> <code>ParentArn</code> </p>   <p> <code>GranteePrincipalArn</code> </p> "
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "MaxResults":{
          "shape":"MaxSize100",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"

        }
      }
    },
    "ListReceivedGrantsForOrganizationResponse":{
      "type":"structure",
      "members":{
        "Grants":{

  "shape":"GrantList",
          "documentation":"<p>Lists the grants the organization has received.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListReceivedGrantsRequest":{
      "type":"structure",
      "members":{
        "GrantArns":{
          "shape":"ArnList",
          "documentation":"<p>Amazon Resource Names (ARNs) of the grants.</p>"
        },
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>Filters to scope the results. The following filters are supported:</p>   <p> <code>ProductSKU</code> </p>   <p> <code>LicenseIssuerName</code> </p>   <p> <code>LicenseArn</code> </p>   <p> <code>GrantStatus</code> </p>   <p> <code>GranterAccountId</code> </p> "
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "MaxResults":{
          "shape":"MaxSize100",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        }
      }
    },
    "ListReceivedGrantsResponse":{
      "type":"structure",
      "members":{
        "Grants":{
          "shape":"GrantList",
          "documentation":"<p>Received grant details.</p>"
        },

        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListReceivedLicensesForOrganizationRequest":{
      "type":"structure",
      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>Filters to scope the results. The following filters are supported:</p>   <p> <code>Beneficiary</code> </p>   <p> <code>ProductSKU</code> </p> "
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of
results.</p>"
        },
        "MaxResults":{
          "shape":"MaxSize100",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        }
      }
    },
    "ListReceivedLicensesForOrganizationResponse":{
      "type":"structure",
      "members":{
        "Licenses":{
          "shape":"GrantedLicenseList",
          "documentation":"<p>Lists the licenses the organization has received.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListReceivedLicensesRequest":{
      "type":"structure",
      "members":{
        "LicenseArns":{
          "shape":"ArnList",
          "documentation":"<p>Amazon Resource Names (ARNs) of the licenses.</p>"
        },
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>Filters to scope the results. The following filters are supported:</p>   <p>

<code>ProductSKU</code>
 </p>   <p> <code>Status</code> </p>   <p> <code>Fingerprint</code> </p>   <p>
<code>IssuerName</code> </p>   <p> <code>Beneficiary</code> </p> "
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    },
    "MaxResults":{
      "shape":"MaxSize100",
      "documentation":"<p>Maximum number of results to return in a single call.</p>"
    }
   }
  },
  "ListReceivedLicensesResponse":{
   "type":"structure",
   "members":{
    "Licenses":{
      "shape":"GrantedLicenseList",
      "documentation":"<p>Received license details.</p>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    }
   }
  },
  "ListResourceInventoryRequest":{
   "type":"structure",
   "members":{
    "MaxResults":{
      "shape":"BoxInteger",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
    },
    "Filters":{
      "shape":"InventoryFilterList",
       "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p>   <p> <code>account_id</code> - The ID of the Amazon Web Services account that owns
the resource. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p>   <p>
<code>application_name</code> - The name of the application. Logical operators are <code>EQUALS</code> |
<code>BEGINS_WITH</code>.</p>   <p> <code>license_included</code> - The type of license
included. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>. Possible values are
<code>sql-server-enterprise</code> | <code>sql-server-standard</code> | <code>sql-server-web</code>

| <code>windows-server-datacenter</code>.</p>   <p> <code>platform</code> - The platform of the resource. Logical operators are <code>EQUALS</code> | <code>BEGINS_WITH</code>.</p>   <p> <code>resource_id</code> - The ID of the resource. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p>   <p> <code>tag:<key></code> - The key/value combination of a tag assigned to the resource. Logical operators are <code>EQUALS</code> (single account) or <code>EQUALS</code> | <code>NOT_EQUALS</code> (cross account).</p> "
```
      }
    }
  },
  "ListResourceInventoryResponse":{
    "type":"structure",
    "members":{
      "ResourceInventoryList":{
        "shape":"ResourceInventoryList",
        "documentation":"<p>Information about the resources.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListTagsForResourceRequest":{
    "type":"structure",
    "required":["ResourceArn"],
    "members":{
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      }
    }
  },
  "ListTagsForResourceResponse":{
    "type":"structure",
    "members":{
      "Tags":{
        "shape":"TagList",
        "documentation":"<p>Information about the tags.</p>"
      }
    }
  },
  "ListTokensRequest":{
    "type":"structure",
    "members":{
      "TokenIds":{
        "shape":"StringList",
        "documentation":"<p>Token IDs.</p>"
      },
```

```
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>Filters to scope the results. The following filter is supported:</p> <ul> <li> <p>
<code>LicenseArns</code> </p> </li> </ul>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of
results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListTokensResponse":{
    "type":"structure",
    "members":{
      "Tokens":{
        "shape":"TokenList",
        "documentation":"<p>Received token details.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListUsageForLicenseConfigurationRequest":{
    "type":"structure",
    "required":["LicenseConfigurationArn"],
    "members":{
      "LicenseConfigurationArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },

"NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "Filters":{
        "shape":"Filters",
```

      "documentation":"<p>Filters to scope the results. The following filters and logical operators are supported:</p>   <p> <code>resourceArn</code> - The ARN of the license configuration resource. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p>   <p> <code>resourceType</code> - The resource type (<code>EC2_INSTANCE</code> | <code>EC2_HOST</code> | <code>EC2_AMI</code> | <code>SYSTEMS_MANAGER_MANAGED_INSTANCE</code>). Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p>   <p> <code>resourceAccount</code> - The ID of the account that owns the resource. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> "
        }
      }
    },
    "ListUsageForLicenseConfigurationResponse":{
     "type":"structure",
     "members":{
       "LicenseConfigurationUsageList":{
        "shape":"LicenseConfigurationUsageList",
        "documentation":"<p>Information about the license configurations.</p>"
       },
       "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
       }
      }
    },
    "Location":{"type":"string"},
    "Long":{"type":"long"},
    "ManagedResourceSummary":{
     "type":"structure",
     "members":{
       "ResourceType":{
        "shape":"ResourceType",
        "documentation":"<p>Type of resource associated with a license.</p>"
       },
       "AssociationCount":{
        "shape":"BoxLong",
        "documentation":"<p>Number of resources associated with licenses.</p>"
       }
      },
      "documentation":"<p>Summary information about a managed resource.</p>"
    },
    "ManagedResourceSummaryList":{
     "type":"list",
     "member":{"shape":"ManagedResourceSummary"}
    },
    "MaxSize100":{
     "type":"integer",
     "max":100,
     "min":1

```
          },
        "MaxSize3StringList":{
         "type":"list",
         "member":{"shape":"String"},
         "max":3
        },
        "Message":{"type":"string"},
        "Metadata":{
         "type":"structure",
         "members":{
           "Name":{
             "shape":"String",
             "documentation":"<p>The key name.</p>"
           },
           "Value":{
             "shape":"String",
             "documentation":"<p>The value.</p>"
           }
         },
         "documentation":"<p>Describes key/value pairs.</p>"
        },
        "MetadataList":{
         "type":"list",
         "member":{"shape":"Metadata"}
        },
        "NoEntitlementsAllowedException":{
         "type":"structure",
         "members":{
           "Message":{"shape":"Message"}
         },
         "documentation":"<p>There are no entitlements found for this license, or the entitlement maximum count is
reached.</p>",
         "exception":true
        },
        "Options":{
         "type":"structure",
         "members":{
           "ActivationOverrideBehavior":{
             "shape":"ActivationOverrideBehavior",
             "documentation":"<p>An activation option for your grant that determines the behavior of activating a grant.
Activation options can only be used with granted licenses sourced from the Amazon Web Services Marketplace.
Additionally, the operation must specify the value of <code>ACTIVE</code> for the <code>Status</code>
parameter.</p> <ul> <li> <p>As a license administrator, you can optionally specify an
<code>ActivationOverrideBehavior</code> when activating a grant.</p> </li> <li> <p>As a grantor, you can
optionally specify an <code>ActivationOverrideBehavior</code> when you activate a grant for a grantee account in
your organization.</p> </li> <li> <p>As a grantee, if the grantor creating the distributed grant doesnt specify an
<code>ActivationOverrideBehavior</code>, you can optionally specify one when you are activating the grant.</p>
</li> </ul> <dl> <dt>DISTRIBUTED_GRANTS_ONLY</dt> <dd> <p>Use this value to activate
```

a grant without replacing any member accounts active grants for the same product.</p> </dd>
<dt>ALL_GRANTS_PERMITTED_BY_ISSUER</dt> <dd> <p>Use this value to activate a grant and disable
other active grants in any member accounts for the same product. This action will also replace their previously
activated grants with this activated grant.</p> </dd> </dl>"
```
    }
    },
    "documentation":"<p>The options you can specify when you create a new version of a grant, such as activation
override behavior. For more information, see <a href=\"https://docs.aws.amazon.com/license-
manager/latest/userguide/granted-licenses.html\">Granted licenses in License Manager</a> in the <i>License
Manager User Guide</i>.</p>"
  },
  "OrganizationConfiguration":{
   "type":"structure",
   "required":["EnableIntegration"],
   "members":{
    "EnableIntegration":{
     "shape":"Boolean",
     "documentation":"<p>Enables Organizations integration.</p>"
    }
   },

   "documentation":"<p>Configuration information for Organizations.</p>"
  },
  "PrincipalArnList":{
   "type":"list",
   "member":{"shape":"Arn"},
   "max":1,
   "min":1
  },
  "ProductInformation":{
   "type":"structure",
   "required":[
    "ResourceType",
    "ProductInformationFilterList"
   ],
   "members":{
    "ResourceType":{
     "shape":"String",
     "documentation":"<p>Resource type. The possible values are <code>SSM_MANAGED</code> |
<code>RDS</code>.</p>"
    },
    "ProductInformationFilterList":{
     "shape":"ProductInformationFilterList",
     "documentation":"<p>A Product information filter consists of a
<code>ProductInformationFilterComparator</code> which is a logical operator, a
<code>ProductInformationFilterName</code> which specifies the type of filter being declared, and a
<code>ProductInformationFilterValue</code> that specifies the value to filter on. </p> <p>Accepted values for
<code>ProductInformationFilterName</code>
```

are listed here along with descriptions and valid options for <code>ProductInformationFilterComparator</code>. </p> <p>The following filters and are supported when the resource type is <code>SSM_MANAGED</code>:</p>   <p> <code>Application Name</code> - The name of the application. Logical operator is <code>EQUALS</code>.</p>   <p> <code>Application Publisher</code> - The publisher of the application. Logical operator is <code>EQUALS</code>.</p>   <p> <code>Application Version</code> - The version of the application. Logical operator is <code>EQUALS</code>.</p>   <p> <code>Platform Name</code> - The name of the platform. Logical operator is <code>EQUALS</code>.</p>   <p> <code>Platform Type</code> - The platform type. Logical operator is <code>EQUALS</code>.</p>   <p> <code>Tag:key</code> - The key of a tag attached to an Amazon Web Services resource you wish to exclude from automated discovery. Logical

 operator is <code>NOT_EQUALS</code>. The key for your tag must be appended to <code>Tag:</code> following the example: <code>Tag:name-of-your-key</code>. <code>ProductInformationFilterValue</code> is optional if you are not using values for the key. </p>   <p> <code>AccountId</code> - The 12-digit ID of an Amazon Web Services account you wish to exclude from automated discovery. Logical operator is <code>NOT_EQUALS</code>.</p>   <p> <code>License Included</code> - The type of license included. Logical operators are <code>EQUALS</code> and <code>NOT_EQUALS</code>. Possible values are: <code>sql-server-enterprise</code> | <code>sql-server-standard</code> | <code>sql-server-web</code> | <code>windows-server-datacenter</code>.</p>   <p>The following filters and logical operators are supported when the resource type is <code>RDS</code>:</p>   <p> <code>Engine Edition</code> - The edition of the database engine. Logical operator is <code>EQUALS</code>. Possible

 values are: <code>oracle-ee</code> | <code>oracle-se</code> | <code>oracle-se1</code> | <code>oracle-se2</code>.</p>   <p> <code>License Pack</code> - The license pack. Logical operator is <code>EQUALS</code>. Possible values are: <code>data guard</code> | <code>diagnostic pack sqlt</code> | <code>tuning pack sqlt</code> | <code>ols</code> | <code>olap</code>.</p> "
    }
   },
   "documentation":"<p>Describes product information for a license configuration.</p>"
  },
  "ProductInformationFilter":{
   "type":"structure",
   "required":[
     "ProductInformationFilterName",
     "ProductInformationFilterComparator"
   ],
   "members":{
     "ProductInformationFilterName":{
       "shape":"String",
       "documentation":"<p>Filter name.</p>"
     },
     "ProductInformationFilterValue":{
       "shape":"StringList",
       "documentation":"<p>Filter value.</p>"
     },
     "ProductInformationFilterComparator":{
       "shape":"String",
       "documentation":"<p>Logical operator.</p>"
     }
   },

```
      "documentation":"<p>Describes product information filters.</p>"
     },
     "ProductInformationFilterList":{
      "type":"list",
      "member":{"shape":"ProductInformationFilter"}
     },
     "ProductInformationList":{
      "type":"list",
      "member":{"shape":"ProductInformation"}
     },
     "ProvisionalConfiguration":{
      "type":"structure",
      "required":["MaxTimeToLiveInMinutes"],
      "members":{
       "MaxTimeToLiveInMinutes":{
         "shape":"BoxInteger",
         "documentation":"<p>Maximum time for the provisional configuration, in minutes.</p>"
       }
      },
      "documentation":"<p>Details about a provisional configuration.</p>"
     },
     "RateLimitExceededException":{
      "type":"structure",
      "members":{
       "Message":{"shape":"Message"}
      },
      "documentation":"<p>Too many requests have been submitted. Try again after
a brief wait.</p>",
      "exception":true
     },
     "ReceivedMetadata":{
      "type":"structure",
      "members":{
       "ReceivedStatus":{
         "shape":"ReceivedStatus",
         "documentation":"<p>Received status.</p>"
       },
       "ReceivedStatusReason":{
         "shape":"StatusReasonMessage",
         "documentation":"<p>Received status reason.</p>"
       },
       "AllowedOperations":{
         "shape":"AllowedOperationList",
         "documentation":"<p>Allowed operations.</p>"
       }
      },
      "documentation":"<p>Metadata associated with received licenses and grants.</p>"
     },
```

```
"ReceivedStatus":{
 "type":"string",
 "enum":[
  "PENDING_WORKFLOW",
  "PENDING_ACCEPT",
  "REJECTED",
  "ACTIVE",
  "FAILED_WORKFLOW",
  "DELETED",
  "DISABLED",
  "WORKFLOW_COMPLETED"
 ]
},
"RedirectException":{
 "type":"structure",
 "members":{
  "Location":{"shape":"Location"},
   "Message":{"shape":"Message"}
 },
 "documentation":"<p>This is not the correct Region for the resource. Try again.</p>",
 "exception":true
},
"RejectGrantRequest":{
 "type":"structure",
 "required":["GrantArn"],
 "members":{
  "GrantArn":{
    "shape":"Arn",
    "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
  }
 }
},
"RejectGrantResponse":{
 "type":"structure",
 "members":{
  "GrantArn":{
    "shape":"Arn",
    "documentation":"<p>Grant ARN.</p>"
  },
  "Status":{
    "shape":"GrantStatus",
    "documentation":"<p>Grant status.</p>"
  },
  "Version":{
    "shape":"String",
    "documentation":"<p>Grant version.</p>"
  }
 }
```

      },
    "RenewType":{
      "type":"string",
      "enum":[
        "None",
        "Weekly",
        "Monthly"
      ]
    },
    "ReportContext":{
      "type":"structure",
      "required":["licenseConfigurationArns"],
      "members":{
        "licenseConfigurationArns":{
          "shape":"ArnList",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration that this generator reports
on.</p>"
        }
      },
      "documentation":"<p>Details of the license configuration that this generator reports on.</p>"
    },
    "ReportFrequency":{
      "type":"structure",
      "members":{
        "value":{
          "shape":"Integer",
          "documentation":"<p>Number of times within the frequency period that a report is generated. The only
supported value is <code>1</code>.</p>"
        },
        "period":{
          "shape":"ReportFrequencyType",
          "documentation":"<p>Time period between each report. The period can be daily, weekly, or monthly.</p>"
        }
      },
      "documentation":"<p>Details about how frequently reports are generated.</p>"
    },
    "ReportFrequencyType":{
      "type":"string",
      "enum":[
        "DAY",
        "WEEK",
        "MONTH"
      ]
    },
    "ReportGenerator":{
      "type":"structure",
      "members":{
        "ReportGeneratorName":{

```
      "shape":"String",
      "documentation":"<p>Name of the report generator.</p>"
     },
     "ReportType":{
      "shape":"ReportTypeList",
      "documentation":"<p>Type of reports that are generated.</p>"
     },
     "ReportContext":{
      "shape":"ReportContext",
      "documentation":"<p>License configuration type for this generator.</p>"
     },
     "ReportFrequency":{
      "shape":"ReportFrequency",
      "documentation":"<p>Details about how frequently reports are generated.</p>"
     },
     "LicenseManagerReportGeneratorArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the report generator.</p>"
     },
     "LastRunStatus":{
      "shape":"String",
      "documentation":"<p>Status of the
last report generation attempt.</p>"
     },
     "LastRunFailureReason":{
      "shape":"String",
      "documentation":"<p>Failure message for the last report generation attempt.</p>"
     },
     "LastReportGenerationTime":{
      "shape":"String",
      "documentation":"<p>Time the last report was generated at.</p>"
     },
     "ReportCreatorAccount":{
      "shape":"String",
      "documentation":"<p>The Amazon Web Services account ID used to create the report generator.</p>"
     },
     "Description":{
      "shape":"String",
      "documentation":"<p>Description of the report generator.</p>"
     },
     "S3Location":{
      "shape":"S3Location",
      "documentation":"<p>Details of the S3 bucket that report generator reports are published to.</p>"
     },
     "CreateTime":{
      "shape":"String",
      "documentation":"<p>Time the report was created.</p>"
     },
```

```
        "Tags":{

  "shape":"TagList",
          "documentation":"<p>Tags associated with the report generator.</p>"
    }
   },
   "documentation":"<p>Describe the details of a report generator.</p>"
},
"ReportGeneratorList":{
 "type":"list",
 "member":{"shape":"ReportGenerator"}
},
"ReportGeneratorName":{
 "type":"string",
 "max":100,
 "min":1
},
"ReportType":{
 "type":"string",
 "enum":[
   "LicenseConfigurationSummaryReport",
   "LicenseConfigurationUsageReport"
 ]
},
"ReportTypeList":{
 "type":"list",
 "member":{"shape":"ReportType"}
},
"ResourceInventory":{
 "type":"structure",
 "members":{
   "ResourceId":{
     "shape":"String",
     "documentation":"<p>ID of the resource.</p>"
   },
   "ResourceType":{
     "shape":"ResourceType",
     "documentation":"<p>Type of resource.</p>"
   },
   "ResourceArn":{
     "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
   },
   "Platform":{
     "shape":"String",
     "documentation":"<p>Platform of the resource.</p>"
   },
   "PlatformVersion":{
```

```
      "shape":"String",
      "documentation":"<p>Platform version of the resource in the inventory.</p>"
     },
     "ResourceOwningAccountId":{
      "shape":"String",
      "documentation":"<p>ID of the account that owns the resource.</p>"
     }
    },
    "documentation":"<p>Details about a resource.</p>"
   },
   "ResourceInventoryList":{
    "type":"list",
    "member":{"shape":"ResourceInventory"}
   },
   "ResourceLimitExceededException":{
    "type":"structure",
    "members":{
     "Message":{"shape":"Message"}
    },
    "documentation":"<p>Your resource limits have been exceeded.</p>",
    "exception":true
   },
   "ResourceNotFoundException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>The resource cannot be found.</p>",
    "exception":true
   },
   "ResourceType":{
    "type":"string",
    "enum":[
     "EC2_INSTANCE",
     "EC2_HOST",
     "EC2_AMI",
     "RDS",
     "SYSTEMS_MANAGER_MANAGED_INSTANCE"
    ]
   },
   "S3Location":{
    "type":"structure",
    "members":{
     "bucket":{
      "shape":"String",
      "documentation":"<p>Name of the S3 bucket reports are published to.</p>"
     },
     "keyPrefix":{
```

```
      "shape":"String",
      "documentation":"<p>Prefix of the S3 bucket reports are published to.</p>"
    }
  },
  "documentation":"<p>Details of the S3 bucket that report generator reports are published to.</p>"
},
"ServerInternalException":{
  "type":"structure",
  "members":{
    "Message":{"shape":"Message"}
  },
  "documentation":"<p>The server experienced an internal error. Try again.</p>",
  "exception":true,
  "fault":true
},
"SignedToken":{
  "type":"string",
  "min":4096
},
"StatusReasonMessage":{
  "type":"string",
  "max":400,
  "pattern":"[\\s\\S]+"
},
"String":{"type":"string"},
"StringList":{
  "type":"list",
  "member":{"shape":"String"}
},
"Tag":{
  "type":"structure",
  "members":{
    "Key":{
      "shape":"String",
      "documentation":"<p>Tag key.</p>"
    },
    "Value":{
      "shape":"String",
      "documentation":"<p>Tag value.</p>"
    }
  },
  "documentation":"<p>Details about a tag for a license configuration.</p>"
},
"TagKeyList":{
  "type":"list",
  "member":{"shape":"String"}
},
"TagList":{
```

```
    "type":"list",
    "member":{"shape":"Tag"}
   },
   "TagResourceRequest":{
    "type":"structure",
    "required":[
     "ResourceArn",
     "Tags"
    ],
    "members":{
     "ResourceArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
     },
     "Tags":{
      "shape":"TagList",
      "documentation":"<p>One or more tags.</p>"
     }
    }
   },
   "TagResourceResponse":{
    "type":"structure",
    "members":{
    }
   },
   "TokenData":{
    "type":"structure",
    "members":{
     "TokenId":{
       "shape":"String",
       "documentation":"<p>Token ID.</p>"
     },
     "TokenType":{
       "shape":"String",
       "documentation":"<p>Type of token generated. The supported value is
<code>REFRESH_TOKEN</code>.</p>"
     },
     "LicenseArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
     },
     "ExpirationTime":{
       "shape":"ISO8601DateTime",
       "documentation":"<p>Token expiration time, in ISO8601-UTC format.</p>"
     },
     "TokenProperties":{
       "shape":"MaxSize3StringList",
       "documentation":"<p>Data specified by the caller.</p>"
```

      },
      "RoleArns":{
        "shape":"ArnList",
        "documentation":"<p>Amazon Resource Names (ARN) of the roles included in the token.</p>"
      },
      "Status":{
        "shape":"String",
        "documentation":"<p>Token status. The possible values are <code>AVAILABLE</code> and <code>DELETED</code>.</p>"
      }
    },
    "documentation":"<p>Describes a token.</p>"
  },
  "TokenList":{
    "type":"list",
    "member":{"shape":"TokenData"}
  },
  "TokenString":{
    "type":"string",
    "max":4096,
    "pattern":"\\S+"
  },
  "TokenType":{
    "type":"string",
    "enum":["REFRESH_TOKEN"]
  },
  "UnsupportedDigitalSignatureMethodException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>The digital signature method is unsupported. Try your request again.</p>",
    "exception":true
  },
  "UntagResourceRequest":{
    "type":"structure",
    "required":[
      "ResourceArn",
      "TagKeys"
    ],
    "members":{
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
      },
      "TagKeys":{
        "shape":"TagKeyList",

          "documentation":"<p>Keys identifying the tags to remove.</p>"
        }
      }
    },
    "UntagResourceResponse":{
      "type":"structure",
      "members":{
      }
    },
    "UpdateLicenseConfigurationRequest":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        },
        "LicenseConfigurationStatus":{
          "shape":"LicenseConfigurationStatus",
          "documentation":"<p>New
status of the license configuration.</p>"
        },
        "LicenseRules":{
          "shape":"StringList",
          "documentation":"<p>New license rule. The only rule that you can add after you create a license configuration
is licenseAffinityToHost.</p>"
        },
        "LicenseCount":{
          "shape":"BoxLong",
          "documentation":"<p>New number of licenses managed by the license configuration.</p>"
        },
        "LicenseCountHardLimit":{
          "shape":"BoxBoolean",
          "documentation":"<p>New hard limit of the number of available licenses.</p>"
        },
        "Name":{
          "shape":"String",
          "documentation":"<p>New name of the license configuration.</p>"
        },
        "Description":{
          "shape":"String",
          "documentation":"<p>New description of the license configuration.</p>"
        },
        "ProductInformationList":{
          "shape":"ProductInformationList",
          "documentation":"<p>New
product information.</p>"
        },

```
    "DisassociateWhenNotFound":{
      "shape":"BoxBoolean",
      "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
    }
  }
},
"UpdateLicenseConfigurationResponse":{
  "type":"structure",
  "members":{
  }
},
"UpdateLicenseManagerReportGeneratorRequest":{
  "type":"structure",
  "required":[
    "LicenseManagerReportGeneratorArn",
    "ReportGeneratorName",
    "Type",
    "ReportContext",
    "ReportFrequency",
    "ClientToken"
  ],
  "members":{
    "LicenseManagerReportGeneratorArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the report generator to update.</p>"
    },
    "ReportGeneratorName":{
      "shape":"ReportGeneratorName",
      "documentation":"<p>Name of the report generator.</p>"
    },
    "Type":{
      "shape":"ReportTypeList",
      "documentation":"<p>Type of reports to generate. The following report types are supported:</p> <ul> <li> <p>License configuration report - Reports the number and details of consumed licenses for a license configuration.</p> </li> <li> <p>Resource report - Reports the tracked licenses and resource consumption for a license configuration.</p> </li> </ul>"
    },
    "ReportContext":{
      "shape":"ReportContext",
      "documentation":"<p>The report context.</p>"
    },
    "ReportFrequency":{
      "shape":"ReportFrequency",
      "documentation":"<p>Frequency by which reports are generated.</p>"
    },
    "ClientToken":{
      "shape":"ClientRequestToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
```

request.</p>"
    },
    "Description":{
      "shape":"String",
      "documentation":"<p>Description of the report generator.</p>"

  }
   }
  },
  "UpdateLicenseManagerReportGeneratorResponse":{
   "type":"structure",
   "members":{
   }
  },
  "UpdateLicenseSpecificationsForResourceRequest":{
   "type":"structure",
   "required":["ResourceArn"],
   "members":{
    "ResourceArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the Amazon Web Services resource.</p>"
     },
    "AddLicenseSpecifications":{
      "shape":"LicenseSpecifications",
      "documentation":"<p>ARNs of the license configurations to add.</p>"
     },
    "RemoveLicenseSpecifications":{
      "shape":"LicenseSpecifications",
      "documentation":"<p>ARNs of the license configurations to remove.</p>"
     }
   }
  },
  "UpdateLicenseSpecificationsForResourceResponse":{
   "type":"structure",
   "members":{
   }
  },
  "UpdateServiceSettingsRequest":{
   "type":"structure",
   "members":{
    "S3BucketArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the Amazon S3 bucket where the License Manager
information is stored.</p>"
     },
    "SnsTopicArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the Amazon SNS topic used for License Manager

alerts.</p>"
        },
        "OrganizationConfiguration":{
          "shape":"OrganizationConfiguration",
          "documentation":"<p>Enables integration with Organizations for cross-account discovery.</p>"
        },
        "EnableCrossAccountsDiscovery":{
          "shape":"BoxBoolean",
          "documentation":"<p>Activates cross-account discovery.</p>"
        }
      }
    },
    "UpdateServiceSettingsResponse":{
      "type":"structure",
      "members":{
      }
    },
    "UsageOperation":{
      "type":"string",
      "max":50
    },
    "ValidationException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>The provided input is not valid. Try your request again.</p>",
      "exception":true
    }
  },
  "documentation":"<p>License Manager makes it easier to manage licenses from software vendors across multiple Amazon Web Services accounts and on-premises servers.</p>"
}
{
  "testCases": [
    {
      "documentation": "For region us-east-1 with FIPS enabled and DualStack enabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-user-subscriptions-fips.us-east-1.api.aws"
        }
      },
      "params": {
        "Region": "us-east-1",
        "UseFIPS": true,
        "UseDualStack": true
      }
    },

```
{
    "documentation": "For region us-east-1 with FIPS enabled and DualStack disabled",
    "expect": {
        "endpoint": {
            "url": "https://license-manager-user-subscriptions-fips.us-east-1.amazonaws.com"
        }
    },
    "params": {
        "Region": "us-east-1",
        "UseFIPS": true,
        "UseDualStack": false
    }
},
{
    "documentation": "For region us-east-1 with FIPS disabled and DualStack
enabled",
    "expect": {
        "endpoint": {
            "url": "https://license-manager-user-subscriptions.us-east-1.api.aws"
        }
    },
    "params": {
        "Region": "us-east-1",
        "UseFIPS": false,
        "UseDualStack": true
    }
},
{
    "documentation": "For region us-east-1 with FIPS disabled and DualStack disabled",
    "expect": {
        "endpoint": {
            "url": "https://license-manager-user-subscriptions.us-east-1.amazonaws.com"
        }
    },
    "params": {
        "Region": "us-east-1",
        "UseFIPS": false,
        "UseDualStack": false
    }
},
{
    "documentation": "For region cn-north-1 with FIPS enabled and DualStack enabled",
    "expect": {
        "endpoint": {
            "url": "https://license-manager-user-subscriptions-fips.cn-north-1.api.amazonwebservices.com.cn"
        }
    },
    "params": {
```

```
          "Region": "cn-north-1",
          "UseFIPS": true,
          "UseDualStack": true
        }
    },
    {
      "documentation": "For region cn-north-1 with FIPS enabled and DualStack disabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-user-subscriptions-fips.cn-north-1.amazonaws.com.cn"
        }
      },
      "params": {
        "Region": "cn-north-1",
        "UseFIPS": true,
        "UseDualStack": false
      }
    },
    {
      "documentation": "For region cn-north-1 with FIPS disabled and DualStack enabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-user-subscriptions.cn-north-1.api.amazonwebservices.com.cn"

        }
      },
      "params": {
        "Region": "cn-north-1",
        "UseFIPS": false,
        "UseDualStack": true
      }
    },
    {
      "documentation": "For region cn-north-1 with FIPS disabled and DualStack disabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-user-subscriptions.cn-north-1.amazonaws.com.cn"
        }
      },
      "params": {
        "Region": "cn-north-1",
        "UseFIPS": false,
        "UseDualStack": false
      }
    },
    {
      "documentation": "For region us-gov-east-1 with FIPS enabled and DualStack enabled",
      "expect": {
```

```
      "endpoint": {
        "url": "https://license-manager-user-subscriptions-fips.us-gov-east-1.api.aws"
      }
    },
    "params": {
      "Region": "us-gov-east-1",
      "UseFIPS": true,
      "UseDualStack": true
    }
  },
  {
    "documentation": "For region us-gov-east-1 with FIPS enabled and DualStack disabled",
    "expect": {
      "endpoint": {
        "url": "https://license-manager-user-subscriptions-fips.us-gov-east-1.amazonaws.com"
      }
    },
    "params": {
      "Region": "us-gov-east-1",
      "UseFIPS": true,
      "UseDualStack": false
    }
  },
  {
    "documentation": "For region us-gov-east-1 with FIPS disabled and DualStack enabled",
    "expect": {
      "endpoint": {
        "url": "https://license-manager-user-subscriptions.us-gov-east-1.api.aws"
      }
    },
    "params": {
      "Region": "us-gov-east-1",
      "UseFIPS": false,
      "UseDualStack": true
    }

}
  },
  {
    "documentation": "For region us-gov-east-1 with FIPS disabled and DualStack disabled",
    "expect": {
      "endpoint": {
        "url": "https://license-manager-user-subscriptions.us-gov-east-1.amazonaws.com"
      }
    },
    "params": {
      "Region": "us-gov-east-1",
      "UseFIPS": false,
      "UseDualStack": false
```

```
        }
    },
    {
        "documentation": "For region us-iso-east-1 with FIPS enabled and DualStack enabled",
        "expect": {
            "error": "FIPS and DualStack are enabled, but this partition does not support one or both"
        },
        "params": {
            "Region": "us-iso-east-1",
            "UseFIPS": true,
            "UseDualStack": true
        }
    },
    {
        "documentation": "For region us-iso-east-1 with FIPS enabled and DualStack disabled",

        "expect": {
            "endpoint": {
                "url": "https://license-manager-user-subscriptions-fips.us-iso-east-1.c2s.ic.gov"
            }
        },
        "params": {
            "Region": "us-iso-east-1",
            "UseFIPS": true,
            "UseDualStack": false
        }
    },
    {
        "documentation": "For region us-iso-east-1 with FIPS disabled and DualStack enabled",
        "expect": {
            "error": "DualStack is enabled but this partition does not support DualStack"
        },
        "params": {
            "Region": "us-iso-east-1",
            "UseFIPS": false,
            "UseDualStack": true
        }
    },
    {
        "documentation": "For region us-iso-east-1 with FIPS disabled and DualStack disabled",
        "expect": {
            "endpoint": {
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            }
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        "params": {
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            "UseFIPS": false,
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      "UseDualStack": false
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  {
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    "expect": {
      "error": "FIPS and DualStack are enabled, but this partition does not support one or both"
    },
    "params": {
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      "UseFIPS": true,
      "UseDualStack": true
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    "expect": {
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    "params": {
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      "UseDualStack": false
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      "UseDualStack": true
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    "params": {
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          "Endpoint": "https://example.com"
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        "expect": {
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        }
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    "version": "1.0"
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        "params": {
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        "UseFIPS": false,
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        }
    },
    "params": {
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        "UseFIPS": false,
        "UseDualStack": false
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        }
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    "params": {
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        "params": {
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          "UseDualStack": false
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      "params": {
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        "UseDualStack": false
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        "UseDualStack": false
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      "UseDualStack": false
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      "UseDualStack": true
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AWS Signature Version 4 Test Suite
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{
 "version":"2.0",
 "metadata":{
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  "jsonVersion":"1.1",
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  "protocols":["rest-json"],
  "serviceFullName":"AWS License Manager User Subscriptions",
  "serviceId":"License Manager User Subscriptions",
  "signatureVersion":"v4",
  "signingName":"license-manager-user-subscriptions",
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<p>Your estimated bill for charges on the number of users and related costs will take 48 hours to appear for billing
periods that haven't closed (marked as <b>Pending</b> billing status) in Amazon Web Services Billing. For more
information, see <a href=\"https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/invoice.html\">Viewing
your monthly charges</a> in the <i>Amazon Web Services Billing User Guide</i>.</p> </note>",
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    "http":{
      "method":"POST",
      "requestUri":"/license-server/CreateLicenseServerEndpoint",
      "responseCode":200
    },
    "input":{"shape":"CreateLicenseServerEndpointRequest"},
    "output":{"shape":"CreateLicenseServerEndpointResponse"},
     "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Creates a network endpoint for the Remote Desktop Services (RDS) license server.</p>",
    "idempotent":true
  },
  "DeleteLicenseServerEndpoint":{
    "name":"DeleteLicenseServerEndpoint",
    "http":{
      "method":"POST",
```

```
      "requestUri":"/license-server/DeleteLicenseServerEndpoint",
      "responseCode":200
     },
     "input":{"shape":"DeleteLicenseServerEndpointRequest"},
     "output":{"shape":"DeleteLicenseServerEndpointResponse"},
     "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
       {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
     ],
     "documentation":"<p>Deletes a <code>LicenseServerEndpoint</code> resource.</p>",
     "idempotent":true
    },
    "DeregisterIdentityProvider":{
     "name":"DeregisterIdentityProvider",
     "http":{
      "method":"POST",
      "requestUri":"/identity-provider/DeregisterIdentityProvider",
      "responseCode":200
     },
     "input":{"shape":"DeregisterIdentityProviderRequest"},
     "output":{"shape":"DeregisterIdentityProviderResponse"},
     "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}

     ],
     "documentation":"<p>Deregisters the Active Directory identity provider from License Manager user-based
subscriptions.</p>",
     "idempotent":true
    },
    "DisassociateUser":{
     "name":"DisassociateUser",
     "http":{
      "method":"POST",
      "requestUri":"/user/DisassociateUser",
      "responseCode":200
     },
     "input":{"shape":"DisassociateUserRequest"},
```

    "output":{"shape":"DisassociateUserResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Disassociates the user from an EC2 instance providing user-based subscriptions.</p>",
    "idempotent":true
  },
  "ListIdentityProviders":{
    "name":"ListIdentityProviders",

  "http":{
      "method":"POST",
      "requestUri":"/identity-provider/ListIdentityProviders",
      "responseCode":200
    },
    "input":{"shape":"ListIdentityProvidersRequest"},
    "output":{"shape":"ListIdentityProvidersResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Lists the Active Directory identity providers for user-based subscriptions.</p>"
  },
  "ListInstances":{
    "name":"ListInstances",
    "http":{
      "method":"POST",
      "requestUri":"/instance/ListInstances",
      "responseCode":200
    },
    "input":{"shape":"ListInstancesRequest"},
    "output":{"shape":"ListInstancesResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},

```
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>Lists the EC2 instances providing user-based subscriptions.</p>"
  },
  "ListLicenseServerEndpoints":{
   "name":"ListLicenseServerEndpoints",
   "http":{
    "method":"POST",
    "requestUri":"/license-server/ListLicenseServerEndpoints",
    "responseCode":200
   },
   "input":{"shape":"ListLicenseServerEndpointsRequest"},
   "output":{"shape":"ListLicenseServerEndpointsResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>List the Remote Desktop Services (RDS) License Server endpoints </p>"
  },
  "ListProductSubscriptions":{
   "name":"ListProductSubscriptions",
   "http":{
    "method":"POST",
    "requestUri":"/user/ListProductSubscriptions",
    "responseCode":200
   },
   "input":{"shape":"ListProductSubscriptionsRequest"},
   "output":{"shape":"ListProductSubscriptionsResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>Lists the user-based subscription products available from an identity provider.</p>"
  },
  "ListTagsForResource":{
   "name":"ListTagsForResource",
   "http":{
```

```
      "method":"GET",
      "requestUri":"/tags/{ResourceArn}",
      "responseCode":200
     },
     "input":{"shape":"ListTagsForResourceRequest"},
     "output":{"shape":"ListTagsForResourceResponse"},
     "errors":[
      {"shape":"ValidationException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
     ],
     "documentation":"<p>Returns the list of tags for the specified resource.</p>"
    },
    "ListUserAssociations":{
     "name":"ListUserAssociations",
     "http":{
      "method":"POST",
      "requestUri":"/user/ListUserAssociations",
      "responseCode":200
     },
     "input":{"shape":"ListUserAssociationsRequest"},
     "output":{"shape":"ListUserAssociationsResponse"},
     "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
     ],
     "documentation":"<p>Lists user associations for an identity provider.</p>"
    },
    "RegisterIdentityProvider":{
     "name":"RegisterIdentityProvider",
     "http":{
      "method":"POST",
      "requestUri":"/identity-provider/RegisterIdentityProvider",
      "responseCode":200
     },
     "input":{"shape":"RegisterIdentityProviderRequest"},
     "output":{"shape":"RegisterIdentityProviderResponse"},
     "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
```

```
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Registers an identity provider for user-based subscriptions.</p>",
    "idempotent":true
  },
  "StartProductSubscription":{
    "name":"StartProductSubscription",
    "http":{
      "method":"POST",
      "requestUri":"/user/StartProductSubscription",
      "responseCode":200
    },
    "input":{"shape":"StartProductSubscriptionRequest"},
    "output":{"shape":"StartProductSubscriptionResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Starts a product subscription for a user with the specified identity provider.</p> <note> <p>Your estimated bill for charges on the number of users and related costs will take 48 hours to appear for billing periods that haven't closed (marked as <b>Pending</b> billing status) in Amazon Web Services Billing. For more information, see <a href=\"https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/invoice.html\">Viewing your monthly charges</a> in the <i>Amazon Web Services Billing User Guide</i>.</p> </note>"
  },
  "StopProductSubscription":{
    "name":"StopProductSubscription",
    "http":{
      "method":"POST",
      "requestUri":"/user/StopProductSubscription",
      "responseCode":200
    },
    "input":{"shape":"StopProductSubscriptionRequest"},
    "output":{"shape":"StopProductSubscriptionResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
```

```
    "documentation":"<p>Stops a product subscription for a user with the specified identity provider.</p>"
    },
    "TagResource":{
     "name":"TagResource",

     "http":{
      "method":"PUT",
      "requestUri":"/tags/{ResourceArn}",
      "responseCode":200
     },
     "input":{"shape":"TagResourceRequest"},
     "output":{"shape":"TagResourceResponse"},
     "errors":[
      {"shape":"ValidationException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
     ],
     "documentation":"<p>Adds tags to a resource.</p>",
     "idempotent":true
    },
    "UntagResource":{
     "name":"UntagResource",
     "http":{
      "method":"DELETE",
      "requestUri":"/tags/{ResourceArn}",
      "responseCode":200
     },
     "input":{"shape":"UntagResourceRequest"},
     "output":{"shape":"UntagResourceResponse"},
     "errors":[
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
     ],
     "documentation":"<p>Removes tags from a resource.</p>",
     "idempotent":true
    },
    "UpdateIdentityProviderSettings":{
     "name":"UpdateIdentityProviderSettings",
     "http":{
      "method":"POST",
      "requestUri":"/identity-provider/UpdateIdentityProviderSettings",
      "responseCode":200
     },
     "input":{"shape":"UpdateIdentityProviderSettingsRequest"},
     "output":{"shape":"UpdateIdentityProviderSettingsResponse"},
     "errors":[
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
```

```
      {"shape":"InternalServerException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Updates additional product configuration settings for the registered identity
provider.</p>",
    "idempotent":true
  }
},
"shapes":{
  "AccessDeniedException":{
   "type":"structure",
   "members":{
     "message":{"shape":"String"}
   },
   "documentation":"<p>You don't have sufficient access to perform this action.</p>",
   "exception":true
  },
  "ActiveDirectoryIdentityProvider":{
   "type":"structure",
   "members":{

 "ActiveDirectorySettings":{
     "shape":"ActiveDirectorySettings",
     "documentation":"<p>The <code>ActiveDirectorySettings</code> resource contains details about the Active
Directory, including network access details such as domain name and IP addresses, and the credential provider for
user administration.</p>"
    },
    "ActiveDirectoryType":{
     "shape":"ActiveDirectoryType",
     "documentation":"<p>The type of Active Directory  either a self-managed Active Directory or an Amazon
Web Services Managed Active Directory.</p>"
    },
    "DirectoryId":{
     "shape":"Directory",
     "documentation":"<p>The directory ID for an Active Directory identity provider.</p>"
    }
   },
   "documentation":"<p>Details about an Active Directory identity provider.</p>"
  },
  "ActiveDirectorySettings":{
   "type":"structure",
   "members":{
     "DomainCredentialsProvider":{
      "shape":"CredentialsProvider",

   "documentation":"<p>Points to the <code>CredentialsProvider</code> resource that contains information about
the credential provider for user administration.</p>"
    },
```

```
    "DomainIpv4List":{
     "shape":"ActiveDirectorySettingsDomainIpv4ListList",
     "documentation":"<p>A list of domain IPv4 addresses that are used for the Active Directory.</p>"
    },
    "DomainName":{
     "shape":"String",
     "documentation":"<p>The domain name for the Active Directory.</p>"
    },
    "DomainNetworkSettings":{
     "shape":"DomainNetworkSettings",
     "documentation":"<p>The <code>DomainNetworkSettings</code> resource contains an array of subnets that
apply for the Active Directory.</p>"
    }
   },
   "documentation":"<p>Contains network access and credential details that are needed for user administration in
the Active Directory.</p>"
  },
  "ActiveDirectorySettingsDomainIpv4ListList":{
   "type":"list",
   "member":{"shape":"IpV4"},
    "max":2,
   "min":1
  },
  "ActiveDirectoryType":{
   "type":"string",
   "enum":[
    "SELF_MANAGED",
    "AWS_MANAGED"
   ]
  },
  "Arn":{
   "type":"string",
   "pattern":"^arn:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-zA-Z0-9-
\\.]{1,510}/[a-zA-Z0-9-\\.]{1,510}$"
  },
  "AssociateUserRequest":{
   "type":"structure",
   "required":[
    "IdentityProvider",
    "InstanceId",
    "Username"
   ],
   "members":{
    "Domain":{
     "shape":"String",
     "documentation":"<p>The domain name of the Active Directory that contains information for the user to
associate.</p>"
    },
```

```
    "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>The identity provider for the user.</p>"
    },
    "InstanceId":{
      "shape":"String",
      "documentation":"<p>The ID of the EC2 instance that provides
the user-based subscription.</p>"
    },
    "Tags":{
      "shape":"Tags",
      "documentation":"<p>The tags that apply for the user association.</p>"
    },
    "Username":{
      "shape":"String",
      "documentation":"<p>The user name from the identity provider.</p>"
    }
   }
  },
  "AssociateUserResponse":{
   "type":"structure",
   "required":["InstanceUserSummary"],
   "members":{
    "InstanceUserSummary":{
      "shape":"InstanceUserSummary",
      "documentation":"<p>Metadata that describes the associate user operation.</p>"
    }
   }
  },
  "BoxInteger":{
   "type":"integer",
   "box":true
  },
  "ConflictException":{
   "type":"structure",
   "members":{
    "message":{"shape":"String"}
   },
   "documentation":"<p>The request couldn't be completed because it conflicted with the current state of the
resource.</p>",
   "exception":true,
   "fault":true
  },
  "CreateLicenseServerEndpointRequest":{
   "type":"structure",
   "required":[
    "IdentityProviderArn",
    "LicenseServerSettings"
```

```
        ],
      "members":{
        "IdentityProviderArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) that identifies the <code>IdentityProvider</code>
resource that contains details about a registered identity provider. In the case of Active Directory, that can be a self-
managed Active Directory or an Amazon Web Services Managed Active Directory that contains user identity
details.</p>"
        },
        "LicenseServerSettings":{
          "shape":"LicenseServerSettings",
          "documentation":"<p>The <code>LicenseServerSettings</code> resource to create for the endpoint. The
settings include the type of license server and the Secrets Manager secret that enables administrators to add or
remove users associated with the license server.</p>"
        },
        "Tags":{
          "shape":"Tags",
          "documentation":"<p>The tags that apply for the license server endpoint.</p>"
        }
      }
    },
    "CreateLicenseServerEndpointResponse":{
      "type":"structure",
      "members":{
        "IdentityProviderArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider specified in the
request.</p>"
        },
        "LicenseServerEndpointArn":{
          "shape":"Arn",
          "documentation":"<p>The ARN of the <code>LicenseServerEndpoint</code> resource.</p>"
        }
      }
    },
    "CredentialsProvider":{
      "type":"structure",
      "members":{
        "SecretsManagerCredentialsProvider":{
          "shape":"SecretsManagerCredentialsProvider",
          "documentation":"<p>Identifies the Secrets Manager secret that contains credentials needed for user
administration in the Active Directory.</p>"
        }
      },
      "documentation":"<p>Contains information about the credential provider for user
administration.</p>",
      "union":true
    },
```

```
"DeleteLicenseServerEndpointRequest":{
 "type":"structure",
 "required":[
   "LicenseServerEndpointArn",
   "ServerType"
 ],
 "members":{
   "LicenseServerEndpointArn":{
     "shape":"Arn",
     "documentation":"<p>The Amazon Resource Name (ARN) that identifies the
<code>LicenseServerEndpoint</code> resource to delete.</p>"
   },
   "ServerType":{
     "shape":"ServerType",
     "documentation":"<p>The type of License Server that the delete request refers to.</p>"
   }
 }
},
"DeleteLicenseServerEndpointResponse":{
 "type":"structure",
 "members":{
   "LicenseServerEndpoint":{
     "shape":"LicenseServerEndpoint",
     "documentation":"<p>Shows details from the <code>LicenseServerEndpoint</code> resource that was
deleted.</p>"
   }
 }
},
"DeregisterIdentityProviderRequest":{
 "type":"structure",
 "members":{
   "IdentityProvider":{
     "shape":"IdentityProvider",
     "documentation":"<p>An object that specifies details for the Active Directory identity provider.</p>"
   },
   "IdentityProviderArn":{
     "shape":"Arn",
     "documentation":"<p>The Amazon Resource Name (ARN) that identifies the identity provider to
deregister.</p>"
   },
   "Product":{
     "shape":"String",
     "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
   }
 }
},
```

```
"DeregisterIdentityProviderResponse":{
  "type":"structure",
  "required":["IdentityProviderSummary"],
  "members":{
    "IdentityProviderSummary":{
      "shape":"IdentityProviderSummary",
      "documentation":"<p>Metadata that describes the results
of an identity provider operation.</p>"
    }
  }
},
"Directory":{
  "type":"string",
  "pattern":"^(d|sd)-[0-9a-f]{10}$"
},
"DisassociateUserRequest":{
  "type":"structure",
  "members":{
    "Domain":{
      "shape":"String",
      "documentation":"<p>The domain name of the Active Directory that contains information for the user to
disassociate.</p>"
    },
    "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>An object that specifies details for the Active Directory identity provider.</p>"
    },
    "InstanceId":{
      "shape":"String",
      "documentation":"<p>The ID of the EC2 instance which provides user-based subscriptions.</p>"
    },
    "InstanceUserArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the user to disassociate from the EC2
instance.</p>"
    },
    "Username":{
      "shape":"String",
      "documentation":"<p>The user name from the Active Directory identity provider for the user.</p>"
    }
  }
},
"DisassociateUserResponse":{
  "type":"structure",
  "required":["InstanceUserSummary"],
  "members":{
    "InstanceUserSummary":{
      "shape":"InstanceUserSummary",
```

          "documentation":"<p>Metadata that describes the associate user operation.</p>"
        }
      }
    },
    "DomainNetworkSettings":{
     "type":"structure",
     "required":["Subnets"],
     "members":{
      "Subnets":{
        "shape":"DomainNetworkSettingsSubnetsList",
        "documentation":"<p>Contains a list of subnets that apply for the Active Directory domain.</p>"
      }
     },
     "documentation":"<p>Contains network settings for the Active Directory domain.</p>"
    },
    "DomainNetworkSettingsSubnetsList":{
     "type":"list",
     "member":{"shape":"Subnet"},
     "min":1
    },
    "Filter":{
     "type":"structure",
     "members":{
      "Attribute":{
        "shape":"String",
        "documentation":"<p>The name of an attribute to use as a filter.</p>"
      },
      "Operation":{
        "shape":"String",
        "documentation":"<p>The type of search (For example, eq, geq, leq)</p>"
      },
      "Value":{
        "shape":"String",
        "documentation":"<p>Value of the filter.</p>"
      }
     },
     "documentation":"<p>A filter name and value pair that is used to return more specific results from a describe or
list operation. You can use filters can be used to match a set of resources by specific criteria, such as tags, attributes,
or IDs.</p>"
    },
    "FilterList":{
     "type":"list",
     "member":{"shape":"Filter"}
    },
    "IdentityProvider":{
     "type":"structure",
     "members":{
      "ActiveDirectoryIdentityProvider":{

        "shape":"ActiveDirectoryIdentityProvider",
        "documentation":"<p>The <code>ActiveDirectoryIdentityProvider</code>
resource contains settings and other details about a specific Active Directory identity provider.</p>"
      }
    },
    "documentation":"<p>Refers to an identity provider.</p>",
    "union":true
  },
  "IdentityProviderSummary":{
    "type":"structure",
    "required":[
      "IdentityProvider",
      "Product",
      "Settings",
      "Status"
    ],
    "members":{
      "FailureMessage":{
        "shape":"String",
        "documentation":"<p>The failure message associated with an identity provider.</p>"
      },
      "IdentityProvider":{
        "shape":"IdentityProvider",
        "documentation":"<p>The <code>IdentityProvider</code> resource contains information about an identity
provider.</p>"
      },
      "IdentityProviderArn":{
        "shape":"Arn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider.</p>"
      },
      "Product":{
        "shape":"String",
        "documentation":"<p>The
name of the user-based subscription product.</p>"
      },
      "Settings":{
        "shape":"Settings",
        "documentation":"<p>The <code>Settings</code> resource contains details about the registered identity
providers product related configuration settings, such as the subnets to provision VPC endpoints.</p>"
      },
      "Status":{
        "shape":"String",
        "documentation":"<p>The status of the identity provider.</p>"
      }
    },
    "documentation":"<p>Describes an identity provider.</p>"
  },
  "IdentityProviderSummaryList":{

```
    "type":"list",
    "member":{"shape":"IdentityProviderSummary"}
   },
   "InstanceSummary":{
    "type":"structure",
    "required":[
      "InstanceId",
      "Products",
      "Status"
    ],
    "members":{
      "InstanceId":{
        "shape":"String",
        "documentation":"<p>The ID of the EC2 instance, which provides user-based subscriptions.</p>"
      },
      "LastStatusCheckDate":{
        "shape":"String",
        "documentation":"<p>The date of the last status check.</p>"
      },
      "Products":{
        "shape":"StringList",
        "documentation":"<p>A list of provided user-based subscription products.</p>"
      },
      "Status":{
        "shape":"String",
        "documentation":"<p>The status of an EC2 instance resource.</p>"
      },
      "StatusMessage":{
        "shape":"String",
        "documentation":"<p>The status message for an EC2 instance.</p>"
      }
    },
    "documentation":"<p>Describes an EC2 instance providing user-based subscriptions.</p>"
   },
   "InstanceSummaryList":{
    "type":"list",
    "member":{"shape":"InstanceSummary"}
   },
   "InstanceUserSummary":{
    "type":"structure",
    "required":[
      "IdentityProvider",
      "InstanceId",
      "Status",
      "Username"
    ],
    "members":{
      "AssociationDate":{
```

```
  "shape":"String",
      "documentation":"<p>The date a user was associated with an EC2 instance.</p>"
    },
    "DisassociationDate":{
     "shape":"String",
     "documentation":"<p>The date a user was disassociated from an EC2 instance.</p>"
    },
    "Domain":{
     "shape":"String",
     "documentation":"<p>The domain name of the Active Directory that contains the user information for the
product subscription.</p>"
    },
    "IdentityProvider":{
     "shape":"IdentityProvider",
     "documentation":"<p>The <code>IdentityProvider</code> resource specifies details about the identity
provider.</p>"
    },
    "InstanceId":{
     "shape":"String",
     "documentation":"<p>The ID of the EC2 instance that provides user-based subscriptions.</p>"
    },
    "InstanceUserArn":{
     "shape":"Arn",
     "documentation":"<p>The Amazon Resource Name (ARN) that identifies the instance user.</p>"

    },
    "Status":{
     "shape":"String",
     "documentation":"<p>The status of a user associated with an EC2 instance.</p>"
    },
    "StatusMessage":{
     "shape":"String",
     "documentation":"<p>The status message for users of an EC2 instance.</p>"
    },
    "Username":{
     "shape":"String",
     "documentation":"<p>The user name from the identity provider for the user.</p>"
    }
   },
   "documentation":"<p>Describes users of an EC2 instance providing user-based subscriptions.</p>"
  },
  "InstanceUserSummaryList":{
   "type":"list",
   "member":{"shape":"InstanceUserSummary"}
  },
  "InternalServerException":{
   "type":"structure",
```

```
      "members":{
        "message":{"shape":"String"}
      },
      "documentation":"<p>An exception occurred with the service.</p>",
      "error":{"httpStatusCode":500},
      "exception":true,
      "fault":true
    },
    "IpV4":{
      "type":"string",

      "pattern":"^(?:(25[0-5]|2[0-4][0-9]|1[0-9][0-9]|[1-9][0-9]|[0-9])(\\.(?!$)|$)){4}$"
    },
    "LicenseServer":{
      "type":"structure",
      "members":{
        "HealthStatus":{
          "shape":"LicenseServerHealthStatus",
          "documentation":"<p>The health status of the RDS license server.</p>"
        },
        "Ipv4Address":{
          "shape":"String",
          "documentation":"<p>A list of domain IPv4 addresses that are used for the RDS license server.</p>"
        },
        "ProvisioningStatus":{
          "shape":"LicenseServerEndpointProvisioningStatus",
          "documentation":"<p>The current state of the provisioning process for the RDS license server.</p>"
        }
      },
      "documentation":"<p>Information about a Remote Desktop Services (RDS) license server.</p>"
    },
    "LicenseServerEndpoint":{
      "type":"structure",
      "members":{
        "CreationTime":{
          "shape":"Timestamp",
          "documentation":"<p>The timestamp when License
Manager created the license server endpoint.</p>"
        },
        "IdentityProviderArn":{
          "shape":"String",
          "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider that's associated with the
RDS license server endpoint.</p>"
        },
        "LicenseServerEndpointArn":{
          "shape":"Arn",
          "documentation":"<p>The ARN of the <code>ServerEndpoint</code> resource for the RDS license
server.</p>"
```

```
      },
      "LicenseServerEndpointId":{
        "shape":"LicenseServerEndpointId",
        "documentation":"<p>The ID of the license server endpoint.</p>"
      },
      "LicenseServerEndpointProvisioningStatus":{
        "shape":"LicenseServerEndpointProvisioningStatus",
        "documentation":"<p>The current state of the provisioning process for the RDS license server endpoint</p>"
      },
      "LicenseServers":{
        "shape":"LicenseServerList",
        "documentation":"<p>An array of <code>LicenseServer</code>
 resources that represent the license servers that are accessed through this endpoint.</p>"
      },
      "ServerEndpoint":{
        "shape":"ServerEndpoint",
        "documentation":"<p>The <code>ServerEndpoint</code> resource contains the network address of the RDS
license server endpoint.</p>"
      },
      "ServerType":{
        "shape":"ServerType",
        "documentation":"<p>The type of license server.</p>"
      },
      "StatusMessage":{
        "shape":"String",
        "documentation":"<p>The message associated with the provisioning status, if there is one.</p>"
      }
    },
    "documentation":"<p>Contains details about a network endpoint for a Remote Desktop Services (RDS) license
server.</p>"
  },
  "LicenseServerEndpointId":{"type":"string"},
  "LicenseServerEndpointList":{
    "type":"list",
    "member":{"shape":"LicenseServerEndpoint"}
  },
  "LicenseServerEndpointProvisioningStatus":{
    "type":"string",
    "enum":[
      "PROVISIONING",
      "PROVISIONING_FAILED",
      "PROVISIONED",
      "DELETING",
      "DELETION_FAILED",
      "DELETED"
    ]
  },
  "LicenseServerHealthStatus":{
```

```
    "type":"string",
   "enum":[
     "HEALTHY",
     "UNHEALTHY",
     "NOT_APPLICABLE"
   ]
  },
  "LicenseServerList":{
   "type":"list",
   "member":{"shape":"LicenseServer"}
  },
  "LicenseServerSettings":{
   "type":"structure",
   "required":[
     "ServerSettings",
     "ServerType"
   ],
   "members":{
     "ServerSettings":{
       "shape":"ServerSettings",
       "documentation":"<p>The <code>ServerSettings</code> resource contains the settings for your server.</p>"
     },
     "ServerType":{
      "shape":"ServerType",
      "documentation":"<p>The type of license server.</p>"
     }
   },
   "documentation":"<p>The settings to configure your license server.</p>"
  },
  "ListIdentityProvidersRequest":{
    "type":"structure",
   "members":{
     "Filters":{
       "shape":"FilterList",
       "documentation":"<p>You can use the following filters to streamline results:</p> <ul> <li> <p>Product</p>
</li> <li> <p>DirectoryId</p> </li> </ul>"
     },
     "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>The maximum number of results to return from a single request.</p>"
     },
     "NextToken":{
       "shape":"String",
       "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
     }
   }
  },
```

    "ListIdentityProvidersResponse":{
     "type":"structure",
     "required":["IdentityProviderSummaries"],
     "members":{
      "IdentityProviderSummaries":{
       "shape":"IdentityProviderSummaryList",
       "documentation":"<p>An array of <code>IdentityProviderSummary</code> resources that contain details
about the
 Active Directory identity providers that meet the request criteria.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
      }
     }
    },
    "ListInstancesRequest":{
     "type":"structure",
     "members":{
      "Filters":{
       "shape":"FilterList",
       "documentation":"<p>You can use the following filters to streamline results:</p>   <p>Status</p>
  <p>InstanceId</p> "
      },
      "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>The maximum number of results to return from a single request.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>A token to specify where to start paginating.
 This is the nextToken from a previously truncated response.</p>"
      }
     }
    },
    "ListInstancesResponse":{
     "type":"structure",
     "members":{
      "InstanceSummaries":{
       "shape":"InstanceSummaryList",
       "documentation":"<p>An array of <code>InstanceSummary</code> resources that contain details about the
instances that provide user-based subscriptions and also meet the request criteria.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are

additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
```
          }
        }
      },
      "ListLicenseServerEndpointsRequest":{
        "type":"structure",
        "members":{
          "Filters":{
            "shape":"FilterList",
            "documentation":"<p>You can use the following filters to streamline results:</p>
 <ul> <li> <p>IdentityProviderArn</p> </li> </ul>"
          },
          "MaxResults":{
            "shape":"ListLicenseServerEndpointsRequestMaxResultsInteger",
            "documentation":"<p>The maximum number of results to return from a single request.</p>"
          },
          "NextToken":{
            "shape":"String",
            "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>"
          }
        }
      },
      "ListLicenseServerEndpointsRequestMaxResultsInteger":{
        "type":"integer",
        "box":true,
        "max":100,
        "min":1
      },
      "ListLicenseServerEndpointsResponse":{
        "type":"structure",
        "members":{
          "LicenseServerEndpoints":{
            "shape":"LicenseServerEndpointList",
            "documentation":"<p>An array of <code>LicenseServerEndpoint</code> resources that contain detailed information about the RDS License Servers that meet the request criteria.</p>"
          },

          "NextToken":{
            "shape":"String",
            "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
          }
        }
      },
      "ListProductSubscriptionsRequest":{
```

```
      "type":"structure",
      "required":["IdentityProvider"],
      "members":{
       "Filters":{
        "shape":"FilterList",
        "documentation":"<p>You can use the following filters to streamline results:</p> <ul> <li> <p>Status</p>
</li> <li> <p>Username</p> </li> <li> <p>Domain</p> </li> </ul>"
       },
       "IdentityProvider":{
        "shape":"IdentityProvider",
        "documentation":"<p>An object that specifies details for the identity provider.</p>"
       },
       "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>The maximum number of results to return from
 a single request.</p>"
       },
       "NextToken":{
        "shape":"String",
        "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
       },
       "Product":{
        "shape":"String",
        "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
       }
      }
     },
     "ListProductSubscriptionsResponse":{
      "type":"structure",
      "members":{
       "NextToken":{
        "shape":"String",
        "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
       },
       "ProductUserSummaries":{
         "shape":"ProductUserSummaryList",
        "documentation":"<p>Metadata that describes the list product subscriptions operation.</p>"
       }
      }
     },
     "ListTagsForResourceRequest":{
      "type":"structure",
      "required":["ResourceArn"],
```

```
        "members":{
          "ResourceArn":{
            "shape":"ResourceArn",
            "documentation":"<p>The Amazon Resource Name (ARN) of the resource whose tags you want to
retrieve.</p>",
            "location":"uri",
            "locationName":"ResourceArn"
          }
        }
      },
      "ListTagsForResourceResponse":{
        "type":"structure",
        "members":{
          "Tags":{
            "shape":"Tags",
            "documentation":"<p>The tags for the specified resource.</p>"
          }
        }
      },
      "ListUserAssociationsRequest":{
        "type":"structure",
        "required":[
          "IdentityProvider",
          "InstanceId"
        ],
        "members":{
          "Filters":{
            "shape":"FilterList",
            "documentation":"<p>You
can use the following filters to streamline results:</p> <ul> <li> <p>Status</p> </li> <li> <p>Username</p> </li>
<li> <p>Domain</p> </li> </ul>"
          },
          "IdentityProvider":{
            "shape":"IdentityProvider",
            "documentation":"<p>An object that specifies details for the identity provider.</p>"
          },
          "InstanceId":{
            "shape":"String",
            "documentation":"<p>The ID of the EC2 instance, which provides user-based subscriptions.</p>"
          },
          "MaxResults":{
            "shape":"BoxInteger",
            "documentation":"<p>The maximum number of results to return from a single request.</p>"
          },
          "NextToken":{
            "shape":"String",
            "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
```

```
          }
        }
      },
    "ListUserAssociationsResponse":{
      "type":"structure",
      "members":{
        "InstanceUserSummaries":{
          "shape":"InstanceUserSummaryList",
          "documentation":"<p>Metadata that describes the list user association operation.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
        }
      }
    },
    "ProductUserSummary":{
      "type":"structure",
      "required":[
        "IdentityProvider",
        "Product",
        "Status",
        "Username"
      ],
      "members":{
        "Domain":{
          "shape":"String",
          "documentation":"<p>The domain name of the Active Directory that contains the user information for the
product subscription.</p>"
        },
        "IdentityProvider":{
          "shape":"IdentityProvider",
          "documentation":"<p>An object that specifies
 details for the identity provider.</p>"
        },
        "Product":{
          "shape":"String",
          "documentation":"<p>The name of the user-based subscription product.</p>"
        },
        "ProductUserArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) for this product user.</p>"
        },
        "Status":{
          "shape":"String",
          "documentation":"<p>The status of a product for this user.</p>"
```

```
      },
      "StatusMessage":{
        "shape":"String",
        "documentation":"<p>The status message for a product for this user.</p>"
      },
      "SubscriptionEndDate":{
        "shape":"String",
        "documentation":"<p>The end date of a subscription.</p>"
      },
      "SubscriptionStartDate":{
        "shape":"String",
        "documentation":"<p>The start date of a subscription.</p>"
      },
      "Username":{
        "shape":"String",
        "documentation":"<p>The user name
from the identity provider for this product user.</p>"
      }
    },
    "documentation":"<p>A summary of the user-based subscription products for a specific user.</p>"
  },
  "ProductUserSummaryList":{
    "type":"list",
    "member":{"shape":"ProductUserSummary"}
  },
  "RdsSalSettings":{
    "type":"structure",
    "required":["RdsSalCredentialsProvider"],
    "members":{
      "RdsSalCredentialsProvider":{
        "shape":"CredentialsProvider",
        "documentation":"<p>The <code>CredentialsProvider</code> resource contains a reference to the credentials
provider that's used for RDS license server user administration.</p>"
      }
    },
    "documentation":"<p>Server settings that are specific to a Remote Desktop Services (RDS) license server.</p>"
  },
  "RegisterIdentityProviderRequest":{
    "type":"structure",
    "required":[
      "IdentityProvider",
      "Product"
    ],
    "members":{
      "IdentityProvider":{

        "shape":"IdentityProvider",
        "documentation":"<p>An object that specifies details for the identity provider to register.</p>"
```

```
      },
      "Product":{
        "shape":"String",
        "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
      },
      "Settings":{
        "shape":"Settings",
        "documentation":"<p>The registered identity providers product related configuration settings such as the
subnets to provision VPC endpoints.</p>"
      },
      "Tags":{
        "shape":"Tags",
        "documentation":"<p>The tags that apply to the identity provider's registration.</p>"
      }
    }
  },
  "RegisterIdentityProviderResponse":{
    "type":"structure",
    "required":["IdentityProviderSummary"],
    "members":{
      "IdentityProviderSummary":{
        "shape":"IdentityProviderSummary",
        "documentation":"<p>Metadata that describes the results of an identity provider operation.</p>"
      }
    }
  },
  "ResourceArn":{
    "type":"string",
    "pattern":"^arn:([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-
\\.]{1,510})/([a-z0-9-\\.]{1,510})$"
  },
  "ResourceNotFoundException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>The resource couldn't be found.</p>",
    "error":{
      "httpStatusCode":404,
      "senderFault":true
    },
    "exception":true
  },
  "SecretsManagerCredentialsProvider":{
    "type":"structure",
    "members":{
```

```
    "SecretId":{
      "shape":"SecretsManagerCredentialsProviderSecretIdString",
      "documentation":"<p>The ID of the Secrets Manager secret that contains credentials.</p>"
     }
    },

    "documentation":"<p>Contains a credentials secret that's stored in Secrets Manager.</p>"
   },
   "SecretsManagerCredentialsProviderSecretIdString":{
    "type":"string",
    "min":1
   },
   "SecurityGroup":{
    "type":"string",
    "max":200,
    "min":5,
    "pattern":"^sg-(([0-9a-z]{8})|([0-9a-z]{17}))$"
   },
   "ServerEndpoint":{
    "type":"structure",
    "members":{
     "Endpoint":{
      "shape":"String",
      "documentation":"<p>The network address of the endpoint.</p>"
     }
    },
    "documentation":"<p>A network endpoint through which you can access one or more servers.</p>"
   },
   "ServerSettings":{
    "type":"structure",
    "members":{
     "RdsSalSettings":{
      "shape":"RdsSalSettings",
      "documentation":"<p>The <code>RdsSalSettings</code> resource contains settings to configure a specific
Remote Desktop Services (RDS) license server.</p>"
     }
    },
    "documentation":"<p>Contains
settings for a specific server.</p>",
    "union":true
   },
   "ServerType":{
    "type":"string",
    "enum":["RDS_SAL"]
   },
   "ServiceQuotaExceededException":{
    "type":"structure",
    "members":{
```

"message":{"shape":"String"}
    },
    "documentation":"<p>The request failed because a service quota is exceeded.</p>",
    "exception":true
    },
  "Settings":{
   "type":"structure",
   "required":[
     "SecurityGroupId",
     "Subnets"
   ],
   "members":{
     "SecurityGroupId":{
      "shape":"SecurityGroup",
      "documentation":"<p>A security group ID that allows inbound TCP port 1688 communication between
resources in your VPC and the VPC endpoint for activation servers.</p>"
     },
     "Subnets":{
      "shape":"SettingsSubnetsList",
      "documentation":"<p>The subnets defined for the registered identity provider.</p>"
     }
    },
    "documentation":"<p>The registered identity providers
 product related configuration settings such as the subnets to provision VPC endpoints, and the security group ID
that is associated with the VPC endpoints. The security group should permit inbound TCP port 1688 communication
from resources in the VPC.</p>"
    },
  "SettingsSubnetsList":{
   "type":"list",
   "member":{"shape":"Subnet"},
   "min":1
   },
  "StartProductSubscriptionRequest":{
   "type":"structure",
   "required":[
     "IdentityProvider",
     "Product",
     "Username"
   ],
   "members":{
     "Domain":{
      "shape":"String",
      "documentation":"<p>The domain name of the Active Directory that contains the user for whom to start the
product subscription.</p>"
     },
     "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>An object that specifies details for the identity provider.</p>"

```
          },
        "Product":{
          "shape":"String",
          "documentation":"<p>The
 name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
        },
        "Tags":{
          "shape":"Tags",
          "documentation":"<p>The tags that apply to the product subscription.</p>"
        },
        "Username":{
          "shape":"String",
          "documentation":"<p>The user name from the identity provider of the user.</p>"
        }
      }
    },
    "StartProductSubscriptionResponse":{
      "type":"structure",
      "required":["ProductUserSummary"],
      "members":{
        "ProductUserSummary":{
          "shape":"ProductUserSummary",
          "documentation":"<p>Metadata that describes the start product subscription operation.</p>"
        }
      }
    },
    "StopProductSubscriptionRequest":{
      "type":"structure",
      "members":{
        "Domain":{
          "shape":"String",
          "documentation":"<p>The domain name of the Active Directory that contains the user for whom to stop the
product subscription.</p>"
        },
        "IdentityProvider":{
          "shape":"IdentityProvider",
          "documentation":"<p>An object that specifies details for the identity provider.</p>"
        },
        "Product":{
          "shape":"String",
          "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
        },
        "ProductUserArn":{
          "shape":"Arn",
```

          "documentation":"<p>The Amazon Resource Name (ARN) of the product user.</p>"
        },
        "Username":{
          "shape":"String",
          "documentation":"<p>The user name from the identity provider for the user.</p>"
        }
      }
    },
    "StopProductSubscriptionResponse":{
      "type":"structure",
      "required":["ProductUserSummary"],
      "members":{
        "ProductUserSummary":{
          "shape":"ProductUserSummary",
          "documentation":"<p>Metadata that describes the start product subscription operation.</p>"
        }
      }
    },
    "String":{"type":"string"},
    "StringList":{
      "type":"list",
      "member":{"shape":"String"}
    },
    "Subnet":{
      "type":"string",
      "pattern":"^subnet-[a-z0-9]{8,17}"
    },
    "Subnets":{
      "type":"list",
      "member":{"shape":"Subnet"}
    },
    "TagKeyList":{
      "type":"list",
      "member":{"shape":"String"},
      "max":50,
      "min":0,
      "sensitive":true
    },
    "TagResourceRequest":{
      "type":"structure",
      "required":[
        "ResourceArn",
        "Tags"
      ],
      "members":{
        "ResourceArn":{
          "shape":"ResourceArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the resource that you want to tag.</p>",

```
        "location":"uri",
        "locationName":"ResourceArn"
      },
      "Tags":{
        "shape":"Tags",
        "documentation":"<p>The tags to apply to the specified resource.</p>"
      }
    }
  },
  "TagResourceResponse":{
    "type":"structure",
    "members":{
    }
  },
  "Tags":{
    "type":"map",
    "key":{"shape":"String"},
    "value":{"shape":"String"},
    "max":50,
    "min":0,
    "sensitive":true
  },
  "ThrottlingException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>The request was denied because of request throttling. Retry the request.</p>",
    "exception":true
  },
  "Timestamp":{"type":"timestamp"},
  "UntagResourceRequest":{
    "type":"structure",
    "required":[
      "ResourceArn",
      "TagKeys"
    ],
    "members":{
      "ResourceArn":{
        "shape":"ResourceArn",
        "documentation":"<p>The Amazon
Resource Name (ARN) of the resource that you want to remove tags from.</p>",
        "location":"uri",
        "locationName":"ResourceArn"
      },
      "TagKeys":{
        "shape":"TagKeyList",
```

```
      "documentation":"<p>The tag keys to remove from the resource.</p>",
      "location":"querystring",
      "locationName":"tagKeys"
     }
    }
   },
   "UntagResourceResponse":{
    "type":"structure",
    "members":{
    }
   },
   "UpdateIdentityProviderSettingsRequest":{
    "type":"structure",
    "required":["UpdateSettings"],
    "members":{
     "IdentityProvider":{"shape":"IdentityProvider"},
     "IdentityProviderArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider to update.</p>"
     },
     "Product":{
      "shape":"String",
      "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code>
 | <code>VISUAL_STUDIO_PROFESSIONAL</code> | <code>OFFICE_PROFESSIONAL_PLUS</code> |
<code>REMOTE_DESKTOP_SERVICES</code> </p>"
     },
     "UpdateSettings":{
      "shape":"UpdateSettings",
      "documentation":"<p>Updates the registered identity providers product related configuration settings. You can
update any combination of settings in a single operation such as the:</p> <ul> <li> <p>Subnets which you want to
add to provision VPC endpoints.</p> </li> <li> <p>Subnets which you want to remove the VPC endpoints
from.</p> </li> <li> <p>Security group ID which permits traffic to the VPC endpoints.</p> </li> </ul>"
     }
    }
   },
   "UpdateIdentityProviderSettingsResponse":{
    "type":"structure",
    "required":["IdentityProviderSummary"],
    "members":{
     "IdentityProviderSummary":{"shape":"IdentityProviderSummary"}
    }
   },
   "UpdateSettings":{
    "type":"structure",
    "required":[
     "AddSubnets",
     "RemoveSubnets"
```

```
    ],
    "members":{
     "AddSubnets":{
      "shape":"Subnets",
      "documentation":"<p>The ID of one or more subnets in which License Manager will create a VPC endpoint
for products that require connectivity to activation servers.</p>"
     },
     "RemoveSubnets":{
      "shape":"Subnets",
      "documentation":"<p>The ID of one or more subnets to remove.</p>"
     },
     "SecurityGroupId":{
      "shape":"SecurityGroup",
      "documentation":"<p>A security group ID that allows inbound TCP port 1688 communication between
resources in your VPC and the VPC endpoints for activation servers.</p>"
     }
    },
    "documentation":"<p>Updates the registered identity providers product related configuration settings such as the
subnets to provision VPC endpoints.</p>"
   },
   "ValidationException":{
    "type":"structure",
    "members":{
     "message":{"shape":"String"}
    },
    "documentation":"<p>A parameter
is not valid.</p>",
    "exception":true
   }
  },
  "documentation":"<p>With License Manager, you can create user-based subscriptions to utilize licensed software
with a per user subscription fee on Amazon EC2 instances.</p>"
}
{
  "version": "1.0",
  "parameters": {
    "Region": {
      "builtIn": "AWS::Region",
      "required": false,
      "documentation": "The AWS region used to dispatch the request.",
      "type": "String"
    },
    "UseDualStack": {
      "builtIn": "AWS::UseDualStack",
      "required": true,
      "default": false,
      "documentation": "When true, use the dual-stack endpoint. If the configured endpoint does not support dual-
stack, dispatching the request MAY return an error.",
```

```
        "type": "Boolean"
      },
      "UseFIPS": {
        "builtIn": "AWS::UseFIPS",
        "required": true,
        "default": false,
        "documentation": "When true, send this request to the FIPS-compliant regional endpoint. If the configured
endpoint does not have a FIPS compliant endpoint, dispatching the request will return an error.",
        "type": "Boolean"
      },
      "Endpoint": {

    "builtIn": "SDK::Endpoint",
        "required": false,
        "documentation": "Override the endpoint used to send this request",
        "type": "String"
      }
    },
    "rules": [
      {
        "conditions": [
          {
            "fn": "isSet",
            "argv": [
              {
                "ref": "Endpoint"
              }
            ]
          }
        ],
        "rules": [
          {
            "conditions": [
              {
                "fn": "booleanEquals",
                "argv": [
                  {
                    "ref": "UseFIPS"
                  },
                  true
                ]
              }
            ],
            "error": "Invalid Configuration: FIPS and custom endpoint are not supported",
            "type": "error"
          },
          {
            "conditions": [],
```

```
      "rules": [
        {
          "conditions": [
            {
              "fn": "booleanEquals",
              "argv": [
                {
                  "ref": "UseDualStack"
                },
                true
              ]
            }
          ],
          "error": "Invalid Configuration: Dualstack and custom endpoint are not supported",
          "type": "error"
        },
        {
          "conditions": [],
          "endpoint": {
            "url": {

              "ref": "Endpoint"
              },
              "properties": {},
              "headers": {}
            },
            "type": "endpoint"
          }
        ],
        "type": "tree"
      }
    ],
    "type": "tree"
  },
  {
    "conditions": [],
    "rules": [
      {
        "conditions": [
          {
            "fn": "isSet",
            "argv": [
              {
                "ref": "Region"
              }
            ]
          }
        ],
```

```
"rules": [
  {
    "conditions": [
      {

        "fn": "aws.partition",
        "argv": [
          {
            "ref": "Region"
          }
        ],
        "assign": "PartitionResult"
      }
    ],
    "rules": [
      {
        "conditions": [
          {
            "fn": "booleanEquals",
            "argv": [
              {
                "ref": "UseFIPS"
              },
              true
            ]
          },

          {
            "fn": "booleanEquals",
            "argv": [
              {
                "ref": "UseDualStack"
              },
              true
            ]
          }
        ],
        "rules": [
          {
            "conditions": [
              {
                "fn": "booleanEquals",
                "argv": [
                  true,
                  {

                    "fn": "getAttr",
                    "argv": [
```

```
                                    {
                                        "ref": "PartitionResult"
                                    },
                                    "supportsFIPS"
                                ]
                            }
                        ]
                    },
                    {
                        "fn": "booleanEquals",
                        "argv": [
                            true,
                            {
                                "fn": "getAttr",
                                "argv": [
                                    {
                                        "ref": "PartitionResult"
                                    },
                                    "supportsDualStack"
                                ]
                            }
                        ]
                    }
                ],
                "rules": [
                    {
                        "conditions": [],
                        "rules": [
                            {
                                "conditions": [],
                                "endpoint": {
                                    "url": "https://license-manager-linux-subscriptions-fips.{Region}.{PartitionResult#dualStackDnsSuffix}",
                                    "properties": {},
                                    "headers": {}
                                },
                                "type": "endpoint"
                            }
                        ],
                        "type": "tree"
                    }
                ],
                "type": "tree"
            },
```

```
        {
                                "conditions": [],
                                "error": "FIPS and DualStack are enabled, but this partition does not support one or
both",
                                "type": "error"
                        }
                ],
                "type": "tree"
        },
        {
            "conditions": [
                {
                    "fn": "booleanEquals",
                    "argv": [
                        {
                            "ref": "UseFIPS"
                        },
                        true
                    ]
                }

            ],
            "rules": [
                {
                    "conditions": [
                        {
                            "fn": "booleanEquals",
                            "argv": [
                                {
                                    "fn": "getAttr",
                                    "argv": [
                                        {
                                            "ref": "PartitionResult"
                                        },
                                        "supportsFIPS"
                                    ]

},

                                true
                            ]
                        }
                    ],
                    "rules": [
                        {
                            "conditions": [],
                            "rules": [
                                {
                                    "conditions": [],
```

```
                        "endpoint": {
                            "url": "https://license-manager-linux-subscriptions-
fips.{Region}.{PartitionResult#dnsSuffix}",
                            "properties": {},
                            "headers": {}

                 },
                        "type": "endpoint"
                      }
                  ],
                  "type": "tree"
                }
              ],
              "type": "tree"
            },
            {
              "conditions": [],
              "error": "FIPS is enabled but this partition does not support FIPS",
              "type": "error"
            }
          ],
          "type": "tree"
        },
        {

        "conditions": [
              {
                "fn": "booleanEquals",
                "argv": [
                  {
                    "ref": "UseDualStack"
                  },
                  true
                ]
              }
            ],
            "rules": [
              {
                "conditions": [
                  {
                    "fn": "booleanEquals",
                    "argv": [
                      true,

    {

                        "fn": "getAttr",
                        "argv": [
                          {
```

```
                                    "ref": "PartitionResult"
                                },
                                "supportsDualStack"
                            ]
                        }
                    ]
                }
            ],
            "rules": [
                {
                    "conditions": [],
                    "rules": [

                        {
                            "conditions": [],
                            "endpoint": {
                                "url": "https://license-manager-linux-
subscriptions.{Region}.{PartitionResult#dualStackDnsSuffix}",
                                "properties": {},
                                "headers": {}
                            },
                            "type": "endpoint"
                        }
                    ],
                    "type": "tree"
                }
            ],
            "type": "tree"

        },
        {
            "conditions": [],
            "error": "DualStack is enabled but this partition does not support DualStack",
            "type": "error"
        }
    ],
    "type": "tree"
},
{
    "conditions": [],
    "rules": [
        {
            "conditions": [],
            "endpoint": {
                "url": "https://license-manager-linux-
subscriptions.{Region}.{PartitionResult#dnsSuffix}",
                "properties": {},
```

```
                            "headers": {}
                        },
                        "type": "endpoint"
                    }
                ],
                "type": "tree"
            }
        ],
        "type": "tree"
    },
    {
        "conditions": [],
        "error": "Invalid Configuration: Missing Region",
        "type": "error"
    }
  ],
  "type": "tree"
    }
  ]
}
{
 "pagination": {
  "ListAssociationsForLicenseConfiguration": {
   "input_token": "NextToken",
   "limit_key": "MaxResults",
   "output_token": "NextToken",
   "result_key": "LicenseConfigurationAssociations"
  },
  "ListLicenseConfigurations": {
   "input_token": "NextToken",
   "limit_key": "MaxResults",
   "output_token": "NextToken",
   "result_key": "LicenseConfigurations"
  },
  "ListLicenseSpecificationsForResource": {
   "input_token": "NextToken",
   "limit_key": "MaxResults",
   "output_token": "NextToken",
   "result_key": "LicenseSpecifications"
  },
  "ListResourceInventory": {
   "input_token": "NextToken",
   "limit_key": "MaxResults",
   "output_token": "NextToken",
   "result_key": "ResourceInventoryList"
```

```
        },
     "ListUsageForLicenseConfiguration": {
       "input_token": "NextToken",
       "limit_key": "MaxResults",
       "output_token": "NextToken",
       "result_key": "LicenseConfigurationUsageList"
       }
   }
 }
 {
  "pagination": {
    "ListLinuxSubscriptionInstances": {
      "input_token": "NextToken",
      "output_token": "NextToken",
      "limit_key": "MaxResults",
      "result_key": "Instances"
     },
    "ListLinuxSubscriptions": {
      "input_token": "NextToken",
      "output_token": "NextToken",
      "limit_key": "MaxResults",
      "result_key": "Subscriptions"
     },
    "ListRegisteredSubscriptionProviders": {
      "input_token": "NextToken",
      "output_token": "NextToken",
      "limit_key": "MaxResults",
      "result_key": "RegisteredSubscriptionProviders"
     }
   }
 }
 {
 "version":"2.0",
 "metadata":{
   "apiVersion":"2018-05-10",
   "endpointPrefix":"license-manager-linux-subscriptions",
   "jsonVersion":"1.1",
   "protocol":"rest-json",
   "protocols":["rest-json"],
   "serviceFullName":"AWS License Manager Linux Subscriptions",
   "serviceId":"License Manager Linux Subscriptions",
   "signatureVersion":"v4",
   "signingName":"license-manager-linux-subscriptions",
   "uid":"license-manager-linux-subscriptions-2018-05-10",
   "auth":["aws.auth#sigv4"]
 },
 "operations":{
   "DeregisterSubscriptionProvider":{
```

     "name":"DeregisterSubscriptionProvider",
     "http":{
       "method":"POST",
       "requestUri":"/subscription/DeregisterSubscriptionProvider",
       "responseCode":200
     },
     "input":{"shape":"DeregisterSubscriptionProviderRequest"},
     "output":{"shape":"DeregisterSubscriptionProviderResponse"},
     "errors":[
       {"shape":"InternalServerException"},
       {"shape":"ResourceNotFoundException"},
       {"shape":"ThrottlingException"},
       {"shape":"ValidationException"}
     ],
     "documentation":"<p>Remove a third-party subscription provider from the Bring Your Own License (BYOL)
subscriptions registered to your account.</p>",
     "idempotent":true
   },
   "GetRegisteredSubscriptionProvider":{
     "name":"GetRegisteredSubscriptionProvider",
     "http":{
       "method":"POST",
       "requestUri":"/subscription/GetRegisteredSubscriptionProvider",
       "responseCode":200
     },
     "input":{"shape":"GetRegisteredSubscriptionProviderRequest"},
     "output":{"shape":"GetRegisteredSubscriptionProviderResponse"},
     "errors":[
       {"shape":"InternalServerException"},
       {"shape":"ResourceNotFoundException"},
       {"shape":"ThrottlingException"},
       {"shape":"ValidationException"}
     ],
     "documentation":"<p>Get details for a Bring Your Own License (BYOL) subscription that's registered to your
account.</p>",
     "idempotent":true
   },
   "GetServiceSettings":{
     "name":"GetServiceSettings",
     "http":{
       "method":"POST",
       "requestUri":"/subscription/GetServiceSettings",
       "responseCode":200
     },
     "input":{"shape":"GetServiceSettingsRequest"},
     "output":{"shape":"GetServiceSettingsResponse"},
     "errors":[
       {"shape":"InternalServerException"},

```
    {"shape":"ThrottlingException"},
    {"shape":"ValidationException"}
   ],
   "documentation":"<p>Lists the Linux subscriptions service settings for your account.</p>",
   "idempotent":true
  },
  "ListLinuxSubscriptionInstances":{
   "name":"ListLinuxSubscriptionInstances",
   "http":{
    "method":"POST",
    "requestUri":"/subscription/ListLinuxSubscriptionInstances",
    "responseCode":200
   },
   "input":{"shape":"ListLinuxSubscriptionInstancesRequest"},
   "output":{"shape":"ListLinuxSubscriptionInstancesResponse"},
   "errors":[
    {"shape":"InternalServerException"},
    {"shape":"ThrottlingException"},
    {"shape":"ValidationException"}
   ],
   "documentation":"<p>Lists the running Amazon EC2 instances that were discovered with commercial Linux
subscriptions.</p>",
   "idempotent":true
  },
  "ListLinuxSubscriptions":{
   "name":"ListLinuxSubscriptions",
   "http":{
    "method":"POST",
    "requestUri":"/subscription/ListLinuxSubscriptions",
    "responseCode":200
   },
   "input":{"shape":"ListLinuxSubscriptionsRequest"},
   "output":{"shape":"ListLinuxSubscriptionsResponse"},
   "errors":[
    {"shape":"InternalServerException"},
    {"shape":"ThrottlingException"},
    {"shape":"ValidationException"}
   ],
   "documentation":"<p>Lists the Linux subscriptions that have been discovered. If you have linked your
organization, the returned results will include data aggregated across your accounts in Organizations.</p>",
   "idempotent":true
  },
  "ListRegisteredSubscriptionProviders":{
   "name":"ListRegisteredSubscriptionProviders",
   "http":{
    "method":"POST",
    "requestUri":"/subscription/ListRegisteredSubscriptionProviders",
    "responseCode":200
```

```
      },
      "input":{"shape":"ListRegisteredSubscriptionProvidersRequest"},
      "output":{"shape":"ListRegisteredSubscriptionProvidersResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>List Bring Your Own License (BYOL) subscription registration resources for your
account.</p>",
      "idempotent":true
    },
    "ListTagsForResource":{
      "name":"ListTagsForResource",
      "http":{
        "method":"GET",
        "requestUri":"/tags/{resourceArn}",
        "responseCode":200
      },
      "input":{"shape":"ListTagsForResourceRequest"},
      "output":{"shape":"ListTagsForResourceResponse"},
      "errors":[

      {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>List the metadata tags that are assigned to the specified Amazon Web Services
resource.</p>"
    },
    "RegisterSubscriptionProvider":{
      "name":"RegisterSubscriptionProvider",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/RegisterSubscriptionProvider",
        "responseCode":200
      },
      "input":{"shape":"RegisterSubscriptionProviderRequest"},
      "output":{"shape":"RegisterSubscriptionProviderResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Register the supported third-party subscription provider for your Bring Your Own License
(BYOL) subscription.</p>",
      "idempotent":true
    },
```

```
"TagResource":{
  "name":"TagResource",
  "http":{
    "method":"PUT",
    "requestUri":"/tags/{resourceArn}",
    "responseCode":200
  },
  "input":{"shape":"TagResourceRequest"},
  "output":{"shape":"TagResourceResponse"},
  "errors":[
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"ValidationException"}
  ],
  "documentation":"<p>Add metadata tags to the specified Amazon Web Services resource.</p>",
  "idempotent":true
},
"UntagResource":{
  "name":"UntagResource",
  "http":{
    "method":"DELETE",
    "requestUri":"/tags/{resourceArn}",
    "responseCode":200
  },
  "input":{"shape":"UntagResourceRequest"},
  "output":{"shape":"UntagResourceResponse"},
  "errors":[
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"}
  ],
  "documentation":"<p>Remove one or more metadata tag from the specified Amazon Web Services resource.</p>",
  "idempotent":true
},
"UpdateServiceSettings":{
  "name":"UpdateServiceSettings",
  "http":{
    "method":"POST",
    "requestUri":"/subscription/UpdateServiceSettings",
    "responseCode":200
  },
  "input":{"shape":"UpdateServiceSettingsRequest"},
  "output":{"shape":"UpdateServiceSettingsResponse"},
  "errors":[
    {"shape":"InternalServerException"},
    {"shape":"ThrottlingException"},
    {"shape":"ValidationException"}
  ],
```

"documentation":"<p>Updates the service settings for Linux subscriptions.</p>",
          "idempotent":true
        }
    },
    "shapes":{
      "Boolean":{
        "type":"boolean",
        "box":true
      },
      "BoxInteger":{
        "type":"integer",
        "box":true
      },
      "BoxLong":{
        "type":"long",
        "box":true
      },
      "DeregisterSubscriptionProviderRequest":{
        "type":"structure",
        "required":["SubscriptionProviderArn"],
        "members":{
          "SubscriptionProviderArn":{
            "shape":"SubscriptionProviderArn",
            "documentation":"<p>The Amazon Resource Name (ARN) of the subscription provider resource to deregister.</p>"
          }
        }
      },
      "DeregisterSubscriptionProviderResponse":{
        "type":"structure",
        "members":{
        }
      },
      "Filter":{
        "type":"structure",
        "members":{
          "Name":{
            "shape":"String",
            "documentation":"<p>The type of name to filter by.</p>"
          },
          "Operator":{
            "shape":"Operator",
            "documentation":"<p>An operator for filtering results.</p>"
          },
          "Values":{
            "shape":"StringList",
            "documentation":"<p>One or more values for the name to filter by.</p>"
          }

```
      },
      "documentation":"<p>A filter object that is used to return more specific results from a describe operation. Filters
can be used to match a set of resources by specific criteria.</p>"
    },
    "FilterList":{
      "type":"list",
      "member":{"shape":"Filter"}
    },
    "GetRegisteredSubscriptionProviderRequest":{
      "type":"structure",
      "required":["SubscriptionProviderArn"],
      "members":{
        "SubscriptionProviderArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the BYOL registration resource to get details
for.</p>"
        }
      }
    },
    "GetRegisteredSubscriptionProviderResponse":{
      "type":"structure",
      "members":{
        "LastSuccessfulDataRetrievalTime":{
          "shape":"String",
          "documentation":"<p>The timestamp from the last time License Manager retrieved subscription details from
your registered third-party Linux subscription provider.</p>"
        },
        "SecretArn":{
          "shape":"SecretArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the third-party access secret stored in Secrets
Manager for the BYOL registration resource specified in the request.</p>"
        },

  "SubscriptionProviderArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) for the BYOL registration resource specified in
the request.</p>"
        },
        "SubscriptionProviderSource":{
          "shape":"SubscriptionProviderSource",
          "documentation":"<p>The subscription provider for the BYOL registration resource specified in the
request.</p>"
        },
        "SubscriptionProviderStatus":{
          "shape":"SubscriptionProviderStatus",
          "documentation":"<p>The status of the Linux subscription provider access token from the last successful
subscription data request.</p>"
        },
```

```
      "SubscriptionProviderStatusMessage":{
        "shape":"String",
        "documentation":"<p>The detailed message from your subscription provider token status.</p>"
      }
    }
  },
  "GetServiceSettingsRequest":{
    "type":"structure",
    "members":{
    }
  },
  "GetServiceSettingsResponse":{
    "type":"structure",
    "members":{
      "HomeRegions":{
        "shape":"StringList",
        "documentation":"<p>The Region in which License Manager displays the aggregated data for Linux
subscriptions.</p>"
      },
      "LinuxSubscriptionsDiscovery":{
        "shape":"LinuxSubscriptionsDiscovery",
        "documentation":"<p>Lists if discovery has been enabled for Linux subscriptions.</p>"
      },
      "LinuxSubscriptionsDiscoverySettings":{
        "shape":"LinuxSubscriptionsDiscoverySettings",
        "documentation":"<p>Lists the settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
      },
      "Status":{
        "shape":"Status",
        "documentation":"<p>Indicates the status of Linux subscriptions settings being applied.</p>"
      },
      "StatusMessage":{
        "shape":"StringMap",
        "documentation":"<p>A
message which details the Linux subscriptions service settings current status.</p>"
      }
    }
  },
  "Instance":{
    "type":"structure",
    "members":{
      "AccountID":{
        "shape":"String",
        "documentation":"<p>The account ID which owns the instance.</p>"
      },
      "AmiId":{
        "shape":"String",
```

          "documentation":"<p>The AMI ID used to launch the instance.</p>"
        },
      "DualSubscription":{
        "shape":"String",
        "documentation":"<p>Indicates that you have two different license subscriptions for the same software on your
instance.</p>"
        },
      "InstanceID":{
        "shape":"String",
        "documentation":"<p>The instance ID of the resource.</p>"
        },
      "InstanceType":{
        "shape":"String",
        "documentation":"<p>The instance type of the resource.</p>"
        },
      "LastUpdatedTime":{
        "shape":"String",
        "documentation":"<p>The
 time in which the last discovery updated the instance details.</p>"
        },
      "OsVersion":{
        "shape":"String",
        "documentation":"<p>The operating system software version that runs on your instance.</p>"
        },
      "ProductCode":{
        "shape":"ProductCodeList",
        "documentation":"<p>The product code for the instance. For more information, see <a
href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/linux-subscriptions-usage-
operation.html\">Usage operation values in the <i>License Manager User Guide</i> .</p>"
        },
      "Region":{
        "shape":"String",
        "documentation":"<p>The Region the instance is running in.</p>"
        },
      "RegisteredWithSubscriptionProvider":{
        "shape":"String",
        "documentation":"<p>Indicates that your instance uses a BYOL license subscription from a third-party Linux
subscription provider that you've registered with License Manager.</p>"
        },
      "Status":{
        "shape":"String",
        "documentation":"<p>The status of the instance.</p>"
        },
      "SubscriptionName":{
        "shape":"String",
        "documentation":"<p>The name of the license subscription that the instance uses.</p>"
        },
      "SubscriptionProviderCreateTime":{

```
      "shape":"String",
      "documentation":"<p>The timestamp when you registered the third-party Linux subscription provider for the
subscription that the instance uses.</p>"
    },
    "SubscriptionProviderUpdateTime":{
      "shape":"String",
      "documentation":"<p>The timestamp from the last time that the instance synced with the registered third-party
Linux subscription provider.</p>"
    },
    "UsageOperation":{
      "shape":"String",
      "documentation":"<p>The usage operation of the instance. For more information, see For more information,
see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/linux-subscriptions-usage-
operation.html\">Usage
 operation values</a> in the <i>License Manager User Guide</i>.</p>"
    }
    },
    "documentation":"<p>Details discovered information about a running instance using Linux subscriptions.</p>"
  },
  "InstanceList":{
    "type":"list",
    "member":{"shape":"Instance"}
  },
  "InternalServerException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>An exception occurred with the service.</p>",
    "exception":true,
    "fault":true
  },
  "LinuxSubscriptionsDiscovery":{
    "type":"string",
    "enum":[
      "Enabled",
      "Disabled"
    ]
  },
  "LinuxSubscriptionsDiscoverySettings":{
    "type":"structure",
    "required":[
      "OrganizationIntegration",
      "SourceRegions"
    ],
    "members":{
      "OrganizationIntegration":{
        "shape":"OrganizationIntegration",
```

          "documentation":"<p>Details
if you have enabled resource discovery across your accounts in Organizations.</p>"
        },
        "SourceRegions":{
          "shape":"StringList",
          "documentation":"<p>The Regions in which to discover data for Linux subscriptions.</p>"
        }
      },
      "documentation":"<p>Lists the settings defined for discovering Linux subscriptions.</p>"
    },
    "ListLinuxSubscriptionInstancesRequest":{
      "type":"structure",
      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>An array of structures that you can use to filter the results by your specified criteria. For
example, you can specify <code>Region</code> in the <code>Name</code>, with the <code>contains</code>
operator to list all subscriptions that match a partial string in the <code>Value</code>, such as <code>us-
west</code>.</p> <p>For each filter, you can specify one of the following values for the <code>Name</code> key
to streamline results:</p>
   <p> <code>AccountID</code> </p>   <p> <code>AmiID</code> </p>   <p>
<code>DualSubscription</code> </p>   <p> <code>InstanceID</code> </p>   <p>
<code>InstanceType</code> </p>   <p> <code>ProductCode</code> </p>   <p>
<code>Region</code> </p>   <p> <code>Status</code> </p>   <p>
<code>UsageOperation</code> </p>   <p>For each filter, you can use one of the following
<code>Operator</code> values to define the behavior of the filter:</p>   <p> <code>contains</code> </p>
  <p> <code>equals</code> </p>   <p> <code>Notequal</code> </p> "
        },
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>The maximum items to return in a request.</p>"
        },
        "NextToken":{
          "shape":"ListLinuxSubscriptionInstancesRequestNextTokenString",
          "documentation":"<p>A token to specify where to start paginating.
This is the nextToken from a previously truncated response.</p>"
        }
      },
      "documentation":"<p>NextToken length limit is half of ddb accepted limit. Increase this limit if parameters in
request increases.</p>"
    },
    "ListLinuxSubscriptionInstancesRequestNextTokenString":{
      "type":"string",
      "max":16384,
      "min":1
    },
    "ListLinuxSubscriptionInstancesResponse":{
      "type":"structure",

```
    "members":{
     "Instances":{
       "shape":"InstanceList",
       "documentation":"<p>An array that contains instance objects.</p>"
     },
     "NextToken":{
       "shape":"String",
       "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
     }
    }
   },
   "ListLinuxSubscriptionsRequest":{
    "type":"structure",
    "members":{
     "Filters":{
       "shape":"FilterList",
       "documentation":"<p>An array of structures that you can use to filter the results to those that match one or
more sets of key-value pairs that you specify. For example, you can filter by the name of
<code>Subscription</code> with an optional operator to see subscriptions that match, partially match, or don't
match a certain subscription's name.</p> <p>The valid names for this filter are:</p> <ul> <li> <p>
<code>Subscription</code> </p> </li> </ul> <p>The valid Operators for this filter are:</p> <ul> <li> <p>
<code>contains</code> </p> </li> <li> <p> <code>equals</code> </p> </li> <li> <p> <code>Notequal</code>
</p> </li> </ul>"
     },
     "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>The maximum items to return in a request.</p>"
     },
     "NextToken":{
       "shape":"ListLinuxSubscriptionsRequestNextTokenString",
       "documentation":"<p>A token to specify where
to start paginating. This is the nextToken from a previously truncated response.</p>"
     }
    },
    "documentation":"<p>NextToken length limit is half of ddb accepted limit. Increase this limit if parameters in
request increases.</p>"
   },
   "ListLinuxSubscriptionsRequestNextTokenString":{
    "type":"string",
    "max":16384,
    "min":1
   },
   "ListLinuxSubscriptionsResponse":{
    "type":"structure",
    "members":{
     "NextToken":{
```

```
      "shape":"String",
      "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
    },
    "Subscriptions":{
      "shape":"SubscriptionList",
      "documentation":"<p>An array that contains subscription objects.</p>"
    }
   }
  },
  "ListRegisteredSubscriptionProvidersRequest":{
   "type":"structure",
   "members":{
    "MaxResults":{
      "shape":"ListRegisteredSubscriptionProvidersRequestMaxResultsInteger",
      "documentation":"<p>The maximum items to return in a request.</p>"
    },
    "NextToken":{
      "shape":"String",
      "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
    },
    "SubscriptionProviderSources":{
      "shape":"SubscriptionProviderSourceList",
      "documentation":"<p>To filter your results, specify which subscription providers to return in the list.</p>"
    }
   }
  },
  "ListRegisteredSubscriptionProvidersRequestMaxResultsInteger":{
   "type":"integer",
   "box":true,
   "max":100,
   "min":1
  },
  "ListRegisteredSubscriptionProvidersResponse":{
   "type":"structure",
   "members":{
    "NextToken":{
      "shape":"String",
      "documentation":"<p>The next token
used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't
included in this request. Use this token with the next request to retrieve additional objects.</p>"
    },
    "RegisteredSubscriptionProviders":{
      "shape":"RegisteredSubscriptionProviderList",
      "documentation":"<p>The list of BYOL registration resources that fit the criteria you specified in the
request.</p>"
```

```
      }
     }
    },
    "ListTagsForResourceRequest":{
     "type":"structure",
     "required":["resourceArn"],
     "members":{
      "resourceArn":{
       "shape":"SubscriptionProviderArn",
       "documentation":"<p>The Amazon Resource Name (ARN) of the resource for which to list metadata
tags.</p>",
       "location":"uri",
       "locationName":"resourceArn"
      }
     }
    },
    "ListTagsForResourceResponse":{
     "type":"structure",
     "members":{
      "tags":{
       "shape":"Tags",

     "documentation":"<p>The metadata tags for the requested resource.</p>"
      }
     }
    },
    "Operator":{
     "type":"string",
     "enum":[
      "Equal",
      "NotEqual",
      "Contains"
     ],
     "max":20,
     "min":1
    },
    "OrganizationIntegration":{
     "type":"string",
     "enum":[
      "Enabled",
      "Disabled"
     ]
    },
    "ProductCodeList":{
     "type":"list",
     "member":{"shape":"String"}
    },
    "RegisterSubscriptionProviderRequest":{
```

```
     "type":"structure",
     "required":[
      "SecretArn",
      "SubscriptionProviderSource"
     ],
     "members":{
      "SecretArn":{
       "shape":"SecretArn",
       "documentation":"<p>The Amazon Resource Name (ARN) of the secret where you've stored your subscription
provider's access token. For RHEL subscriptions managed through the Red Hat Subscription Manager (RHSM), the
secret contains your Red Hat Offline token.</p>"
      },
      "SubscriptionProviderSource":{
        "shape":"SubscriptionProviderSource",
       "documentation":"<p>The supported Linux subscription provider to register.</p>"
      },
      "Tags":{
       "shape":"Tags",
       "documentation":"<p>The metadata tags to assign to your registered Linux subscription provider
resource.</p>"
      }
     }
    },
   "RegisterSubscriptionProviderResponse":{
    "type":"structure",
    "members":{
     "SubscriptionProviderArn":{
      "shape":"String",
      "documentation":"<p>The Amazon Resource Name (ARN) of the Linux subscription provider resource that
you registered.</p>"
     },
     "SubscriptionProviderSource":{
      "shape":"SubscriptionProviderSource",
      "documentation":"<p>The Linux subscription provider that you registered.</p>"
     },
     "SubscriptionProviderStatus":{
      "shape":"SubscriptionProviderStatus",
      "documentation":"<p>Indicates the status of the registration action for
 the Linux subscription provider that you requested.</p>"
     }
    }
   },
   "RegisteredSubscriptionProvider":{
    "type":"structure",
    "members":{
     "LastSuccessfulDataRetrievalTime":{
      "shape":"String",
       "documentation":"<p>The timestamp from the last time that License Manager accessed third-party
```

subscription data for your account from your registered Linux subscription provider.</p>"
      },
      "SecretArn":{
        "shape":"SecretArn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the Secrets Manager secret that stores your registered Linux subscription provider access token. For RHEL account subscriptions, this is the offline token.</p>"
      },
      "SubscriptionProviderArn":{
        "shape":"SubscriptionProviderArn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the Linux subscription provider resource that you registered.</p>"
      },
      "SubscriptionProviderSource":{

        "shape":"SubscriptionProviderSource",
        "documentation":"<p>A supported third-party Linux subscription provider. License Manager currently supports Red Hat subscriptions.</p>"
      },
      "SubscriptionProviderStatus":{
        "shape":"SubscriptionProviderStatus",
        "documentation":"<p>Indicates the status of your registered Linux subscription provider access token from the last time License Manager retrieved subscription data. For RHEL account subscriptions, this is the status of the offline token.</p>"
      },
      "SubscriptionProviderStatusMessage":{
        "shape":"String",
        "documentation":"<p>A detailed message that's associated with your BYOL subscription provider token status.</p>"
      }
    },
    "documentation":"<p>A third-party provider for operating system (OS) platform software and license subscriptions, such as Red Hat. When you register a third-party Linux subscription provider, License Manager can get subscription
 data from the registered provider.</p>"
  },
  "RegisteredSubscriptionProviderList":{
    "type":"list",
    "member":{"shape":"RegisteredSubscriptionProvider"}
  },
  "ResourceNotFoundException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>Unable to find the requested Amazon Web Services resource.</p>",
    "exception":true
  },
  "SecretArn":{

```
    "type":"string",
    "pattern":"^arn:[a-z0-9-\\.]{1,63}:secretsmanager:[a-z0-9-\\.]{0,63}:[a-z0-9-\\.]{0,63}:secret:[^/]{1,1023}$"
   },
   "Status":{
    "type":"string",
    "enum":[
      "InProgress",
      "Completed",
      "Successful",
      "Failed"
    ]
   },
   "String":{"type":"string"},
   "StringList":{
    "type":"list",
    "member":{"shape":"StringListMemberString"},
    "max":100,
    "min":1
   },
   "StringListMemberString":{
    "type":"string",
    "max":100,
    "min":1
   },
   "StringMap":{
     "type":"map",
    "key":{"shape":"String"},
    "value":{"shape":"String"}
   },
   "Subscription":{
    "type":"structure",
    "members":{
      "InstanceCount":{
        "shape":"BoxLong",
        "documentation":"<p>The total amount of running instances using this subscription.</p>"
      },
      "Name":{
        "shape":"String",
        "documentation":"<p>The name of the subscription.</p>"
      },
      "Type":{
        "shape":"String",
        "documentation":"<p>The type of subscription. The type can be subscription-included with Amazon EC2,
Bring Your Own Subscription model (BYOS), or from the Amazon Web Services Marketplace. Certain
subscriptions may use licensing from the Amazon Web Services Marketplace as well as OS licensing from Amazon
EC2 or BYOS.</p>"
      }
    },
```

```
      "documentation":"<p>An object which details a discovered Linux subscription.</p>"
    },
    "SubscriptionList":{
      "type":"list",
      "member":{"shape":"Subscription"}
    },
    "SubscriptionProviderArn":{
      "type":"string",
      "pattern":"^arn:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,510}/[a-z0-9-\\.]{1,510}$"
    },
    "SubscriptionProviderSource":{
      "type":"string",
      "enum":["RedHat"]
    },
    "SubscriptionProviderSourceList":{
      "type":"list",
      "member":{"shape":"SubscriptionProviderSource"}
    },
    "SubscriptionProviderStatus":{
      "type":"string",
      "enum":[
        "ACTIVE",
        "INVALID",
        "PENDING"
      ]
    },
    "TagKeyList":{
      "type":"list",
      "member":{"shape":"String"},
      "max":50,
      "min":0,
      "sensitive":true
    },
    "TagResourceRequest":{
      "type":"structure",
      "required":[
        "resourceArn",
        "tags"
      ],
      "members":{
        "resourceArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the Amazon
Web Services resource to which to add the specified metadata tags.</p>",
          "location":"uri",
          "locationName":"resourceArn"
        },
```

```
      "tags":{
       "shape":"Tags",
       "documentation":"<p>The metadata tags to assign to the Amazon Web Services resource. Tags are formatted
as key value pairs.</p>"
      }
     }
    },
    "TagResourceResponse":{
     "type":"structure",
     "members":{
     }
    },
    "Tags":{
     "type":"map",
     "key":{"shape":"String"},
     "value":{"shape":"String"},
     "max":50,
     "min":0,
     "sensitive":true
    },
    "ThrottlingException":{
     "type":"structure",
     "members":{
      "message":{"shape":"String"}
     },
     "documentation":"<p>The request was denied due to request throttling.</p>",
     "exception":true
    },
    "UntagResourceRequest":{
     "type":"structure",
     "required":[
      "resourceArn",
      "tagKeys"
     ],
     "members":{
      "resourceArn":{
       "shape":"SubscriptionProviderArn",
       "documentation":"<p>The Amazon Resource Name (ARN) of the Amazon Web Services resource to remove
the metadata tags from.</p>",
       "location":"uri",
       "locationName":"resourceArn"
      },
      "tagKeys":{
       "shape":"TagKeyList",
       "documentation":"<p>A list of metadata tag keys to remove from the requested resource.</p>",
       "location":"querystring",
       "locationName":"tagKeys"
      }
```

```
      }
    },
  "UntagResourceResponse":{
   "type":"structure",
   "members":{
   }
  },
  "UpdateServiceSettingsRequest":{
   "type":"structure",
   "required":[
    "LinuxSubscriptionsDiscovery",
    "LinuxSubscriptionsDiscoverySettings"
   ],
   "members":{
    "AllowUpdate":{
     "shape":"Boolean",
     "documentation":"<p>Describes if updates are allowed to the service settings for Linux subscriptions. If you allow updates, you can aggregate
 Linux subscription data in more than one home Region.</p>"
    },
    "LinuxSubscriptionsDiscovery":{
     "shape":"LinuxSubscriptionsDiscovery",
     "documentation":"<p>Describes if the discovery of Linux subscriptions is enabled.</p>"
    },
    "LinuxSubscriptionsDiscoverySettings":{
     "shape":"LinuxSubscriptionsDiscoverySettings",
     "documentation":"<p>The settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
    }
   }
  },
  "UpdateServiceSettingsResponse":{
   "type":"structure",
   "members":{
    "HomeRegions":{
     "shape":"StringList",
     "documentation":"<p>The Region in which License Manager displays the aggregated data for Linux
subscriptions.</p>"
    },
    "LinuxSubscriptionsDiscovery":{
     "shape":"LinuxSubscriptionsDiscovery",
     "documentation":"<p>Lists
 if discovery has been enabled for Linux subscriptions.</p>"
    },
    "LinuxSubscriptionsDiscoverySettings":{
     "shape":"LinuxSubscriptionsDiscoverySettings",
     "documentation":"<p>The settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
```

```
            },
            "Status":{
              "shape":"Status",
              "documentation":"<p>Indicates the status of Linux subscriptions settings being applied.</p>"
            },
            "StatusMessage":{
              "shape":"StringMap",
              "documentation":"<p>A message which details the Linux subscriptions service settings current status.</p>"
            }
          }
        },
      "ValidationException":{
        "type":"structure",
        "members":{
          "message":{"shape":"String"}
        },
        "documentation":"<p>The provided input is not valid. Try your request again.</p>",
        "exception":true
      }

    },
   "documentation":"<p>With License Manager, you can discover and track your commercial Linux subscriptions on
running Amazon EC2 instances.</p>"
}
{
   "ResponseMetadata": {
       "RequestId": "9a285199-c8d6-47c2-bdb2-314cb47d599d"
   }
}
{
 "version": "1.0",
 "examples": {
 }
}
```

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{
 "pagination": {
  "ListIdentityProviders": {
    "input_token": "NextToken",

```
    "output_token": "NextToken",
    "limit_key": "MaxResults",
    "result_key": "IdentityProviderSummaries"
   },
   "ListInstances": {
    "input_token": "NextToken",
    "output_token": "NextToken",
    "limit_key": "MaxResults",
    "result_key": "InstanceSummaries"
   },
   "ListProductSubscriptions": {
    "input_token": "NextToken",
    "output_token": "NextToken",
    "limit_key": "MaxResults",
    "result_key": "ProductUserSummaries"
   },
   "ListUserAssociations": {
    "input_token": "NextToken",
    "output_token": "NextToken",
    "limit_key": "MaxResults",
    "result_key": "InstanceUserSummaries"
   },
   "ListLicenseServerEndpoints": {
    "input_token": "NextToken",
    "output_token": "NextToken",
    "limit_key": "MaxResults",
    "result_key": "LicenseServerEndpoints"
   }
  }
 }
```

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        "error": "FIPS and DualStack are enabled, but this partition does not support one or both"
      },
      "params": {
        "Region": "us-isob-east-1",
        "UseFIPS": true,
        "UseDualStack": true
      }
    },
    {
      "documentation": "For region us-isob-east-1 with FIPS enabled and DualStack disabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-linux-subscriptions-fips.us-isob-east-1.sc2s.sgov.gov"
        }
      },
      "params": {
        "Region": "us-isob-east-1",
        "UseFIPS": true,
        "UseDualStack": false
      }
    },
    {
      "documentation": "For region us-isob-east-1 with FIPS disabled and DualStack enabled",
      "expect": {
        "error": "DualStack is enabled but this partition does not support DualStack"
      },
      "params": {
        "Region": "us-isob-east-1",
        "UseFIPS": false,
        "UseDualStack": true
      }
    },
    {
      "documentation": "For region us-isob-east-1 with FIPS disabled and DualStack disabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-linux-subscriptions.us-isob-east-1.sc2s.sgov.gov"
        }
      },
      "params": {
        "Region": "us-isob-east-1",
```

```
            "UseFIPS": false,
            "UseDualStack": false
        }
    },
    {

"documentation": "For custom endpoint with region set and fips disabled and dualstack disabled",
        "expect": {
          "endpoint": {
            "url": "https://example.com"
          }
        },
        "params": {
          "Region": "us-east-1",
          "UseFIPS": false,
          "UseDualStack": false,
          "Endpoint": "https://example.com"
        }
    },
    {
        "documentation": "For custom endpoint with region not set and fips disabled and dualstack disabled",
        "expect": {
          "endpoint": {
            "url": "https://example.com"
          }
        },
        "params": {
          "UseFIPS": false,
          "UseDualStack": false,
          "Endpoint": "https://example.com"
        }
    },
    {
        "documentation": "For custom endpoint with fips enabled and dualstack disabled",
        "expect":
{
          "error": "Invalid Configuration: FIPS and custom endpoint are not supported"
        },
        "params": {
          "Region": "us-east-1",
          "UseFIPS": true,
          "UseDualStack": false,
          "Endpoint": "https://example.com"
        }
    },
    {
        "documentation": "For custom endpoint with fips disabled and dualstack enabled",
        "expect": {
```

```
        "error": "Invalid Configuration: Dualstack and custom endpoint are not supported"
      },
      "params": {
        "Region": "us-east-1",
        "UseFIPS": false,
        "UseDualStack": true,
        "Endpoint": "https://example.com"
      }
    },
    {
      "documentation": "Missing region",
      "expect": {
        "error": "Invalid Configuration: Missing Region"
      }
    }
  ],
  "version": "1.0"
}
```

1.220 pkginfo 1.12.1.2

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* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/codec/cer/__main__.py
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* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/codec/ber/eoo.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/codec/native/decoder.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/error.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/codec/native/test_decoder.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/codec/ber/__main__.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/codec/cer/decoder.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/codec/cer/encoder.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/type/test_useful.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/compat/binary.py
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 /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/base.py
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* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/codec/native/encoder.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/type/base.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/codec/der/__main__.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/type/test_namedval.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/compat/octets.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/compat/__main__.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/codec/native/__main__.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/codec/native/test_encoder.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/type/test_opentype.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/pyasn1/type/tagmap.py
* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/tests/type/__main__.py
No license file was found, but licenses were detected in source scan.

ASN.1 library for Python

[![PyPI](https://img.shields.io/pypi/v/pyasn1.svg?maxAge=2592000)](https://pypi.python.org/pypi/pyasn1)
[![Python Versions](https://img.shields.io/pypi/pyversions/pyasn1.svg)](https://pypi.python.org/pypi/pyasn1/)
[![Build status](https://travis-ci.org/etingof/pyasn1.svg?branch=master)](https://secure.travis-ci.org/etingof/pyasn1)
[![Coverage
Status](https://img.shields.io/codecov/c/github/etingof/pyasn1.svg)](https://codecov.io/github/etingof/pyasn1)
[![GitHub license](https://img.shields.io/badge/license-BSD-
blue.svg)](https://raw.githubusercontent.com/etingof/pyasn1/master/LICENSE.txt)

This is a free and open source implementation of ASN.1 types and codecs
as a Python package. It has been first written to support particular
protocol (SNMP) but then generalized to be suitable for a wide range
of protocols based on
[ASN.1 specification](https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-X.208-198811-W!!PDF-
E&type=items).

Features
----

*

Generic implementation of ASN.1 types (X.208)
* Standards compliant BER/CER/DER codecs
* Dumps/loads ASN.1 structures from Python types
* 100% Python, works with Python 2.4 up to Python 3.6
* MT-safe
* Contributed ASN.1 compiler [Asn1ate](https://github.com/kimgr/asn1ate)

Why using pyasn1

ASN.1 solves the data serialisation problem. This solution was
designed long ago by the wise Ancients. Back then, they did not
have the luxury of wasting bits. That is why ASN.1 is designed
to serialise data structures of unbounded complexity into
something compact and efficient when it comes to processing
the data.

That probably explains why many network protocols and file formats
still rely on the 30+ years old technology. Including a number of
high-profile Internet protocols and file formats.

Quite a number of books cover the topic of ASN.1.
[Communication between heterogeneous systems](http://www.oss.com/asn1/dubuisson.html)
by
 Olivier Dubuisson is one of those high quality books freely
available on the Internet.

The pyasn1 package is designed to help Python programmers tackling
network protocols and file formats at the comfort of their Python
prompt. The tool struggles to capture all aspects of a rather
complicated ASN.1 system and to represent it on the Python terms.

How to use pyasn1

With pyasn1 you can build Python objects from ASN.1 data structures.
For example, the following ASN.1 data structure:

```bash
Record ::= SEQUENCE {
 id      INTEGER,
 room  [0] INTEGER OPTIONAL,
 house [1] INTEGER DEFAULT 0
}
```

Could be expressed in pyasn1 like this:

```python
class Record(Sequence):
  componentType = NamedTypes(
    NamedType('id', Integer()),
    OptionalNamedType(
      'room', Integer().subtype(
        implicitTag=Tag(tagClassContext, tagFormatSimple, 0)
      )
    ),
    DefaultedNamedType(

  'house', Integer(0).subtype(
        implicitTag=Tag(tagClassContext, tagFormatSimple, 1)
      )
    )
  )
```

It is in the spirit of ASN.1 to take abstract data description
and turn it into a programming language specific form.
Once you have your ASN.1 data structure expressed in Python, you
can use it along the lines of similar Python type (e.g. ASN.1
`SET` is similar to Python `dict`, `SET OF` to `list`):

```python
>>> record = Record()
>>> record['id'] = 123
>>> record['room'] = 321
>>> str(record)
Record:
id=123
room=321
>>>
```

Part of the power of ASN.1 comes from its serialisation features. You
can serialise your data structure and send it over the network.

```python
>>> from pyasn1.codec.der.encoder import encode
>>> substrate = encode(record)
>>> hexdump(substrate)
00000: 30 07 02 01 7B 80 02 01 41
```

Conversely, you can turn serialised ASN.1 content, as received from
network or read from a file, into a Python object which you can
introspect,

modify, encode and send back.

```python
>>> from pyasn1.codec.der.decoder import decode
>>> received_record, rest_of_substrate = decode(substrate, asn1Spec=Record())
>>>
>>> for field in received_record:
>>>    print('{} is {}'.format(field, received_record[field]))
id is 123
room is 321
house is 0
>>>
>>> record == received_record
True
>>> received_record.update(room=123)
>>> substrate = encode(received_record)
>>> hexdump(substrate)
00000: 30 06 02 01 7B 80 01 7B
```

The pyasn1 classes struggle to emulate their Python prototypes (e.g. int, list, dict etc.). But ASN.1 types exhibit more complicated behaviour. To make life easier for a Pythonista, they can turn their pyasn1 classes into Python built-ins:

```python
>>> from pyasn1.codec.native.encoder import encode
>>> encode(record)
{'id': 123, 'room': 321, 'house': 0}
```

Or vice-versa -- you can initialize an ASN.1 structure from a tree of Python objects:

```python
>>> from pyasn1.codec.native.decoder import decode
>>> record =
 decode({'id': 123, 'room': 321, 'house': 0}, asn1Spec=Record())
>>> str(record)
Record:
id=123
room=321
>>>
```

With ASN.1 design, serialisation codecs are decoupled from data objects, so you could turn every single ASN.1 object into many different serialised forms. As of this moment, pyasn1 supports BER, DER, CER and

Python built-ins codecs. The extremely compact PER encoding is expected
to be introduced in the upcoming pyasn1 release.

More information on pyasn1 APIs can be found in the
[documentation](http://snmplabs.com/pyasn1/),
compiled ASN.1 modules for different protocols and file formats
could be found in the pyasn1-modules
[repo](https://github.com/etingof/pyasn1-modules).

How to get pyasn1

The pyasn1 package is distributed under terms and conditions of 2-clause
BSD [license](http://snmplabs.com/pyasn1/license.html). Source code is freely
available as a GitHub [repo](https://github.com/etingof/pyasn1).

You could `pip install pyasn1` or download it from
 [PyPI](https://pypi.python.org/pypi/pyasn1).

If something does not work as expected,
[open an issue](https://github.com/etingof/pyasn1/issues) at GitHub or
post your question [on Stack Overflow](http://stackoverflow.com/questions/ask)
or try browsing pyasn1
[mailing list archives](https://sourceforge.net/p/pyasn1/mailman/pyasn1-users/).

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* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/README.md
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* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/LICENSE.rst
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ASN.1 library for Python
========================

.. toctree::
  :maxdepth: 1

Abstract Syntax Notation One (`ASN.1
<http://en.wikipedia.org/wiki/Abstract_Syntax_Notation_1x>`_) is a
technology for exchanging structured data in a universally understood,
hardware agnostic way. Many industrial, security and telephony
applications heavily rely on ASN.1.

The `pyasn1 <https://pypi.python.org/pypi/pyasn1/>`_ library implements
ASN.1 support in pure-Python.

What is ASN.1

ASN.1 is a large, arguably over-engineered and extremely old data modelling and
serialisation tool. It is probably among the first serialisation protocols in
the history of computer science and technology.

ASN.1 started its life over 30 years ago as a serialisation mechanism for the first
electronic mail (known as X.400). Later on if was split off the e-mail application
and become a stand-alone tech still being actively supported by its
 designers
and widely used in industry and technology.

Since then ASN.1 is sort of haunted by its relations with the OSI model -- the
first, unsuccessful, version of the Internet. You can read many interesting
`discussions <https://news.ycombinator.com/item?id=8871453>`_ on that topic.

In the following years, generations of software engineers tackled the serialisation
problem many times. We can see that in Google's `ProtoBuffers <https://developers.google.com/protocol-

buffers/>`_
or `FlatBuffers <https://google.github.io/flatbuffers/>`_, for example.
Interestingly, many new takes on binary protocol design do not depart
far from ASN.1 from technical perspective. It's more of a matter of striking
a balance between processing overhead, wire format overhead and human
readability.

Looking at what ASN.1 has to offer, it has three loosely coupled parts:

* Data types: the standard introduces a collection of basic data types
  (integers, bits, strings, arrays and records) that can be used for
  describing
  arbitrarily complex, nested data structures.

* Serialisation protocols: the above data structures could be converted into a
  series of octets for storage or transmission over the wire as well as
  recovered back into their structured form. The system is fully agnostic
  to hardware architectures differences.

* Schema language: ASN.1 data structures could be described in terms
  of a schema language for ASN.1 compiler to turn it into platform-specific
  implementation.

ASN.1 applications

Being an old and generally successful standard, ASN.1 is widely
adopted for many uses. To give you an example, these technologies
use ASN.1 for their data exchange needs:

* Signaling standards for the public switched telephone network (SS7 family)
* Network management standards (SNMP, CMIP)
* Directory standards (X.500 family, LDAP)
* Public Key Infrastructure standards (X.509, etc.)
* PBX control (CSTA)
* IP-based Videoconferencing (H.323 family)
* Biometrics (BIP,
  CBEFF, ACBio)
* Intelligent transportation (SAE J2735)
* Cellular telephony (GSM, GPRS/EDGE, UMTS, LTE)

ASN.1 gotchas

Apparently, ASN.1 is hard to implement properly. Quality open-source
ASN.1 tools are rare, but ad-hoc implementations are numerous. Judging from the
`statistics <http://cve.mitre.org/cgi-bin/cvekey.cgi?keyword=ASN.1>`_ on discovered
security vulnerabilities, many people have implemented ASN.1 parsers

and oftentimes fell victim to its edge cases.

On the bright side, ASN.1 has been around for a long time, it is well understood
and security reviewed.

Documentation

.. toctree::
  :maxdepth: 2

  /pyasn1/contents

Use case

.. toctree::
  :maxdepth: 2

  /example-use-case

Download & Install

.. toctree::
  :maxdepth: 2

  /download

Changes

All changes and release history is maintained in changelog. There you
could also download the latest unreleased pyasn1 tarball containing
the latest fixes and
 improvements.

.. toctree::
  :maxdepth: 1

  /changelog

License

The PyASN1 software is distributed under 2-clause BSD License.

.. toctree::

:maxdepth: 2

   /license

Getting help

Please, file your `issues <https://github.com/etingof/pyasn1/issues>`_
and `PRs <https://github.com/etingof/pyasn1/pulls>`_ at GitHub.
Alternatively, you could ask for help at
`Stack Overflow <http://stackoverflow.com/questions/tagged/pyasn1>`_
or search
`pyasn1-users <https://lists.sourceforge.net/lists/listinfo/pyasn1-users>`_
mailing list archive.

Books on ASN.1

The pyasn1 implementation is largely based on reading up the following awesome
books:

* `ASN.1 - Communication between heterogeneous systems <http://www.oss.com/asn1/dubuisson.html>`_ by
Olivier Dubuisson
* `ASN.1 Complete <http://www.oss.com/asn1/resources/books-whitepapers-pubs/larmouth-asn1-book.pdf>`_ by
Prof John Larmouth

Here you can get the official standards which is hard to read:

* `ITU
 standards <http://www.itu.int/ITU-T/studygroups/com17/languages/X.680-X.693-0207w.zip>`_

On the other end of the readability spectrum, here is a quick and sweet write up:

* `A Layman's Guide to a Subset of ASN.1, BER, and DER <ftp://ftp.rsasecurity.com/pub/pkcs/ascii/layman.asc>`_
by Burton S. Kaliski

If you are working with ASN.1, we'd highly recommend reading a proper
book on the subject.

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* /pyasn1-0-4-2-1-tar-gz/pyasn1-0.4.2/docs/source/contents.rst

1.225 webencodings 0.5.1

1.225.1 Available under license :

BSD-style without advertising clause

1.226 six 1.16.0

1.226.1 Available under license :

The primary author and maintainer of six is Benjamin Peterson. He would like to acknowledge the following people who submitted bug reports, pull requests, and otherwise worked to improve six:

Marc Abramowitz

immerrr again

Alexander Artemenko

Aymeric Augustin

Lee Ball

Ben Bariteau

Ned Batchelder

Wouter Bolsterlee

Brett Cannon

Jason R. Coombs

Julien Danjou

Ben Darnell

Ben Davis

Jon Dufresne

Tim Graham

Thomas Grainger

Max Grender-Jones

Pierre Grimaud

Joshua Harlow

Toshiki Kataoka

Hugo van Kemenade

Anselm Kruis

Ivan Levkivskyi

Alexander Lukanin

James Mills

Jordan Moldow

Berker Peksag

Sridhar Ratnakumar

Erik Rose

Mirko Rossini

Peter Ruibal

Miroslav Shubernetskiy

Eli Schwartz

Anthony Sottile

Victor Stinner

Jonathan Vanasco

Lucas Wiman

Jingxin Zhu

If you think you belong on this list, please let me know! --Benjamin

1.227 recharts 2.15.1

1.227.1 Available under license :

1.228 botocore 1.37.25

1.228.1 Available under license :

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a specific Amazon Web Services account, an organization, or an organizational unit (OU). For more information,
see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/granted-licenses.html\">Granted
licenses in License Manager</a> in the <i>License Manager User Guide</i>.</p>"
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License Manager</a> in the <i>License Manager User Guide</i>.</p>"
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```

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specifications for the license type (licensing by instance, socket, CPU, or vCPU), allowed tenancy (shared tenancy,
Dedicated Instance,
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number of licenses purchased and used.</p>"
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specified license.</p>"
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        {"shape":"InvalidParameterValueException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"},
        {"shape":"ResourceLimitExceededException"},
        {"shape":"ServerInternalException"}
      ],
      "documentation":"<p>Deletes the specified grant.</p>"
    },
    "DeleteLicense":{
      "name":"DeleteLicense",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"DeleteLicenseRequest"},
      "output":{"shape":"DeleteLicenseResponse"},
      "errors":[
        {"shape":"ValidationException"},
        {"shape":"InvalidParameterValueException"},
        {"shape":"RedirectException"},
        {"shape":"ConflictException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Deletes the specified license.</p>"
    },
    "DeleteLicenseConfiguration":{
      "name":"DeleteLicenseConfiguration",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"DeleteLicenseConfigurationRequest"},
      "output":{"shape":"DeleteLicenseConfigurationResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
```

      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Deletes the specified license configuration.</p> <p>You cannot delete a license configuration that is in use.</p>"
  },
  "DeleteLicenseManagerReportGenerator":{
    "name":"DeleteLicenseManagerReportGenerator",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"DeleteLicenseManagerReportGeneratorRequest"},
    "output":{"shape":"DeleteLicenseManagerReportGeneratorResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"AccessDeniedException"},
      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Deletes the specified report generator.</p> <p>This action deletes the report generator, which stops it from generating future reports. The action cannot be reversed. It has no effect on the previous reports from this generator.</p>"
  },
  "DeleteToken":{
    "name":"DeleteToken",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"DeleteTokenRequest"},
    "output":{"shape":"DeleteTokenResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"RedirectException"}
    ],
    "documentation":"<p>Deletes the specified token. Must be called in the license home Region.</p>"
  },
  "ExtendLicenseConsumption":{
    "name":"ExtendLicenseConsumption",

```
     "http":{
       "method":"POST",
       "requestUri":"/"
      },
     "input":{"shape":"ExtendLicenseConsumptionRequest"},
     "output":{"shape":"ExtendLicenseConsumptionResponse"},
     "errors":[
       {"shape":"ValidationException"},
       {"shape":"InvalidParameterValueException"},
       {"shape":"AuthorizationException"},
       {"shape":"AccessDeniedException"},
       {"shape":"RateLimitExceededException"},
       {"shape":"ServerInternalException"},
       {"shape":"ResourceNotFoundException"}
      ],
     "documentation":"<p>Extends the expiration date for license consumption.</p>"
    },
   "GetAccessToken":{
     "name":"GetAccessToken",
     "http":{
       "method":"POST",
       "requestUri":"/"
      },
     "input":{"shape":"GetAccessTokenRequest"},
     "output":{"shape":"GetAccessTokenResponse"},
     "errors":[
       {"shape":"ValidationException"},
       {"shape":"AuthorizationException"},
       {"shape":"AccessDeniedException"},
       {"shape":"RateLimitExceededException"},

       {"shape":"ServerInternalException"}
      ],
     "documentation":"<p>Gets a temporary access token to use with AssumeRoleWithWebIdentity. Access tokens
are valid for one hour.</p>"
    },
   "GetGrant":{
     "name":"GetGrant",
     "http":{
       "method":"POST",
       "requestUri":"/"
      },
     "input":{"shape":"GetGrantRequest"},
     "output":{"shape":"GetGrantResponse"},
     "errors":[
       {"shape":"ValidationException"},
       {"shape":"InvalidParameterValueException"},
       {"shape":"ResourceLimitExceededException"},
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```
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Gets detailed information about the specified grant.</p>"
    },
    "GetLicense":{
     "name":"GetLicense",
     "http":{
      "method":"POST",
      "requestUri":"/"
     },
     "input":{"shape":"GetLicenseRequest"},
     "output":{"shape":"GetLicenseResponse"},
     "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"}
     ],
     "documentation":"<p>Gets detailed information about the specified license.</p>"
    },
    "GetLicenseConfiguration":{
     "name":"GetLicenseConfiguration",
     "http":{
      "method":"POST",
      "requestUri":"/"
     },
     "input":{"shape":"GetLicenseConfigurationRequest"},
     "output":{"shape":"GetLicenseConfigurationResponse"},
     "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Gets detailed
information about the specified license configuration.</p>"
    },
    "GetLicenseConversionTask":{
     "name":"GetLicenseConversionTask",
     "http":{
      "method":"POST",
      "requestUri":"/"
```

```
      },
     "input":{"shape":"GetLicenseConversionTaskRequest"},
     "output":{"shape":"GetLicenseConversionTaskResponse"},
     "errors":[
       {"shape":"InvalidParameterValueException"},
       {"shape":"ServerInternalException"},
       {"shape":"AuthorizationException"},
       {"shape":"AccessDeniedException"},
       {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Gets information about the specified license type conversion task.</p>"
    },
    "GetLicenseManagerReportGenerator":{
     "name":"GetLicenseManagerReportGenerator",
     "http":{
       "method":"POST",
       "requestUri":"/"
      },
     "input":{"shape":"GetLicenseManagerReportGeneratorRequest"},
     "output":{"shape":"GetLicenseManagerReportGeneratorResponse"},
     "errors":[
       {"shape":"ValidationException"},
       {"shape":"InvalidParameterValueException"},
       {"shape":"ResourceLimitExceededException"},
       {"shape":"ServerInternalException"},
       {"shape":"AuthorizationException"},
       {"shape":"RateLimitExceededException"},
       {"shape":"AccessDeniedException"},
       {"shape":"ResourceNotFoundException"}
     ],
     "documentation":"<p>Gets information about the specified report generator.</p>"
    },
    "GetLicenseUsage":{
     "name":"GetLicenseUsage",
     "http":{
       "method":"POST",
       "requestUri":"/"
      },
     "input":{"shape":"GetLicenseUsageRequest"},
     "output":{"shape":"GetLicenseUsageResponse"},
     "errors":[
       {"shape":"ValidationException"},
       {"shape":"InvalidParameterValueException"},
       {"shape":"AuthorizationException"},
       {"shape":"AccessDeniedException"},
       {"shape":"RateLimitExceededException"},
       {"shape":"ServerInternalException"}
```

```
      ],
      "documentation":"<p>Gets detailed information about the usage of the specified license.</p>"
    },
    "GetServiceSettings":{
      "name":"GetServiceSettings",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"GetServiceSettingsRequest"},
      "output":{"shape":"GetServiceSettingsResponse"},
      "errors":[
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Gets the License Manager settings for the current Region.</p>"
    },
    "ListAssociationsForLicenseConfiguration":{
      "name":"ListAssociationsForLicenseConfiguration",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"ListAssociationsForLicenseConfigurationRequest"},
      "output":{"shape":"ListAssociationsForLicenseConfigurationResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"FilterLimitExceededException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Lists the resource associations for the specified license configuration.</p> <p>Resource
associations need not consume licenses from a license configuration. For example, an AMI or a stopped instance
might not consume a license (depending on the license rules).</p>"
    },
    "ListDistributedGrants":{
      "name":"ListDistributedGrants",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"ListDistributedGrantsRequest"},
      "output":{"shape":"ListDistributedGrantsResponse"},
      "errors":[
```

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      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"ResourceLimitExceededException"},
       {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists the grants distributed for the specified license.</p>"
  },
  "ListFailuresForLicenseConfigurationOperations":{
    "name":"ListFailuresForLicenseConfigurationOperations",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListFailuresForLicenseConfigurationOperationsRequest"},
    "output":{"shape":"ListFailuresForLicenseConfigurationOperationsResponse"},
    "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists the license configuration operations that failed.</p>"
  },
  "ListLicenseConfigurations":{
    "name":"ListLicenseConfigurations",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListLicenseConfigurationsRequest"},
    "output":{"shape":"ListLicenseConfigurationsResponse"},
    "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"ServerInternalException"},
      {"shape":"FilterLimitExceededException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists the license configurations for your account.</p>"
  },
  "ListLicenseConversionTasks":{
    "name":"ListLicenseConversionTasks",
    "http":{
```

```
    "method":"POST",
    "requestUri":"/"
  },
  "input":{"shape":"ListLicenseConversionTasksRequest"},
  "output":{"shape":"ListLicenseConversionTasksResponse"},
  "errors":[
    {"shape":"InvalidParameterValueException"},
     {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
  ],
  "documentation":"<p>Lists the license type conversion tasks for your account.</p>"
},
"ListLicenseManagerReportGenerators":{
  "name":"ListLicenseManagerReportGenerators",
  "http":{
    "method":"POST",
    "requestUri":"/"
  },
  "input":{"shape":"ListLicenseManagerReportGeneratorsRequest"},
  "output":{"shape":"ListLicenseManagerReportGeneratorsResponse"},
  "errors":[
    {"shape":"ValidationException"},
    {"shape":"InvalidParameterValueException"},
    {"shape":"ResourceLimitExceededException"},
    {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"RateLimitExceededException"},
    {"shape":"AccessDeniedException"},
    {"shape":"ResourceNotFoundException"}
  ],
  "documentation":"<p>Lists the report generators for your account.</p>"
},
"ListLicenseSpecificationsForResource":{
  "name":"ListLicenseSpecificationsForResource",
  "http":{
    "method":"POST",
    "requestUri":"/"
  },
  "input":{"shape":"ListLicenseSpecificationsForResourceRequest"},
  "output":{"shape":"ListLicenseSpecificationsForResourceResponse"},
  "errors":[
    {"shape":"InvalidParameterValueException"},
    {"shape":"ServerInternalException"},
    {"shape":"AuthorizationException"},
    {"shape":"AccessDeniedException"},
    {"shape":"RateLimitExceededException"}
```

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    ],
    "documentation":"<p>Describes the license configurations for the specified resource.</p>"
  },
  "ListLicenseVersions":{
    "name":"ListLicenseVersions",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListLicenseVersionsRequest"},
    "output":{"shape":"ListLicenseVersionsResponse"},
    "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"}
    ],
    "documentation":"<p>Lists all versions of the specified license.</p>"
  },
  "ListLicenses":{
    "name":"ListLicenses",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListLicensesRequest"},
    "output":{"shape":"ListLicensesResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ServerInternalException"}
    ],
    "documentation":"<p>Lists the licenses for your account.</p>"
  },
  "ListReceivedGrants":{
    "name":"ListReceivedGrants",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListReceivedGrantsRequest"},
    "output":{"shape":"ListReceivedGrantsResponse"},
    "errors":[
      {"shape":"ValidationException"},
```

      {"shape":"InvalidParameterValueException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists grants that are received. Received grants are grants created while specifying the recipient as this Amazon Web Services account, your organization, or an organizational unit (OU) to which this member account belongs.</p>"
  },
  "ListReceivedGrantsForOrganization":{
    "name":"ListReceivedGrantsForOrganization",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListReceivedGrantsForOrganizationRequest"},
    "output":{"shape":"ListReceivedGrantsForOrganizationResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists the grants received for all accounts in the organization.</p>"
  },
  "ListReceivedLicenses":{
    "name":"ListReceivedLicenses",
    "http":{
      "method":"POST",
      "requestUri":"/"
    },
    "input":{"shape":"ListReceivedLicensesRequest"},
    "output":{"shape":"ListReceivedLicensesResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Lists received licenses.</p>"

```
        },
        "ListReceivedLicensesForOrganization":{
          "name":"ListReceivedLicensesForOrganization",
          "http":{
            "method":"POST",
            "requestUri":"/"
          },
          "input":{"shape":"ListReceivedLicensesForOrganizationRequest"},
          "output":{"shape":"ListReceivedLicensesForOrganizationResponse"},
          "errors":[
            {"shape":"ValidationException"},
            {"shape":"InvalidParameterValueException"},
            {"shape":"ResourceLimitExceededException"},
            {"shape":"ServerInternalException"},
            {"shape":"AuthorizationException"},
            {"shape":"AccessDeniedException"},
            {"shape":"RateLimitExceededException"}
          ],
          "documentation":"<p>Lists the licenses received for all accounts in the organization.</p>"
        },
        "ListResourceInventory":{
          "name":"ListResourceInventory",
          "http":{
            "method":"POST",
            "requestUri":"/"
          },
          "input":{"shape":"ListResourceInventoryRequest"},
          "output":{"shape":"ListResourceInventoryResponse"},
          "errors":[
            {"shape":"InvalidParameterValueException"},
            {"shape":"ServerInternalException"},
            {"shape":"FilterLimitExceededException"},
            {"shape":"FailedDependencyException"},
            {"shape":"AuthorizationException"},
            {"shape":"AccessDeniedException"},
            {"shape":"RateLimitExceededException"}
          ],
          "documentation":"<p>Lists resources managed using Systems Manager inventory.</p>"
        },
        "ListTagsForResource":{
          "name":"ListTagsForResource",
          "http":{
            "method":"POST",
            "requestUri":"/"
          },
          "input":{"shape":"ListTagsForResourceRequest"},
          "output":{"shape":"ListTagsForResourceResponse"},
          "errors":[
```

```json
        {"shape":"InvalidParameterValueException"},
         {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Lists the tags for the specified license configuration.</p>"
    },
    "ListTokens":{
      "name":"ListTokens",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"ListTokensRequest"},
      "output":{"shape":"ListTokensResponse"},
      "errors":[
        {"shape":"ValidationException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"},
        {"shape":"ServerInternalException"}
      ],
      "documentation":"<p>Lists your tokens.</p>"
    },
    "ListUsageForLicenseConfiguration":{
      "name":"ListUsageForLicenseConfiguration",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"ListUsageForLicenseConfigurationRequest"},
       "output":{"shape":"ListUsageForLicenseConfigurationResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"FilterLimitExceededException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Lists all license usage records for a license configuration, displaying license consumption
details by resource at a selected point in time. Use this action to audit the current license consumption for any
license inventory and configuration.</p>"
    },
    "RejectGrant":{
      "name":"RejectGrant",
      "http":{
```

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```json
      "method":"POST",
      "requestUri":"/"
     },
     "input":{"shape":"RejectGrantRequest"},
     "output":{"shape":"RejectGrantResponse"},
     "errors":[
      {"shape":"ValidationException"},
      {"shape":"InvalidParameterValueException"},
       {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"},
      {"shape":"ResourceLimitExceededException"},
      {"shape":"ServerInternalException"}
     ],
     "documentation":"<p>Rejects the specified grant.</p>"
    },
    "TagResource":{
     "name":"TagResource",
     "http":{
      "method":"POST",
      "requestUri":"/"
     },
     "input":{"shape":"TagResourceRequest"},
     "output":{"shape":"TagResourceResponse"},
     "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
     "documentation":"<p>Adds the specified tags to the specified license configuration.</p>"
    },
    "UntagResource":{
     "name":"UntagResource",
     "http":{
      "method":"POST",
       "requestUri":"/"
     },
     "input":{"shape":"UntagResourceRequest"},
     "output":{"shape":"UntagResourceResponse"},
     "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
     ],
```

     "documentation":"<p>Removes the specified tags from the specified license configuration.</p>"
    },
   "UpdateLicenseConfiguration":{
    "name":"UpdateLicenseConfiguration",
    "http":{
     "method":"POST",
     "requestUri":"/"
    },
    "input":{"shape":"UpdateLicenseConfigurationRequest"},
    "output":{"shape":"UpdateLicenseConfigurationResponse"},
    "errors":[
     {"shape":"InvalidParameterValueException"},
     {"shape":"ServerInternalException"},
     {"shape":"AuthorizationException"},
     {"shape":"AccessDeniedException"},
     {"shape":"RateLimitExceededException"},
      {"shape":"ResourceLimitExceededException"}
    ],
    "documentation":"<p>Modifies the attributes of an existing license configuration.</p>"
    },
   "UpdateLicenseManagerReportGenerator":{
    "name":"UpdateLicenseManagerReportGenerator",
    "http":{
     "method":"POST",
     "requestUri":"/"
    },
    "input":{"shape":"UpdateLicenseManagerReportGeneratorRequest"},
    "output":{"shape":"UpdateLicenseManagerReportGeneratorResponse"},
    "errors":[
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     {"shape":"InvalidParameterValueException"},
     {"shape":"RateLimitExceededException"},
     {"shape":"ServerInternalException"},
     {"shape":"AuthorizationException"},
     {"shape":"AccessDeniedException"},
     {"shape":"ResourceNotFoundException"},
     {"shape":"ResourceLimitExceededException"}
    ],
    "documentation":"<p>Updates a report generator.</p> <p>After you make changes to a report generator, it
starts generating new reports within 60 minutes of being updated.</p>"
    },
   "UpdateLicenseSpecificationsForResource":{
    "name":"UpdateLicenseSpecificationsForResource",
    "http":{
     "method":"POST",
     "requestUri":"/"
    },
    "input":{"shape":"UpdateLicenseSpecificationsForResourceRequest"},

```
    "output":{"shape":"UpdateLicenseSpecificationsForResourceResponse"},
    "errors":[
      {"shape":"InvalidParameterValueException"},
      {"shape":"InvalidResourceStateException"},
      {"shape":"LicenseUsageException"},
      {"shape":"ServerInternalException"},
      {"shape":"AuthorizationException"},
      {"shape":"AccessDeniedException"},
      {"shape":"RateLimitExceededException"}
    ],
    "documentation":"<p>Adds or removes the specified license configurations for the specified Amazon Web
Services resource.</p> <p>You can update the license specifications of AMIs, instances, and hosts. You cannot
update the license specifications
 for launch templates and CloudFormation templates, as they send license configurations to the operation that creates
the resource.</p>"
    },
    "UpdateServiceSettings":{
      "name":"UpdateServiceSettings",
      "http":{
        "method":"POST",
        "requestUri":"/"
      },
      "input":{"shape":"UpdateServiceSettingsRequest"},
      "output":{"shape":"UpdateServiceSettingsResponse"},
      "errors":[
        {"shape":"InvalidParameterValueException"},
        {"shape":"ServerInternalException"},
        {"shape":"AuthorizationException"},
        {"shape":"AccessDeniedException"},
        {"shape":"RateLimitExceededException"}
      ],
      "documentation":"<p>Updates License Manager settings for the current Region.</p>"
    }
  },
  "shapes":{
    "AcceptGrantRequest":{
      "type":"structure",
      "required":["GrantArn"],
      "members":{
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
        }
      }
    },
    "AcceptGrantResponse":{
      "type":"structure",
      "members":{
```

```
      "GrantArn":{
       "shape":"Arn",
       "documentation":"<p>Grant ARN.</p>"
      },
      "Status":{
       "shape":"GrantStatus",
       "documentation":"<p>Grant status.</p>"
      },
      "Version":{
       "shape":"String",
       "documentation":"<p>Grant version.</p>"
      }
     }
    },
    "AccessDeniedException":{
     "type":"structure",
     "members":{
      "Message":{"shape":"Message"}
     },
     "documentation":"<p>Access to resource denied.</p>",
     "exception":true
    },
    "ActivationOverrideBehavior":{
     "type":"string",
     "enum":[
      "DISTRIBUTED_GRANTS_ONLY",
      "ALL_GRANTS_PERMITTED_BY_ISSUER"
     ]
    },
    "AllowedOperation":{
     "type":"string",
     "enum":[
      "CreateGrant",
      "CheckoutLicense",
      "CheckoutBorrowLicense",
      "CheckInLicense",
      "ExtendConsumptionLicense",
      "ListPurchasedLicenses",
      "CreateToken"
     ]
    },
    "AllowedOperationList":{
     "type":"list",
     "member":{"shape":"AllowedOperation"},
     "max":7,
     "min":1
    },
    "Arn":{
```

```
    "type":"string",
    "max":2048,
    "pattern":"^arn:aws(-(cn|us-gov|iso-b|iso-c|iso-d))?:[A-Za-z0-9][A-Za-z0-9_/.-]{0,62}:[A-Za-z0-9_/.-]{0,63}:[A-Za-z0-9_/.-]{0,63}:[A-Za-z0-9][A-Za-z0-9:_/+=,@.-]{0,1023}$"
  },
  "ArnList":{
    "type":"list",
    "member":{"shape":"Arn"}
  },
  "AuthorizationException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>The Amazon Web Services user account does not have permission to perform the action. Check the IAM policy associated with this account.</p>",
    "exception":true
  },
  "AutomatedDiscoveryInformation":{
    "type":"structure",
    "members":{
      "LastRunTime":{
        "shape":"DateTime",
        "documentation":"<p>Time that automated discovery last ran.</p>"
      }
    },
    "documentation":"<p>Describes automated discovery.</p>"
  },
  "Boolean":{"type":"boolean"},
  "BorrowConfiguration":{
    "type":"structure",
    "required":[
      "AllowEarlyCheckIn",
      "MaxTimeToLiveInMinutes"
    ],
    "members":{
      "AllowEarlyCheckIn":{
        "shape":"BoxBoolean",
        "documentation":"<p>Indicates whether early check-ins are allowed.</p>"
      },
      "MaxTimeToLiveInMinutes":{
        "shape":"BoxInteger",
        "documentation":"<p>Maximum time for the borrow configuration, in minutes.</p>"
      }
    },
    "documentation":"<p>Details about a borrow configuration.</p>"
  },
```

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"BoxBoolean":{"type":"boolean"},
"BoxInteger":{"type":"integer"},
"BoxLong":{"type":"long"},
"CheckInLicenseRequest":{
 "type":"structure",
 "required":["LicenseConsumptionToken"],
 "members":{
  "LicenseConsumptionToken":{
    "shape":"String",
    "documentation":"<p>License consumption token.</p>"
  },
  "Beneficiary":{
   "shape":"String",
   "documentation":"<p>License beneficiary.</p>"
  }
 }
},
"CheckInLicenseResponse":{
 "type":"structure",
 "members":{
 }
},
"CheckoutBorrowLicenseRequest":{
 "type":"structure",
 "required":[
  "LicenseArn",
  "Entitlements",
  "DigitalSignatureMethod",
  "ClientToken"
 ],
 "members":{
  "LicenseArn":{
    "shape":"Arn",
    "documentation":"<p>Amazon Resource Name (ARN) of the license. The license must use the borrow
consumption configuration.</p>"
  },
  "Entitlements":{
   "shape":"EntitlementDataList",
   "documentation":"<p>License entitlements. Partial checkouts are not supported.</p>"
  },
  "DigitalSignatureMethod":{
   "shape":"DigitalSignatureMethod",

  "documentation":"<p>Digital signature method. The possible value is JSON Web Signature (JWS) algorithm
PS384. For more information, see <a href=\"https://tools.ietf.org/html/rfc7518#section-3.5\">RFC 7518 Digital
Signature with RSASSA-PSS</a>.</p>"
  },
  "NodeId":{
```

```
      "shape":"String",
      "documentation":"<p>Node ID.</p>"
     },
     "CheckoutMetadata":{
      "shape":"MetadataList",
      "documentation":"<p>Information about constraints.</p>"
     },
     "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
     }
    }
   },
   "CheckoutBorrowLicenseResponse":{
    "type":"structure",
    "members":{
     "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
     },
     "LicenseConsumptionToken":{
      "shape":"String",
      "documentation":"<p>License consumption token.</p>"
     },
     "EntitlementsAllowed":{
      "shape":"EntitlementDataList",
      "documentation":"<p>Allowed license entitlements.</p>"
     },
     "NodeId":{
      "shape":"String",
      "documentation":"<p>Node ID.</p>"
     },
     "SignedToken":{
      "shape":"SignedToken",
      "documentation":"<p>Signed token.</p>"
     },
     "IssuedAt":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>Date and time at which the license checkout is issued.</p>"
     },
     "Expiration":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>Date and time at which the license checkout expires.</p>"
     },
     "CheckoutMetadata":{
      "shape":"MetadataList",
      "documentation":"<p>Information about constraints.</p>"
```

```
        }
      }
    },
  "CheckoutLicenseRequest":{
   "type":"structure",
   "required":[
     "ProductSKU",
      "CheckoutType",
     "KeyFingerprint",
     "Entitlements",
     "ClientToken"
   ],
   "members":{
     "ProductSKU":{
       "shape":"String",
       "documentation":"<p>Product SKU.</p>"
     },
     "CheckoutType":{
      "shape":"CheckoutType",
      "documentation":"<p>Checkout type.</p>"
     },
     "KeyFingerprint":{
      "shape":"String",
      "documentation":"<p>Key fingerprint identifying the license.</p>"
     },
     "Entitlements":{
       "shape":"EntitlementDataList",
       "documentation":"<p>License entitlements.</p>"
     },
     "ClientToken":{
       "shape":"ClientToken",
       "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
     },
     "Beneficiary":{
       "shape":"String",
       "documentation":"<p>License beneficiary.</p>"
     },
     "NodeId":{
       "shape":"String",
        "documentation":"<p>Node ID.</p>"
     }
    }
  },
  "CheckoutLicenseResponse":{
   "type":"structure",
   "members":{
     "CheckoutType":{
```

```
        "shape":"CheckoutType",
        "documentation":"<p>Checkout type.</p>"
      },
      "LicenseConsumptionToken":{
        "shape":"String",
        "documentation":"<p>License consumption token.</p>"
      },
      "EntitlementsAllowed":{
        "shape":"EntitlementDataList",
        "documentation":"<p>Allowed license entitlements.</p>"
      },
      "SignedToken":{
        "shape":"SignedToken",
        "documentation":"<p>Signed token.</p>"
      },
      "NodeId":{
        "shape":"String",
        "documentation":"<p>Node ID.</p>"
      },
      "IssuedAt":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>Date and time at which the license checkout is issued.</p>"
      },
      "Expiration":{
        "shape":"ISO8601DateTime",

"documentation":"<p>Date and time at which the license checkout expires.</p>"
      },
      "LicenseArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the checkout license.</p>"
      }
    }
  },
  "CheckoutType":{
    "type":"string",
    "enum":[
      "PROVISIONAL",
      "PERPETUAL"
    ]
  },
  "ClientRequestToken":{
    "type":"string",
    "max":36,
    "min":1
  },
  "ClientToken":{
    "type":"string",
```

```
      "max":2048,
      "pattern":"\\S+"
    },
    "ConflictException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>There was a conflict processing the request. Try your request again.</p>",
      "exception":true
    },
    "ConsumedLicenseSummary":{
      "type":"structure",
      "members":{
        "ResourceType":{
          "shape":"ResourceType",
          "documentation":"<p>Resource type of the resource consuming a
license.</p>"
        },
        "ConsumedLicenses":{
          "shape":"BoxLong",
          "documentation":"<p>Number of licenses consumed by the resource.</p>"
        }
      },
      "documentation":"<p>Details about license consumption.</p>"
    },
    "ConsumedLicenseSummaryList":{
      "type":"list",
      "member":{"shape":"ConsumedLicenseSummary"}
    },
    "ConsumptionConfiguration":{
      "type":"structure",
      "members":{
        "RenewType":{
          "shape":"RenewType",
          "documentation":"<p>Renewal frequency.</p>"
        },
        "ProvisionalConfiguration":{
          "shape":"ProvisionalConfiguration",
          "documentation":"<p>Details about a provisional configuration.</p>"
        },
        "BorrowConfiguration":{
          "shape":"BorrowConfiguration",
          "documentation":"<p>Details about a borrow configuration.</p>"
        }
      },
      "documentation":"<p>Details about a consumption configuration.</p>"
    },
```

```
"CreateGrantRequest":{
  "type":"structure",
  "required":[
    "ClientToken",
    "GrantName",
    "LicenseArn",
    "Principals",
    "HomeRegion",
    "AllowedOperations"
  ],
  "members":{
    "ClientToken":{
      "shape":"ClientToken",
      "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the request.</p>"
    },
    "GrantName":{
      "shape":"String",
      "documentation":"<p>Grant name.</p>"
    },
    "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
    },
    "Principals":{
      "shape":"PrincipalArnList",
      "documentation":"<p>The grant principals. You can specify one of the following as an Amazon Resource Name (ARN):</p> <ul> <li> <p>An Amazon Web Services account, which includes only the account specified.</p> </li> </ul> <ul> <li> <p>An organizational unit (OU), which includes all accounts in the OU.</p> </li> </ul> <ul> <li> <p>An organization, which will include all accounts across your organization.</p> </li> </ul>"
    },
    "HomeRegion":{
      "shape":"String",
      "documentation":"<p>Home Region of the grant.</p>"
    },
    "AllowedOperations":{
      "shape":"AllowedOperationList",
      "documentation":"<p>Allowed operations for the grant.</p>"
    }
  }
},
"CreateGrantResponse":{
  "type":"structure",
  "members":{
    "GrantArn":{
      "shape":"Arn",
      "documentation":"<p>Grant ARN.</p>"
```

```
        },
        "Status":{
          "shape":"GrantStatus",
          "documentation":"<p>Grant status.</p>"
        },
        "Version":{
          "shape":"String",
          "documentation":"<p>Grant version.</p>"
        }
      }
    },
    "CreateGrantVersionRequest":{
      "type":"structure",
      "required":[
        "ClientToken",
        "GrantArn"
      ],

   "members":{
        "ClientToken":{
          "shape":"ClientToken",
          "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
        },
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
        },
        "GrantName":{
          "shape":"String",
          "documentation":"<p>Grant name.</p>"
        },
        "AllowedOperations":{
          "shape":"AllowedOperationList",
          "documentation":"<p>Allowed operations for the grant.</p>"
        },
        "Status":{
          "shape":"GrantStatus",
          "documentation":"<p>Grant status.</p>"
        },
        "StatusReason":{
          "shape":"StatusReasonMessage",
          "documentation":"<p>Grant status reason.</p>"
        },
        "SourceVersion":{
          "shape":"String",
          "documentation":"<p>Current version of the grant.</p>"
        },
```

```
      "Options":{

    "shape":"Options",
      "documentation":"<p>The options specified for the grant.</p>"
     }
    }
   },
   "CreateGrantVersionResponse":{
    "type":"structure",
    "members":{
     "GrantArn":{
      "shape":"Arn",
      "documentation":"<p>Grant ARN.</p>"
     },
     "Status":{
      "shape":"GrantStatus",
      "documentation":"<p>Grant status.</p>"
     },
     "Version":{
      "shape":"String",
      "documentation":"<p>New version of the grant.</p>"
     }
    }
   },
   "CreateLicenseConfigurationRequest":{
    "type":"structure",
    "required":[
     "Name",
     "LicenseCountingType"
    ],
    "members":{
     "Name":{
      "shape":"String",
      "documentation":"<p>Name of the license configuration.</p>"
     },
     "Description":{
      "shape":"String",
      "documentation":"<p>Description of the license configuration.</p>"
     },
     "LicenseCountingType":{
       "shape":"LicenseCountingType",
      "documentation":"<p>Dimension used to track the license inventory.</p>"
     },
     "LicenseCount":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses managed by the license configuration.</p>"
     },
     "LicenseCountHardLimit":{
```

          "shape":"BoxBoolean",
          "documentation":"<p>Indicates whether hard or soft license enforcement is used. Exceeding a hard limit blocks the launch of new instances.</p>"
        },
        "LicenseRules":{
          "shape":"StringList",
          "documentation":"<p>License rules. The syntax is #name=value (for example, #allowedTenancy=EC2-DedicatedHost). The available rules vary by dimension, as follows.</p>   <p> <code>Cores</code> dimension: <code>allowedTenancy</code> | <code>licenseAffinityToHost</code> | <code>maximumCores</code> | <code>minimumCores</code> </p>   <p> <code>Instances</code> dimension: <code>allowedTenancy</code> | <code>maximumCores</code> | <code>minimumCores</code> | <code>maximumSockets</code> | <code>minimumSockets</code> | <code>maximumVcpus</code> | <code>minimumVcpus</code> </p>   <p> <code>Sockets</code> dimension: <code>allowedTenancy</code> | <code>licenseAffinityToHost</code> | <code>maximumSockets</code> | <code>minimumSockets</code> </p>   <p> <code>vCPUs</code> dimension: <code>allowedTenancy</code> | <code>honorVcpuOptimization</code> | <code>maximumVcpus</code> | <code>minimumVcpus</code> </p>   <p>The unit for <code>licenseAffinityToHost</code> is days and the range is 1 to 180. The possible values for <code>allowedTenancy</code> are <code>EC2-Default</code>, <code>EC2-DedicatedHost</code>, and <code>EC2-DedicatedInstance</code>. The possible values for <code>honorVcpuOptimization</code> are <code>True</code> and <code>False</code>.</p>"
        },
        "Tags":{
          "shape":"TagList",
          "documentation":"<p>Tags to add to the license configuration.</p>"
        },
        "DisassociateWhenNotFound":{
          "shape":"BoxBoolean",
          "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
        },
        "ProductInformationList":{
          "shape":"ProductInformationList",
          "documentation":"<p>Product information.</p>"
        }
      }
    },
    "CreateLicenseConfigurationResponse":{
      "type":"structure",
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        }
      }
    },
    "CreateLicenseConversionTaskForResourceRequest":{
      "type":"structure",

```
    "required":[
     "ResourceArn",
     "SourceLicenseContext",
     "DestinationLicenseContext"
    ],
    "members":{
     "ResourceArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the resource you are converting
 the license type for.</p>"
     },
     "SourceLicenseContext":{
      "shape":"LicenseConversionContext",
      "documentation":"<p>Information that identifies the license type you are converting from. For the structure of
 the source license, see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/conversion-
 procedures.html#conversion-cli\">Convert a license type using the CLI </a> in the <i>License Manager User
 Guide</i>.</p>"
     },
     "DestinationLicenseContext":{
      "shape":"LicenseConversionContext",
      "documentation":"<p>Information that identifies the license type you are converting to. For the structure of the
 destination license, see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/conversion-
 procedures.html#conversion-cli\">Convert a license type using the CLI </a> in the <i>License Manager User
 Guide</i>.</p>"
     }
    }
   },
   "CreateLicenseConversionTaskForResourceResponse":{
    "type":"structure",
    "members":{
     "LicenseConversionTaskId":{
      "shape":"LicenseConversionTaskId",
      "documentation":"<p>The ID of the created license type conversion task.</p>"
     }
    }
   },
   "CreateLicenseManagerReportGeneratorRequest":{
    "type":"structure",
    "required":[
     "ReportGeneratorName",
     "Type",
     "ReportContext",
     "ReportFrequency",
     "ClientToken"
    ],
    "members":{
     "ReportGeneratorName":{
      "shape":"ReportGeneratorName",
```

```
        "documentation":"<p>Name of the report generator.</p>"
      },
      "Type":{
        "shape":"ReportTypeList",
        "documentation":"<p>Type of reports to generate. The following report types an be generated:</p> <ul> <li>
<p>License configuration report - Reports the number and details of consumed licenses for a license
configuration.</p> </li> <li> <p>Resource report - Reports the tracked licenses and resource consumption
 for a license configuration.</p> </li> </ul>"
      },
      "ReportContext":{
        "shape":"ReportContext",
        "documentation":"<p>Defines the type of license configuration the report generator tracks.</p>"
      },
      "ReportFrequency":{
        "shape":"ReportFrequency",
        "documentation":"<p>Frequency by which reports are generated. Reports can be generated daily, monthly, or
weekly.</p>"
      },
      "ClientToken":{
        "shape":"ClientRequestToken",
        "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      },
      "Description":{
        "shape":"String",
        "documentation":"<p>Description of the report generator.</p>"
      },
      "Tags":{
        "shape":"TagList",
        "documentation":"<p>Tags to add to the report generator.</p>"
      }
    }
  },
  "CreateLicenseManagerReportGeneratorResponse":{
    "type":"structure",
    "members":{
      "LicenseManagerReportGeneratorArn":{
        "shape":"String",
        "documentation":"<p>The Amazon Resource Name (ARN) of the new report generator.</p>"
      }
    }
  },
  "CreateLicenseRequest":{
    "type":"structure",
    "required":[
      "LicenseName",
      "ProductName",
      "ProductSKU",
```

```
      "Issuer",
      "HomeRegion",
      "Validity",
      "Entitlements",
      "Beneficiary",
      "ConsumptionConfiguration",
      "ClientToken"
    ],
    "members":{
     "LicenseName":{
       "shape":"String",
       "documentation":"<p>License name.</p>"
     },
     "ProductName":{
       "shape":"String",
       "documentation":"<p>Product name.</p>"
     },
     "ProductSKU":{
       "shape":"String",
       "documentation":"<p>Product SKU.</p>"
     },
     "Issuer":{
       "shape":"Issuer",
       "documentation":"<p>License issuer.</p>"
     },

    "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region for the license.</p>"
      },
     "Validity":{
       "shape":"DatetimeRange",
       "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
     },
     "Entitlements":{
       "shape":"EntitlementList",
       "documentation":"<p>License entitlements.</p>"
     },
     "Beneficiary":{
       "shape":"String",
       "documentation":"<p>License beneficiary.</p>"
     },
     "ConsumptionConfiguration":{
       "shape":"ConsumptionConfiguration",
       "documentation":"<p>Configuration for consumption of the license. Choose a provisional configuration for
workloads running with continuous connectivity. Choose a borrow configuration for workloads with offline
usage.</p>"
     },
```

```
      "LicenseMetadata":{
       "shape":"MetadataList",
       "documentation":"<p>Information about the license.</p>"
      },
     "ClientToken":{
       "shape":"ClientToken",
       "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      }
     }
    },
   "CreateLicenseResponse":{
    "type":"structure",
    "members":{
     "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
     "Status":{
       "shape":"LicenseStatus",
       "documentation":"<p>License status.</p>"
      },
     "Version":{
       "shape":"String",
       "documentation":"<p>License version.</p>"
      }
     }
    },
   "CreateLicenseVersionRequest":{
    "type":"structure",
    "required":[
     "LicenseArn",
     "LicenseName",
     "ProductName",
     "Issuer",
     "HomeRegion",
     "Validity",
     "Entitlements",
     "ConsumptionConfiguration",
     "Status",
     "ClientToken"
    ],

  "members":{
     "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
```

"LicenseName":{
  "shape":"String",
  "documentation":"<p>License name.</p>"
},
"ProductName":{
  "shape":"String",
  "documentation":"<p>Product name.</p>"
},
"Issuer":{
  "shape":"Issuer",
  "documentation":"<p>License issuer.</p>"
},
"HomeRegion":{
  "shape":"String",
  "documentation":"<p>Home Region of the license.</p>"
},
"Validity":{
  "shape":"DatetimeRange",
  "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
},
"LicenseMetadata":{
  "shape":"MetadataList",
  "documentation":"<p>Information about the license.</p>"
},
"Entitlements":{
  "shape":"EntitlementList",
  "documentation":"<p>License
entitlements.</p>"
},
"ConsumptionConfiguration":{
  "shape":"ConsumptionConfiguration",
  "documentation":"<p>Configuration for consumption of the license. Choose a provisional configuration for
workloads running with continuous connectivity. Choose a borrow configuration for workloads with offline
usage.</p>"
},
"Status":{
  "shape":"LicenseStatus",
  "documentation":"<p>License status.</p>"
},
"ClientToken":{
  "shape":"ClientToken",
  "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
},
"SourceVersion":{
  "shape":"String",
  "documentation":"<p>Current version of the license.</p>"
}

```
      }
    },
   "CreateLicenseVersionResponse":{
    "type":"structure",
    "members":{
     "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>License
ARN.</p>"
     },
     "Version":{
       "shape":"String",
       "documentation":"<p>New version of the license.</p>"
     },
     "Status":{
       "shape":"LicenseStatus",
       "documentation":"<p>License status.</p>"
     }
    }
   },
   "CreateTokenRequest":{
    "type":"structure",
    "required":[
     "LicenseArn",
     "ClientToken"
    ],
    "members":{
     "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license. The ARN is mapped to the aud claim of
the JWT token.</p>"
     },
     "RoleArns":{
       "shape":"ArnList",
       "documentation":"<p>Amazon Resource Name (ARN) of the IAM roles to embed in the token. License
Manager does not check whether the roles are in use.</p>"
     },
     "ExpirationInDays":{
       "shape":"Integer",
       "documentation":"<p>Token expiration, in days, counted from token creation. The default is 365
days.</p>"
     },
     "TokenProperties":{
       "shape":"MaxSize3StringList",
       "documentation":"<p>Data specified by the caller to be included in the JWT token. The data is mapped to the
amr claim of the JWT token.</p>"
     },
     "ClientToken":{
```

```
        "shape":"ClientToken",
        "documentation":"<p>Idempotency token, valid for 10 minutes.</p>"
      }
    }
  },
  "CreateTokenResponse":{
    "type":"structure",
    "members":{
      "TokenId":{
        "shape":"String",
        "documentation":"<p>Token ID.</p>"
      },
      "TokenType":{
        "shape":"TokenType",
        "documentation":"<p>Token type.</p>"
      },
      "Token":{
        "shape":"TokenString",
        "documentation":"<p>Refresh token, encoded as a JWT token.</p>"
      }
    }
  },
  "DateTime":{"type":"timestamp"},
  "DatetimeRange":{
    "type":"structure",
    "required":["Begin"],
    "members":{
      "Begin":{

        "shape":"ISO8601DateTime",
        "documentation":"<p>Start of the time range.</p>"
      },
      "End":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>End of the time range.</p>"
      }
    },
    "documentation":"<p>Describes a time range, in ISO8601-UTC format.</p>"
  },
  "DeleteGrantRequest":{
    "type":"structure",
    "required":[
      "GrantArn",
      "Version"
    ],
    "members":{
      "GrantArn":{
        "shape":"Arn",
```

            "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
          },
          "StatusReason":{
            "shape":"StatusReasonMessage",
            "documentation":"<p>The Status reason for the delete request.</p>"
          },
          "Version":{
            "shape":"String",
            "documentation":"<p>Current version of the grant.</p>"
          }
        }
    },
    "DeleteGrantResponse":{
      "type":"structure",
      "members":{
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Grant ARN.</p>"
        },
        "Status":{
          "shape":"GrantStatus",
          "documentation":"<p>Grant status.</p>"
        },
        "Version":{
          "shape":"String",
          "documentation":"<p>Grant version.</p>"
        }
      }
    },
    "DeleteLicenseConfigurationRequest":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>ID of the license configuration.</p>"
        }
      }
    },
    "DeleteLicenseConfigurationResponse":{
      "type":"structure",
      "members":{
      }
    },
    "DeleteLicenseManagerReportGeneratorRequest":{
      "type":"structure",
      "required":["LicenseManagerReportGeneratorArn"],
      "members":{

```
    "LicenseManagerReportGeneratorArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the report generator to be deleted.</p>"
     }
  }
 },
 "DeleteLicenseManagerReportGeneratorResponse":{
  "type":"structure",
  "members":{
  }
 },
 "DeleteLicenseRequest":{
  "type":"structure",
  "required":[
    "LicenseArn",
    "SourceVersion"
  ],
  "members":{
    "LicenseArn":{
      "shape":"Arn",
      "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
    },
    "SourceVersion":{
      "shape":"String",
      "documentation":"<p>Current version of the license.</p>"
    }
  }
 },
 "DeleteLicenseResponse":{
  "type":"structure",
  "members":{
    "Status":{
      "shape":"LicenseDeletionStatus",
      "documentation":"<p>License status.</p>"
    },
    "DeletionDate":{
      "shape":"ISO8601DateTime",
      "documentation":"<p>Date when the license is deleted.</p>"
    }
  }
 },
 "DeleteTokenRequest":{
  "type":"structure",
  "required":["TokenId"],
  "members":{
    "TokenId":{
      "shape":"String",
      "documentation":"<p>Token ID.</p>"
```

```
      }
     }
    },
    "DeleteTokenResponse":{
     "type":"structure",
     "members":{
     }
    },
    "DigitalSignatureMethod":{
     "type":"string",
     "enum":["JWT_PS384"]
    },
    "Entitlement":{
     "type":"structure",
     "required":[
      "Name",
      "Unit"
     ],
     "members":{
      "Name":{
        "shape":"String",
        "documentation":"<p>Entitlement name.</p>"
      },
      "Value":{
        "shape":"String",
        "documentation":"<p>Entitlement resource. Use only if the unit is None.</p>"
      },
      "MaxCount":{
        "shape":"Long",
        "documentation":"<p>Maximum entitlement count. Use if the unit is not None.</p>"
      },
      "Overage":{
        "shape":"BoxBoolean",
        "documentation":"<p>Indicates whether overages are allowed.</p>"
      },
      "Unit":{
        "shape":"EntitlementUnit",
        "documentation":"<p>Entitlement unit.</p>"
      },
      "AllowCheckIn":{
        "shape":"BoxBoolean",
        "documentation":"<p>Indicates whether check-ins are allowed.</p>"
      }
     },
     "documentation":"<p>Describes a resource entitled for use with a license.</p>"
    },
    "EntitlementData":{
     "type":"structure",
```

```
  "required":[
   "Name",
   "Unit"
  ],
  "members":{
   "Name":{
     "shape":"String",
     "documentation":"<p>Entitlement data name.</p>"
   },
   "Value":{
     "shape":"String",
     "documentation":"<p>Entitlement data value.</p>"
   },
   "Unit":{
     "shape":"EntitlementDataUnit",
     "documentation":"<p>Entitlement data unit.</p>"
   }
  },
  "documentation":"<p>Data associated with an entitlement resource.</p>"
 },
 "EntitlementDataList":{
  "type":"list",
  "member":{"shape":"EntitlementData"}
 },
 "EntitlementDataUnit":{
  "type":"string",
  "enum":[
   "Count",
   "None",
   "Seconds",
   "Microseconds",
   "Milliseconds",
   "Bytes",
   "Kilobytes",
   "Megabytes",
   "Gigabytes",
   "Terabytes",
   "Bits",
   "Kilobits",
   "Megabits",
   "Gigabits",
   "Terabits",
   "Percent",
   "Bytes/Second",
   "Kilobytes/Second",
   "Megabytes/Second",
   "Gigabytes/Second",
   "Terabytes/Second",
```

```
          "Bits/Second",
          "Kilobits/Second",
          "Megabits/Second",
          "Gigabits/Second",
          "Terabits/Second",
          "Count/Second"
      ]
    },
    "EntitlementList":{
      "type":"list",
      "member":{"shape":"Entitlement"}
    },
    "EntitlementNotAllowedException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>The entitlement is not allowed.</p>",
      "exception":true
    },
    "EntitlementUnit":{
      "type":"string",
      "enum":[
        "Count",
        "None",
        "Seconds",
        "Microseconds",
        "Milliseconds",
        "Bytes",
        "Kilobytes",
        "Megabytes",
        "Gigabytes",
        "Terabytes",
        "Bits",
        "Kilobits",
        "Megabits",
        "Gigabits",
        "Terabits",
        "Percent",
        "Bytes/Second",
        "Kilobytes/Second",
        "Megabytes/Second",
        "Gigabytes/Second",
        "Terabytes/Second",
        "Bits/Second",
        "Kilobits/Second",
        "Megabits/Second",
        "Gigabits/Second",
```

```
      "Terabits/Second",
      "Count/Second"
    ]
  },
  "EntitlementUsage":{
   "type":"structure",
   "required":[
     "Name",
     "ConsumedValue",
     "Unit"
   ],
   "members":{
     "Name":{
       "shape":"String",
       "documentation":"<p>Entitlement usage name.</p>"
     },
     "ConsumedValue":{
       "shape":"String",
       "documentation":"<p>Resource usage consumed.</p>"
     },
     "MaxCount":{
       "shape":"String",
       "documentation":"<p>Maximum entitlement usage count.</p>"
     },
     "Unit":{
       "shape":"EntitlementDataUnit",
       "documentation":"<p>Entitlement usage unit.</p>"
     }
   },
   "documentation":"<p>Usage associated with an entitlement resource.</p>"
  },
  "EntitlementUsageList":{
   "type":"list",
   "member":{"shape":"EntitlementUsage"}
  },
  "ExtendLicenseConsumptionRequest":{
   "type":"structure",
   "required":["LicenseConsumptionToken"],
   "members":{
     "LicenseConsumptionToken":{
       "shape":"String",
       "documentation":"<p>License consumption token.</p>"
     },
     "DryRun":{
       "shape":"Boolean",
       "documentation":"<p>Checks whether you have the required permissions for the action, without actually
making the request. Provides
```

an error response if you do not have the required permissions.</p>"
```
          }
        }
      },
      "ExtendLicenseConsumptionResponse":{
       "type":"structure",
       "members":{
        "LicenseConsumptionToken":{
         "shape":"String",
         "documentation":"<p>License consumption token.</p>"
        },
        "Expiration":{
         "shape":"ISO8601DateTime",
         "documentation":"<p>Date and time at which the license consumption expires.</p>"
        }
       }
      },
      "FailedDependencyException":{
       "type":"structure",
       "members":{
        "Message":{"shape":"Message"},
        "ErrorCode":{"shape":"String"}
       },
       "documentation":"<p>A dependency required to run the API is missing.</p>",
       "exception":true
      },
      "Filter":{
       "type":"structure",
       "members":{
        "Name":{
         "shape":"FilterName",
         "documentation":"<p>Name of the filter. Filter names are case-sensitive.</p>"
        },
        "Values":{

         "shape":"FilterValues",
         "documentation":"<p>The value of the filter, which is case-sensitive. You can only specify one value for the
filter.</p>"
        }
       },
       "documentation":"<p>A filter name and value pair that is used to return more specific results from a describe
operation. Filters can be used to match a set of resources by specific criteria, such as tags, attributes, or IDs.</p>"
      },
      "FilterLimitExceededException":{
       "type":"structure",
       "members":{
        "Message":{"shape":"Message"}
       },
```

```
      "documentation":"<p>The request uses too many filters or too many filter values.</p>",
      "exception":true
    },
    "FilterList":{
      "type":"list",
      "member":{"shape":"Filter"}
    },
    "FilterName":{"type":"string"},
    "FilterValue":{"type":"string"},
    "FilterValues":{
      "type":"list",
      "member":{"shape":"FilterValue"}
    },
    "Filters":{
      "type":"list",
      "member":{"shape":"Filter"}
    },

    "GetAccessTokenRequest":{
      "type":"structure",
      "required":["Token"],
      "members":{
        "Token":{
          "shape":"TokenString",
          "documentation":"<p>Refresh token, encoded as a JWT token.</p>"
        },
        "TokenProperties":{
          "shape":"MaxSize3StringList",
          "documentation":"<p>Token properties to validate against those present in the JWT token.</p>"
        }
      }
    },
    "GetAccessTokenResponse":{
      "type":"structure",
      "members":{
        "AccessToken":{
          "shape":"TokenString",
          "documentation":"<p>Temporary access token.</p>"
        }
      }
    },
    "GetGrantRequest":{
      "type":"structure",
      "required":["GrantArn"],
      "members":{
        "GrantArn":{
          "shape":"Arn",
          "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
```

```
    },
    "Version":{
      "shape":"String",
      "documentation":"<p>Grant version.</p>"
    }
  }
},
"GetGrantResponse":{
  "type":"structure",
  "members":{
    "Grant":{
      "shape":"Grant",
      "documentation":"<p>Grant details.</p>"
    }
  }
},
"GetLicenseConfigurationRequest":{
  "type":"structure",
  "required":["LicenseConfigurationArn"],
  "members":{
    "LicenseConfigurationArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    }
  }
},
"GetLicenseConfigurationResponse":{
  "type":"structure",
  "members":{
    "LicenseConfigurationId":{
      "shape":"String",
      "documentation":"<p>Unique ID for the license configuration.</p>"
    },
    "LicenseConfigurationArn":{
      "shape":"String",
      "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    },
    "Name":{
      "shape":"String",
      "documentation":"<p>Name of the license configuration.</p>"
    },
    "Description":{
      "shape":"String",
      "documentation":"<p>Description of the license configuration.</p>"
    },
    "LicenseCountingType":{
      "shape":"LicenseCountingType",
      "documentation":"<p>Dimension for which the licenses are counted.</p>"
```

```
    },
    "LicenseRules":{
      "shape":"StringList",
      "documentation":"<p>License rules.</p>"
    },
    "LicenseCount":{
      "shape":"BoxLong",
      "documentation":"<p>Number of available licenses.</p>"
    },
    "LicenseCountHardLimit":{
      "shape":"BoxBoolean",
      "documentation":"<p>Sets the number of available licenses as a hard limit.</p>"
    },
    "ConsumedLicenses":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses assigned to resources.</p>"
    },
    "Status":{
      "shape":"String",
      "documentation":"<p>License configuration status.</p>"
    },
    "OwnerAccountId":{
      "shape":"String",
      "documentation":"<p>Account ID of the owner of the license configuration.</p>"
    },
    "ConsumedLicenseSummaryList":{
      "shape":"ConsumedLicenseSummaryList",
      "documentation":"<p>Summaries of the licenses consumed by resources.</p>"
    },
    "ManagedResourceSummaryList":{
      "shape":"ManagedResourceSummaryList",
      "documentation":"<p>Summaries of the managed resources.</p>"
    },
    "Tags":{
      "shape":"TagList",
      "documentation":"<p>Tags for the license configuration.</p>"
    },
    "ProductInformationList":{
      "shape":"ProductInformationList",
      "documentation":"<p>Product information.</p>"
    },
    "AutomatedDiscoveryInformation":{
      "shape":"AutomatedDiscoveryInformation",
      "documentation":"<p>Automated discovery information.</p>"
    },
    "DisassociateWhenNotFound":{
      "shape":"BoxBoolean",
      "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
```

```
          }
        }
      },
      "GetLicenseConversionTaskRequest":{
        "type":"structure",
        "required":["LicenseConversionTaskId"],
        "members":{
          "LicenseConversionTaskId":{
            "shape":"LicenseConversionTaskId",
            "documentation":"<p>ID of the license type conversion task to retrieve information on.</p>"
          }
        }
      },
      "GetLicenseConversionTaskResponse":{
        "type":"structure",
        "members":{
          "LicenseConversionTaskId":{
            "shape":"LicenseConversionTaskId",
            "documentation":"<p>ID of the license type conversion task.</p>"
          },
          "ResourceArn":{
            "shape":"String",
            "documentation":"<p>Amazon Resource Names (ARN) of the resources the license conversion task is
associated with.</p>"
          },
          "SourceLicenseContext":{
            "shape":"LicenseConversionContext",
            "documentation":"<p>Information about the license type converted from.</p>"
          },
          "DestinationLicenseContext":{
            "shape":"LicenseConversionContext",
            "documentation":"<p>Information about the license type converted to.</p>"
          },
          "StatusMessage":{
            "shape":"String",
            "documentation":"<p>The status message for the conversion task.</p>"
          },
          "Status":{
            "shape":"LicenseConversionTaskStatus",
            "documentation":"<p>Status of the license type conversion task.</p>"
          },
          "StartTime":{
            "shape":"DateTime",
            "documentation":"<p>Time at which the license type conversion task was started .</p>"
          },
          "LicenseConversionTime":{
            "shape":"DateTime",
            "documentation":"<p>Amount of time to complete the license type conversion.</p>"
```

```
      },
      "EndTime":{
        "shape":"DateTime",
        "documentation":"<p>Time
at which the license type conversion task was completed.</p>"
      }
    }
  },
  "GetLicenseManagerReportGeneratorRequest":{
    "type":"structure",
    "required":["LicenseManagerReportGeneratorArn"],
    "members":{
      "LicenseManagerReportGeneratorArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the report generator.</p>"
      }
    }
  },
  "GetLicenseManagerReportGeneratorResponse":{
    "type":"structure",
    "members":{
      "ReportGenerator":{
        "shape":"ReportGenerator",
        "documentation":"<p>A report generator that creates periodic reports about your license configurations.</p>"
      }
    }
  },
  "GetLicenseRequest":{
    "type":"structure",
    "required":["LicenseArn"],
    "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "Version":{

  "shape":"String",
        "documentation":"<p>License version.</p>"
      }
    }
  },
  "GetLicenseResponse":{
    "type":"structure",
    "members":{
      "License":{
        "shape":"License",
        "documentation":"<p>License details.</p>"
```

```
      }
     }
    },
    "GetLicenseUsageRequest":{
     "type":"structure",
     "required":["LicenseArn"],
     "members":{
      "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      }
     }
    },
    "GetLicenseUsageResponse":{
     "type":"structure",
     "members":{
      "LicenseUsage":{
       "shape":"LicenseUsage",
       "documentation":"<p>License usage details.</p>"
      }
     }
    },
    "GetServiceSettingsRequest":{
     "type":"structure",
     "members":{
     }
    },
    "GetServiceSettingsResponse":{
     "type":"structure",
     "members":{
      "S3BucketArn":{
       "shape":"String",

       "documentation":"<p>Regional S3 bucket path for storing reports, license trail event data, discovery data, and
so on.</p>"
      },
      "SnsTopicArn":{
       "shape":"String",
       "documentation":"<p>SNS topic configured to receive notifications from License Manager.</p>"
      },
      "OrganizationConfiguration":{
       "shape":"OrganizationConfiguration",
       "documentation":"<p>Indicates whether Organizations is integrated with License Manager for cross-account
discovery.</p>"
      },
      "EnableCrossAccountsDiscovery":{
       "shape":"BoxBoolean",
       "documentation":"<p>Indicates whether cross-account discovery is enabled.</p>"
```

```
      },
      "LicenseManagerResourceShareArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the resource share. The License Manager
management account provides member accounts with access to this share.</p>"
      }
    }
  },
  "Grant":{
    "type":"structure",
    "required":[
      "GrantArn",
      "GrantName",
      "ParentArn",
      "LicenseArn",
      "GranteePrincipalArn",
      "HomeRegion",
      "GrantStatus",
      "Version",
      "GrantedOperations"
    ],
    "members":{
      "GrantArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
      },
      "GrantName":{
        "shape":"String",
        "documentation":"<p>Grant name.</p>"
      },
      "ParentArn":{
        "shape":"Arn",
        "documentation":"<p>Parent ARN.</p>"
      },
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>License ARN.</p>"
      },
      "GranteePrincipalArn":{
        "shape":"Arn",
        "documentation":"<p>The grantee principal ARN.</p>"
      },
      "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region of the grant.</p>"
      },
      "GrantStatus":{
```

```
        "shape":"GrantStatus",
        "documentation":"<p>Grant status.</p>"
      },
      "StatusReason":{
        "shape":"StatusReasonMessage",
        "documentation":"<p>Grant status reason.</p>"
      },
      "Version":{
        "shape":"String",
        "documentation":"<p>Grant version.</p>"
      },
      "GrantedOperations":{
        "shape":"AllowedOperationList",
        "documentation":"<p>Granted operations.</p>"
      },
      "Options":{
        "shape":"Options",
        "documentation":"<p>The options specified for the grant.</p>"
      }
    },
    "documentation":"<p>Describes a grant.</p>"
  },
  "GrantList":{
    "type":"list",
    "member":{"shape":"Grant"}
  },
  "GrantStatus":{
    "type":"string",
    "enum":[
      "PENDING_WORKFLOW",
      "PENDING_ACCEPT",
      "REJECTED",
      "ACTIVE",
      "FAILED_WORKFLOW",
      "DELETED",
      "PENDING_DELETE",
      "DISABLED",

"WORKFLOW_COMPLETED"
    ]
  },
  "GrantedLicense":{
    "type":"structure",
    "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
```

      "LicenseName":{
        "shape":"String",
        "documentation":"<p>License name.</p>"
      },
      "ProductName":{
        "shape":"String",
        "documentation":"<p>Product name.</p>"
      },
      "ProductSKU":{
        "shape":"String",
        "documentation":"<p>Product SKU.</p>"
      },
      "Issuer":{
        "shape":"IssuerDetails",
        "documentation":"<p>Granted license issuer.</p>"
      },
      "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region of the granted license.</p>"
      },
      "Status":{
        "shape":"LicenseStatus",
        "documentation":"<p>Granted license status.</p>"
      },
      "Validity":{
        "shape":"DatetimeRange",
        "documentation":"<p>Date and time range during which the granted license is valid, in ISO8601-UTC
format.</p>"
      },
      "Beneficiary":{
        "shape":"String",
        "documentation":"<p>Granted license beneficiary.</p>"
      },
      "Entitlements":{
        "shape":"EntitlementList",
        "documentation":"<p>License entitlements.</p>"
      },
      "ConsumptionConfiguration":{
        "shape":"ConsumptionConfiguration",
        "documentation":"<p>Configuration for consumption of the license.</p>"
      },
      "LicenseMetadata":{
        "shape":"MetadataList",
        "documentation":"<p>Granted license metadata.</p>"
      },
      "CreateTime":{
        "shape":"ISO8601DateTime",
        "documentation":"<p>Creation time of the granted license.</p>"

        },
      "Version":{
        "shape":"String",
        "documentation":"<p>Version of the granted license.</p>"
      },
      "ReceivedMetadata":{
        "shape":"ReceivedMetadata",
        "documentation":"<p>Granted license received metadata.</p>"
      }
    },
    "documentation":"<p>Describes a license that is granted to a grantee.</p>"
  },
  "GrantedLicenseList":{
    "type":"list",
    "member":{"shape":"GrantedLicense"}
  },
  "ISO8601DateTime":{
    "type":"string",
    "max":50,
    "pattern":"^(-?(?:[1-9][0-9]*)?[0-9]{4})-(1[0-2]|0[1-9])-(3[0-1]|0[1-9]|[1-2][0-9])T(2[0-3]|[0-1][0-9]):([0-5][0-9]):([0-5][0-9])(\\.[0-9]+)?(Z|[+-](?:2[0-3]|[0-1][0-9]):[0-5][0-9])+$"
  },
  "Integer":{"type":"integer"},
  "InvalidParameterValueException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}
    },
    "documentation":"<p>One or more parameter values are not valid.</p>",
    "exception":true,
    "synthetic":true
  },
  "InvalidResourceStateException":{
    "type":"structure",
    "members":{
      "Message":{"shape":"Message"}

    },
    "documentation":"<p>License Manager cannot allocate a license to a resource because of its state. </p> <p>For example, you cannot allocate a license to an instance in the process of shutting down.</p>",
    "exception":true
  },
  "InventoryFilter":{
    "type":"structure",
    "required":[
      "Name",
      "Condition"
    ],

```
    "members":{
     "Name":{
      "shape":"String",
      "documentation":"<p>Name of the filter.</p>"
     },
     "Condition":{
      "shape":"InventoryFilterCondition",
      "documentation":"<p>Condition of the filter.</p>"
     },
     "Value":{
      "shape":"String",
      "documentation":"<p>Value of the filter.</p>"
     }
    },
    "documentation":"<p>An inventory filter.</p>"
   },
   "InventoryFilterCondition":{
    "type":"string",
    "enum":[
     "EQUALS",
     "NOT_EQUALS",
     "BEGINS_WITH",
     "CONTAINS"
    ]
   },
   "InventoryFilterList":{
    "type":"list",
    "member":{"shape":"InventoryFilter"}
   },
   "Issuer":{
    "type":"structure",
    "required":["Name"],
    "members":{
     "Name":{
      "shape":"String",
      "documentation":"<p>Issuer name.</p>"
     },
     "SignKey":{
      "shape":"String",
      "documentation":"<p>Asymmetric KMS key from Key Management Service. The KMS key must have a key usage of sign and verify, and support the RSASSA-PSS SHA-256 signing algorithm.</p>"
     }
    },
    "documentation":"<p>Details about the issuer of a license.</p>"
   },
   "IssuerDetails":{
    "type":"structure",
    "members":{
```

```
      "Name":{
        "shape":"String",
        "documentation":"<p>Issuer name.</p>"
      },
      "SignKey":{
        "shape":"String",
        "documentation":"<p>Asymmetric KMS key from Key Management Service. The KMS key must have a key
usage of sign and verify, and support the RSASSA-PSS SHA-256 signing algorithm.</p>"
      },
      "KeyFingerprint":{
        "shape":"String",
        "documentation":"<p>Issuer key fingerprint.</p>"
      }
    },
    "documentation":"<p>Details associated with the issuer of a license.</p>"
  },
  "License":{
    "type":"structure",
    "members":{
      "LicenseArn":{
        "shape":"Arn",
        "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "LicenseName":{
        "shape":"String",
        "documentation":"<p>License name.</p>"
      },
      "ProductName":{
        "shape":"String",
        "documentation":"<p>Product name.</p>"
      },
      "ProductSKU":{
        "shape":"String",
        "documentation":"<p>Product SKU.</p>"
      },
      "Issuer":{
        "shape":"IssuerDetails",
        "documentation":"<p>License issuer.</p>"
      },
      "HomeRegion":{
        "shape":"String",
        "documentation":"<p>Home Region of the license.</p>"
      },
      "Status":{
        "shape":"LicenseStatus",
        "documentation":"<p>License status.</p>"
      },
      "Validity":{
```

```
     "shape":"DatetimeRange",
     "documentation":"<p>Date and time range during which the license is valid, in ISO8601-UTC format.</p>"
    },
    "Beneficiary":{
     "shape":"String",
     "documentation":"<p>License beneficiary.</p>"
    },
    "Entitlements":{
     "shape":"EntitlementList",
     "documentation":"<p>License entitlements.</p>"
    },
    "ConsumptionConfiguration":{
     "shape":"ConsumptionConfiguration",
     "documentation":"<p>Configuration for consumption of the license.</p>"
    },
    "LicenseMetadata":{
     "shape":"MetadataList",
     "documentation":"<p>License metadata.</p>"
    },
    "CreateTime":{
     "shape":"ISO8601DateTime",
     "documentation":"<p>License creation time.</p>"
    },
    "Version":{
      "shape":"String",
     "documentation":"<p>License version.</p>"
    }
   },
   "documentation":"<p>Software license that is managed in License Manager.</p>"
  },
  "LicenseConfiguration":{
   "type":"structure",
   "members":{
    "LicenseConfigurationId":{
      "shape":"String",
     "documentation":"<p>Unique ID of the license configuration.</p>"
    },
    "LicenseConfigurationArn":{
      "shape":"String",
     "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    },
    "Name":{
      "shape":"String",
     "documentation":"<p>Name of the license configuration.</p>"
    },
    "Description":{
      "shape":"String",
      "documentation":"<p>Description of the license configuration.</p>"
```

```
    },
    "LicenseCountingType":{
      "shape":"LicenseCountingType",
      "documentation":"<p>Dimension to use to track the license inventory.</p>"
    },
    "LicenseRules":{
      "shape":"StringList",
      "documentation":"<p>License rules.</p>"
    },
    "LicenseCount":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses managed by the license configuration.</p>"
    },
    "LicenseCountHardLimit":{
      "shape":"BoxBoolean",
      "documentation":"<p>Number of available licenses as a hard limit.</p>"
    },
    "DisassociateWhenNotFound":{
      "shape":"BoxBoolean",
      "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
    },
    "ConsumedLicenses":{
      "shape":"BoxLong",
      "documentation":"<p>Number of licenses consumed. </p>"
    },
    "Status":{
      "shape":"String",
      "documentation":"<p>Status of the license configuration.</p>"
    },
    "OwnerAccountId":{
      "shape":"String",
      "documentation":"<p>Account ID of the license
configuration's owner.</p>"
    },
    "ConsumedLicenseSummaryList":{
      "shape":"ConsumedLicenseSummaryList",
      "documentation":"<p>Summaries for licenses consumed by various resources.</p>"
    },
    "ManagedResourceSummaryList":{
      "shape":"ManagedResourceSummaryList",
      "documentation":"<p>Summaries for managed resources.</p>"
    },
    "ProductInformationList":{
      "shape":"ProductInformationList",
      "documentation":"<p>Product information.</p>"
    },
    "AutomatedDiscoveryInformation":{
      "shape":"AutomatedDiscoveryInformation",
```

          "documentation":"<p>Automated discovery information.</p>"
        }
      },
      "documentation":"<p>A license configuration is an abstraction of a customer license agreement that can be
consumed and enforced by License Manager. Components include specifications for the license type (licensing by
instance, socket, CPU, or vCPU), allowed tenancy (shared
 tenancy, Dedicated Instance, Dedicated Host, or all of these), host affinity (how long a VM must be associated with
a host), and the number of licenses purchased and used.</p>"
    },
    "LicenseConfigurationAssociation":{
      "type":"structure",
      "members":{
        "ResourceArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
        },
        "ResourceType":{
          "shape":"ResourceType",
          "documentation":"<p>Type of server resource.</p>"
        },
        "ResourceOwnerId":{
          "shape":"String",
          "documentation":"<p>ID of the Amazon Web Services account that owns the resource consuming
licenses.</p>"
        },
        "AssociationTime":{
          "shape":"DateTime",
          "documentation":"<p>Time when the license configuration was associated with the resource.</p>"
        },
        "AmiAssociationScope":{
          "shape":"String",
          "documentation":"<p>Scope of
 AMI associations. The possible value is <code>cross-account</code>.</p>"
        }
      },
      "documentation":"<p>Describes an association with a license configuration.</p>"
    },
    "LicenseConfigurationAssociations":{
      "type":"list",
      "member":{"shape":"LicenseConfigurationAssociation"}
    },
    "LicenseConfigurationStatus":{
      "type":"string",
      "enum":[
        "AVAILABLE",
        "DISABLED"
      ]
    },

```
  "LicenseConfigurationUsage":{
    "type":"structure",
    "members":{
      "ResourceArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
      },
      "ResourceType":{
        "shape":"ResourceType",
        "documentation":"<p>Type of resource.</p>"
      },
      "ResourceStatus":{
        "shape":"String",
        "documentation":"<p>Status of the resource.</p>"
      },
      "ResourceOwnerId":{
        "shape":"String",
        "documentation":"<p>ID of
the account that owns the resource.</p>"
      },
      "AssociationTime":{
        "shape":"DateTime",
        "documentation":"<p>Time when the license configuration was initially associated with the resource.</p>"
      },
      "ConsumedLicenses":{
        "shape":"BoxLong",
        "documentation":"<p>Number of licenses consumed by the resource.</p>"
      }
    },
    "documentation":"<p>Details about the usage of a resource associated with a license configuration.</p>"
  },
  "LicenseConfigurationUsageList":{
   "type":"list",
   "member":{"shape":"LicenseConfigurationUsage"}
  },
  "LicenseConfigurations":{
   "type":"list",
   "member":{"shape":"LicenseConfiguration"}
  },
  "LicenseConversionContext":{
   "type":"structure",
   "members":{
     "UsageOperation":{
       "shape":"UsageOperation",
       "documentation":"<p>The Usage operation value that corresponds to the license type you are converting your
resource
 from. For more information about which platforms correspond to which usage operation values see <a
href=\"https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/billing-info-fields.html#billing-info\">Sample
```

data: usage operation by platform </p>"
    }
  },
  "documentation":"<p>Information about a license type conversion task.</p>"
},
"LicenseConversionTask":{
  "type":"structure",
  "members":{
    "LicenseConversionTaskId":{
      "shape":"LicenseConversionTaskId",
      "documentation":"<p>The ID of the license type conversion task.</p>"
    },
    "ResourceArn":{
      "shape":"String",
      "documentation":"<p>The Amazon Resource Name (ARN) of the resource associated with the license type conversion task.</p>"
    },
    "SourceLicenseContext":{
      "shape":"LicenseConversionContext",
      "documentation":"<p>Information about the license type this conversion task converted from.</p>"
    },

    "DestinationLicenseContext":{
      "shape":"LicenseConversionContext",
      "documentation":"<p>Information about the license type this conversion task converted to.</p>"
    },
    "Status":{
      "shape":"LicenseConversionTaskStatus",
      "documentation":"<p>The status of the conversion task.</p>"
    },
    "StatusMessage":{
      "shape":"String",
      "documentation":"<p>The status message for the conversion task.</p>"
    },
    "StartTime":{
      "shape":"DateTime",
      "documentation":"<p>The time the conversion task was started at.</p>"
    },
    "LicenseConversionTime":{
      "shape":"DateTime",
      "documentation":"<p>The time the usage operation value of the resource was changed.</p>"
    },
    "EndTime":{
      "shape":"DateTime",
      "documentation":"<p>The time the conversion task was completed.</p>"
    }
  },
  "documentation":"<p>Information about a

license type conversion task.</p>"
  },
  "LicenseConversionTaskId":{
   "type":"string",
   "max":50,
   "pattern":"^lct-[a-zA-Z0-9]*"
  },
  "LicenseConversionTaskStatus":{
   "type":"string",
   "enum":[
     "IN_PROGRESS",
     "SUCCEEDED",
     "FAILED"
   ]
  },
  "LicenseConversionTasks":{
   "type":"list",
   "member":{"shape":"LicenseConversionTask"}
  },
  "LicenseCountingType":{
   "type":"string",
   "enum":[
     "vCPU",
     "Instance",
     "Core",
     "Socket"
   ]
  },
  "LicenseDeletionStatus":{
   "type":"string",
   "enum":[
     "PENDING_DELETE",
     "DELETED"
   ]
  },
  "LicenseList":{
   "type":"list",
   "member":{"shape":"License"}
  },
  "LicenseOperationFailure":{
   "type":"structure",
   "members":{
     "ResourceArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
     },

"ResourceType":{
    "shape":"ResourceType",
    "documentation":"<p>Resource type.</p>"
  },
  "ErrorMessage":{
    "shape":"String",
    "documentation":"<p>Error message.</p>"
  },
  "FailureTime":{
    "shape":"DateTime",
    "documentation":"<p>Failure time.</p>"
  },
  "OperationName":{
    "shape":"String",
    "documentation":"<p>Name of the operation.</p>"
  },
  "ResourceOwnerId":{
    "shape":"String",
    "documentation":"<p>ID of the Amazon Web Services account that owns the resource.</p>"
  },
  "OperationRequestedBy":{
    "shape":"String",
    "documentation":"<p>The requester is \"License Manager Automated Discovery\".</p>"
  },
  "MetadataList":{
    "shape":"MetadataList",
    "documentation":"<p>Reserved.</p>"
  }
 },
 "documentation":"<p>Describes the failure of a license operation.</p>"
},
"LicenseOperationFailureList":{
 "type":"list",
 "member":{"shape":"LicenseOperationFailure"}
},
"LicenseSpecification":{
 "type":"structure",
 "required":["LicenseConfigurationArn"],
 "members":{
  "LicenseConfigurationArn":{
    "shape":"String",
    "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
  },
  "AmiAssociationScope":{
    "shape":"String",
    "documentation":"<p>Scope of AMI associations. The possible value is <code>cross-account</code>.</p>"
  }
 },

    "documentation":"<p>Details for associating a license configuration with a resource.</p>"
  },
  "LicenseSpecifications":{
   "type":"list",
   "member":{"shape":"LicenseSpecification"}
  },
  "LicenseStatus":{
   "type":"string",
   "enum":[
    "AVAILABLE",
    "PENDING_AVAILABLE",
    "DEACTIVATED",
    "SUSPENDED",
    "EXPIRED",
    "PENDING_DELETE",
    "DELETED"
   ]
  },
  "LicenseUsage":{
   "type":"structure",
   "members":{
    "EntitlementUsages":{
     "shape":"EntitlementUsageList",
     "documentation":"<p>License entitlement usages.</p>"
    }
   },
   "documentation":"<p>Describes the entitlement usage associated with a license.</p>"
  },
  "LicenseUsageException":{
   "type":"structure",
   "members":{
    "Message":{"shape":"Message"}
   },
   "documentation":"<p>You do not have enough licenses available to support a new resource launch.</p>",
   "exception":true
  },
  "ListAssociationsForLicenseConfigurationRequest":{
   "type":"structure",
   "required":["LicenseConfigurationArn"],
   "members":{
    "LicenseConfigurationArn":{
     "shape":"String",
     "documentation":"<p>Amazon Resource Name (ARN) of a license configuration.</p>"
    },
    "MaxResults":{
     "shape":"BoxInteger",
     "documentation":"<p>Maximum

number of results to return in a single call.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListAssociationsForLicenseConfigurationResponse":{
    "type":"structure",
    "members":{
      "LicenseConfigurationAssociations":{
        "shape":"LicenseConfigurationAssociations",
        "documentation":"<p>Information about the associations for the license configuration.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListDistributedGrantsRequest":{
    "type":"structure",
    "members":{
      "GrantArns":{
        "shape":"ArnList",
        "documentation":"<p>Amazon Resource Names (ARNs) of the grants.</p>"
      },
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>Filters to scope the results.
The following filters are supported:</p>   <p> <code>LicenseArn</code> </p>   <p> <code>GrantStatus</code> </p>   <p> <code>GranteePrincipalARN</code> </p>   <p> <code>ProductSKU</code> </p>   <p> <code>LicenseIssuerName</code> </p> "
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListDistributedGrantsResponse":{
    "type":"structure",
    "members":{

```
       "Grants":{
         "shape":"GrantList",
         "documentation":"<p>Distributed grant details.</p>"
        },
       "NextToken":{
         "shape":"String",
         "documentation":"<p>Token for the next set of results.</p>"
        }
      }
     },
    "ListFailuresForLicenseConfigurationOperationsRequest":{
      "type":"structure",
     "required":["LicenseConfigurationArn"],
     "members":{
       "LicenseConfigurationArn":{
         "shape":"String",
         "documentation":"<p>Amazon Resource Name of the license configuration.</p>"
        },
       "MaxResults":{
         "shape":"BoxInteger",
         "documentation":"<p>Maximum number of results to return in a single call.</p>"
        },
       "NextToken":{
         "shape":"String",
         "documentation":"<p>Token for the next set of results.</p>"
        }
      }
     },
    "ListFailuresForLicenseConfigurationOperationsResponse":{
      "type":"structure",
     "members":{
       "LicenseOperationFailureList":{
         "shape":"LicenseOperationFailureList",
         "documentation":"<p>License configuration operations that failed.</p>"
        },
       "NextToken":{
         "shape":"String",
         "documentation":"<p>Token for the next set of results.</p>"
        }
      }


     },
    "ListLicenseConfigurationsRequest":{
      "type":"structure",
     "members":{
       "LicenseConfigurationArns":{
         "shape":"StringList",
         "documentation":"<p>Amazon Resource Names (ARN) of the license configurations.</p>"
```

```
      },
      "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      },
      "Filters":{
       "shape":"Filters",
       "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p> <ul> <li> <p> <code>licenseCountingType</code> - The dimension for which licenses are counted.
Possible values are <code>vCPU</code> | <code>Instance</code> | <code>Core</code> | <code>Socket</code>.
Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li>
 <p> <code>enforceLicenseCount</code> - A Boolean value that indicates whether hard license enforcement is
used. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li> <p>
<code>usagelimitExceeded</code> - A Boolean value that indicates whether the available licenses have been
exceeded. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> </ul>"
      }
     }
    },
    "ListLicenseConfigurationsResponse":{
     "type":"structure",
     "members":{
      "LicenseConfigurations":{
       "shape":"LicenseConfigurations",
       "documentation":"<p>Information about the license configurations.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
     }
    },
    "ListLicenseConversionTasksRequest":{
     "type":"structure",
     "members":{
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token
for the next set of results.</p>"
      },
      "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },
      "Filters":{
```

```
        "shape":"Filters",
        "documentation":"<p> Filters to scope the results. Valid filters are <code>ResourceArns</code> and
<code>Status</code>. </p>"
      }
    }
  },
  "ListLicenseConversionTasksResponse":{
    "type":"structure",
    "members":{
      "LicenseConversionTasks":{
        "shape":"LicenseConversionTasks",
        "documentation":"<p>Information about the license configuration tasks for your account.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListLicenseManagerReportGeneratorsRequest":{
    "type":"structure",
    "members":{
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>Filters
 to scope the results. The following filters are supported: </p> <ul> <li> <p>
<code>LicenseConfigurationArn</code> </p> </li> </ul>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListLicenseManagerReportGeneratorsResponse":{
    "type":"structure",
    "members":{
      "ReportGenerators":{
        "shape":"ReportGeneratorList",
        "documentation":"<p>A report generator that creates periodic reports about your license configurations.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
```

```
      }
     }
   },
   "ListLicenseSpecificationsForResourceRequest":{
    "type":"structure",
    "required":["ResourceArn"],
     "members":{
      "ResourceArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Name (ARN) of a resource that has an associated license
configuration.</p>"
      },
      "MaxResults":{
       "shape":"BoxInteger",
       "documentation":"<p>Maximum number of results to return in a single call.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
     }
   },
   "ListLicenseSpecificationsForResourceResponse":{
    "type":"structure",
    "members":{
      "LicenseSpecifications":{
       "shape":"LicenseSpecifications",
       "documentation":"<p>License configurations associated with a resource.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      }
     }
   },
   "ListLicenseVersionsRequest":{
    "type":"structure",

    "required":["LicenseArn"],
    "members":{
      "LicenseArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "NextToken":{
       "shape":"String",
       "documentation":"<p>Token for the next set of results.</p>"
      },
```

```
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListLicenseVersionsResponse":{
    "type":"structure",
    "members":{
      "Licenses":{
        "shape":"LicenseList",
        "documentation":"<p>License details.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      }
    }
  },
  "ListLicensesRequest":{
    "type":"structure",
    "members":{
      "LicenseArns":{
        "shape":"ArnList",
        "documentation":"<p>Amazon Resource Names
(ARNs) of the licenses.</p>"
      },
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p> <code>Beneficiary</code> </p> </li> <li> <p> <code>ProductSKU</code> </p> </li> <li> <p> <code>Fingerprint</code> </p> </li> <li> <p> <code>Status</code> </p> </li> </ul>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>Token for the next set of results.</p>"
      },
      "MaxResults":{
        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListLicensesResponse":{
    "type":"structure",
    "members":{
      "Licenses":{
        "shape":"LicenseList",
```

```
          "documentation":"<p>License details.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListReceivedGrantsForOrganizationRequest":{
      "type":"structure",
      "required":["LicenseArn"],
      "members":{
        "LicenseArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the received license.</p>"
        },
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>ParentArn</code> </p> </li> <li> <p> <code>GranteePrincipalArn</code> </p> </li> </ul>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "MaxResults":{
          "shape":"MaxSize100",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        }
      }
    },
    "ListReceivedGrantsForOrganizationResponse":{
      "type":"structure",
      "members":{
        "Grants":{

    "shape":"GrantList",
          "documentation":"<p>Lists the grants the organization has received.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListReceivedGrantsRequest":{
      "type":"structure",
      "members":{
```

```
    "GrantArns":{
      "shape":"ArnList",
      "documentation":"<p>Amazon Resource Names (ARNs) of the grants.</p>"
     },
     "Filters":{
      "shape":"FilterList",
      "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>ProductSKU</code> </p> </li> <li> <p> <code>LicenseIssuerName</code> </p> </li> <li> <p>
<code>LicenseArn</code> </p> </li> <li> <p> <code>GrantStatus</code> </p> </li> <li> <p>
<code>GranterAccountId</code> </p> </li> </ul>"
     },
     "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
     },
     "MaxResults":{
      "shape":"MaxSize100",
      "documentation":"<p>Maximum number of results to return in a single call.</p>"
     }
    }
   },
   "ListReceivedGrantsResponse":{
    "type":"structure",
    "members":{
     "Grants":{
      "shape":"GrantList",
      "documentation":"<p>Received grant details.</p>"
     },
     "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of results.</p>"
     }
    }
   },
   "ListReceivedLicensesForOrganizationRequest":{
    "type":"structure",
    "members":{
     "Filters":{
      "shape":"FilterList",
      "documentation":"<p>Filters to scope the results. The following filters are supported:</p> <ul> <li> <p>
<code>Beneficiary</code> </p> </li> <li> <p> <code>ProductSKU</code> </p> </li> </ul>"
     },
     "NextToken":{
      "shape":"String",
      "documentation":"<p>Token for the next set of
results.</p>"
     },
     "MaxResults":{
```

        "shape":"MaxSize100",
        "documentation":"<p>Maximum number of results to return in a single call.</p>"
      }
    }
  },
  "ListReceivedLicensesForOrganizationResponse":{
   "type":"structure",
   "members":{
    "Licenses":{
     "shape":"GrantedLicenseList",
     "documentation":"<p>Lists the licenses the organization has received.</p>"
    },
    "NextToken":{
     "shape":"String",
     "documentation":"<p>Token for the next set of results.</p>"
    }
   }
  },
  "ListReceivedLicensesRequest":{
   "type":"structure",
   "members":{
    "LicenseArns":{
     "shape":"ArnList",
     "documentation":"<p>Amazon Resource Names (ARNs) of the licenses.</p>"
    },
    "Filters":{
     "shape":"FilterList",
     "documentation":"<p>Filters to scope the results. The following filters are supported:</p>   <p> <code>ProductSKU</code>
 </p>   <p> <code>Status</code> </p>   <p> <code>Fingerprint</code> </p>   <p>
<code>IssuerName</code> </p>   <p> <code>Beneficiary</code> </p> "
    },
    "NextToken":{
     "shape":"String",
     "documentation":"<p>Token for the next set of results.</p>"
    },
    "MaxResults":{
     "shape":"MaxSize100",
     "documentation":"<p>Maximum number of results to return in a single call.</p>"
    }
   }
  },
  "ListReceivedLicensesResponse":{
   "type":"structure",
   "members":{
    "Licenses":{
     "shape":"GrantedLicenseList",
     "documentation":"<p>Received license details.</p>"

```
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListResourceInventoryRequest":{
      "type":"structure",
      "members":{
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "Filters":{
          "shape":"InventoryFilterList",
          "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p> <ul> <li> <p> <code>account_id</code> - The ID of the Amazon Web Services account that owns
the resource. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li> <p>
<code>application_name</code> - The name of the application. Logical operators are <code>EQUALS</code> |
<code>BEGINS_WITH</code>.</p> </li> <li> <p> <code>license_included</code> - The type of license
included. Logical operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>. Possible values are
<code>sql-server-enterprise</code> | <code>sql-server-standard</code> | <code>sql-server-web</code>
 | <code>windows-server-datacenter</code>.</p> </li> <li> <p> <code>platform</code> - The platform of the
resource. Logical operators are <code>EQUALS</code> | <code>BEGINS_WITH</code>.</p> </li> <li> <p>
<code>resource_id</code> - The ID of the resource. Logical operators are <code>EQUALS</code> |
<code>NOT_EQUALS</code>.</p> </li> <li> <p> <code>tag:&lt;key&gt;</code> - The key/value combination of
a tag assigned to the resource. Logical operators are <code>EQUALS</code> (single account) or
<code>EQUALS</code> | <code>NOT_EQUALS</code> (cross account).</p> </li> </ul>"
        }
      }
    },
    "ListResourceInventoryResponse":{
      "type":"structure",
      "members":{
        "ResourceInventoryList":{
          "shape":"ResourceInventoryList",
          "documentation":"<p>Information about the resources.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
```

            },
          "ListTagsForResourceRequest":{
           "type":"structure",
           "required":["ResourceArn"],
           "members":{
            "ResourceArn":{
              "shape":"String",
              "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
            }
           }
          },
          "ListTagsForResourceResponse":{
           "type":"structure",
           "members":{
            "Tags":{
              "shape":"TagList",
              "documentation":"<p>Information about the tags.</p>"
            }
           }
          },
          "ListTokensRequest":{
           "type":"structure",
           "members":{
            "TokenIds":{
              "shape":"StringList",
              "documentation":"<p>Token IDs.</p>"
            },
            "Filters":{
              "shape":"FilterList",
              "documentation":"<p>Filters to scope the results. The following filter is supported:</p>   <p>
<code>LicenseArns</code> </p> "
            },
            "NextToken":{
              "shape":"String",
              "documentation":"<p>Token for the next set of
          results.</p>"
            },
            "MaxResults":{
              "shape":"MaxSize100",
              "documentation":"<p>Maximum number of results to return in a single call.</p>"
            }
           }
          },
          "ListTokensResponse":{
           "type":"structure",
           "members":{
            "Tokens":{
              "shape":"TokenList",

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          "documentation":"<p>Received token details.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        }
      }
    },
    "ListUsageForLicenseConfigurationRequest":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        },
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>Maximum number of results to return in a single call.</p>"
        },

    "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
        },
        "Filters":{
          "shape":"Filters",
          "documentation":"<p>Filters to scope the results. The following filters and logical operators are
supported:</p> <ul> <li> <p> <code>resourceArn</code> - The ARN of the license configuration resource. Logical
operators are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li> <p>
<code>resourceType</code> - The resource type (<code>EC2_INSTANCE</code> | <code>EC2_HOST</code> |
<code>EC2_AMI</code> | <code>SYSTEMS_MANAGER_MANAGED_INSTANCE</code>). Logical operators
are <code>EQUALS</code> | <code>NOT_EQUALS</code>.</p> </li> <li> <p> <code>resourceAccount</code>
- The ID of the account that owns the resource. Logical operators are <code>EQUALS</code> |
<code>NOT_EQUALS</code>.</p> </li> </ul>"
        }
      }
    },
    "ListUsageForLicenseConfigurationResponse":{
      "type":"structure",
      "members":{
        "LicenseConfigurationUsageList":{
          "shape":"LicenseConfigurationUsageList",
          "documentation":"<p>Information about the license configurations.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>Token for the next set of results.</p>"
```

```
    }
   }
  },
  "Location":{"type":"string"},
  "Long":{"type":"long"},
  "ManagedResourceSummary":{
   "type":"structure",
   "members":{
    "ResourceType":{
     "shape":"ResourceType",
     "documentation":"<p>Type of resource associated with a license.</p>"
    },
    "AssociationCount":{
     "shape":"BoxLong",
     "documentation":"<p>Number of resources associated with licenses.</p>"
    }
   },
   "documentation":"<p>Summary information about a managed resource.</p>"
  },
  "ManagedResourceSummaryList":{
   "type":"list",
   "member":{"shape":"ManagedResourceSummary"}
  },
  "MaxSize100":{
   "type":"integer",
   "max":100,
   "min":1
  },
  "MaxSize3StringList":{
   "type":"list",
   "member":{"shape":"String"},
   "max":3
  },
  "Message":{"type":"string"},
  "Metadata":{
   "type":"structure",
   "members":{
    "Name":{
     "shape":"String",
     "documentation":"<p>The key name.</p>"
    },
    "Value":{
     "shape":"String",
     "documentation":"<p>The value.</p>"
    }
   },
   "documentation":"<p>Describes key/value pairs.</p>"
  },
```

```
"MetadataList":{
  "type":"list",
  "member":{"shape":"Metadata"}
},
"NoEntitlementsAllowedException":{
  "type":"structure",
  "members":{
    "Message":{"shape":"Message"}
  },
  "documentation":"<p>There are no entitlements found for this license, or the entitlement maximum count is
reached.</p>",
  "exception":true
},
"Options":{
  "type":"structure",
  "members":{
    "ActivationOverrideBehavior":{
      "shape":"ActivationOverrideBehavior",
      "documentation":"<p>An activation option for your grant that determines the behavior of activating a grant.
Activation options can only be used with granted licenses sourced from the Amazon Web Services Marketplace.
Additionally, the operation must specify the value of <code>ACTIVE</code> for the <code>Status</code>
parameter.</p> <ul> <li> <p>As a license administrator, you can optionally specify an
<code>ActivationOverrideBehavior</code> when activating a grant.</p> </li> <li> <p>As a grantor, you can
optionally specify an <code>ActivationOverrideBehavior</code> when you activate a grant for a grantee account in
your organization.</p> </li> <li> <p>As a grantee, if the grantor creating the distributed grant doesnt specify an
<code>ActivationOverrideBehavior</code>, you can optionally specify one when you are activating the grant.</p>
</li> </ul> <dl> <dt>DISTRIBUTED_GRANTS_ONLY</dt> <dd> <p>Use this value to activate
 a grant without replacing any member accounts active grants for the same product.</p> </dd>
<dt>ALL_GRANTS_PERMITTED_BY_ISSUER</dt> <dd> <p>Use this value to activate a grant and disable
other active grants in any member accounts for the same product. This action will also replace their previously
activated grants with this activated grant.</p> </dd> </dl>"
    }
  },
  "documentation":"<p>The options you can specify when you create a new version of a grant, such as activation
override behavior. For more information, see <a href=\"https://docs.aws.amazon.com/license-
manager/latest/userguide/granted-licenses.html\">Granted licenses in License Manager</a> in the <i>License
Manager User Guide</i>.</p>"
},
"OrganizationConfiguration":{
  "type":"structure",
  "required":["EnableIntegration"],
  "members":{
    "EnableIntegration":{
      "shape":"Boolean",
      "documentation":"<p>Enables Organizations integration.</p>"
    }
  },
```

```
    "documentation":"<p>Configuration information for Organizations.</p>"
   },
   "PrincipalArnList":{
    "type":"list",
    "member":{"shape":"Arn"},
    "max":1,
    "min":1
   },
   "ProductInformation":{
    "type":"structure",
    "required":[
     "ResourceType",
     "ProductInformationFilterList"
    ],
    "members":{
     "ResourceType":{
      "shape":"String",
      "documentation":"<p>Resource type. The possible values are <code>SSM_MANAGED</code> |
<code>RDS</code>.</p>"
     },
     "ProductInformationFilterList":{
      "shape":"ProductInformationFilterList",
      "documentation":"<p>A Product information filter consists of a
<code>ProductInformationFilterComparator</code> which is a logical operator, a
<code>ProductInformationFilterName</code> which specifies the type of filter being declared, and a
<code>ProductInformationFilterValue</code> that specifies the value to filter on. </p> <p>Accepted values for
<code>ProductInformationFilterName</code>
```
 are listed here along with descriptions and valid options for <code>ProductInformationFilterComparator</code>.
</p> <p>The following filters and are supported when the resource type is <code>SSM_MANAGED</code>:</p>
  <p> <code>Application Name</code> - The name of the application. Logical operator is
<code>EQUALS</code>.</p>   <p> <code>Application Publisher</code> - The publisher of the
application. Logical operator is <code>EQUALS</code>.</p>   <p> <code>Application Version</code> -
The version of the application. Logical operator is <code>EQUALS</code>.</p>   <p> <code>Platform
Name</code> - The name of the platform. Logical operator is <code>EQUALS</code>.</p>   <p>
<code>Platform Type</code> - The platform type. Logical operator is <code>EQUALS</code>.</p>
<p> <code>Tag:key</code> - The key of a tag attached to an Amazon Web Services resource you wish to exclude
from automated discovery. Logical
 operator is <code>NOT_EQUALS</code>. The key for your tag must be appended to <code>Tag:</code>
following the example: <code>Tag:name-of-your-key</code>. <code>ProductInformationFilterValue</code> is
optional if you are not using values for the key. </p>   <p> <code>AccountId</code> - The 12-digit ID of
an Amazon Web Services account you wish to exclude from automated discovery. Logical operator is
<code>NOT_EQUALS</code>.</p>   <p> <code>License Included</code> - The type of license
included. Logical operators are <code>EQUALS</code> and <code>NOT_EQUALS</code>. Possible values are:
<code>sql-server-enterprise</code> | <code>sql-server-standard</code> | <code>sql-server-web</code> |
<code>windows-server-datacenter</code>.</p>   <p>The following filters and logical operators are
supported when the resource type is <code>RDS</code>:</p>   <p> <code>Engine Edition</code> - The
edition of the database engine. Logical operator is <code>EQUALS</code>. Possible

values are: <code>oracle-ee</code> | <code>oracle-se</code> | <code>oracle-se1</code> | <code>oracle-se2</code>.</p>   <p> <code>License Pack</code> - The license pack. Logical operator is <code>EQUALS</code>. Possible values are: <code>data guard</code> | <code>diagnostic pack sqlt</code> | <code>tuning pack sqlt</code> | <code>ols</code> | <code>olap</code>.</p> "
        }
      },
      "documentation":"<p>Describes product information for a license configuration.</p>"
    },
    "ProductInformationFilter":{
      "type":"structure",
      "required":[
        "ProductInformationFilterName",
        "ProductInformationFilterComparator"
      ],
      "members":{
        "ProductInformationFilterName":{
          "shape":"String",
          "documentation":"<p>Filter name.</p>"
        },
        "ProductInformationFilterValue":{
          "shape":"StringList",
          "documentation":"<p>Filter value.</p>"
        },
        "ProductInformationFilterComparator":{
          "shape":"String",
          "documentation":"<p>Logical operator.</p>"
        }
      },
      "documentation":"<p>Describes product information filters.</p>"
    },
    "ProductInformationFilterList":{
      "type":"list",
      "member":{"shape":"ProductInformationFilter"}
    },
    "ProductInformationList":{
      "type":"list",
      "member":{"shape":"ProductInformation"}
    },
    "ProvisionalConfiguration":{
      "type":"structure",
      "required":["MaxTimeToLiveInMinutes"],
      "members":{
        "MaxTimeToLiveInMinutes":{
          "shape":"BoxInteger",
          "documentation":"<p>Maximum time for the provisional configuration, in minutes.</p>"
        }
      },
      "documentation":"<p>Details about a provisional configuration.</p>"

```
    },
  "RateLimitExceededException":{
   "type":"structure",
   "members":{
    "Message":{"shape":"Message"}
   },
   "documentation":"<p>Too many requests have been submitted. Try again after
a brief wait.</p>",
   "exception":true
  },
  "ReceivedMetadata":{
   "type":"structure",
   "members":{
    "ReceivedStatus":{
     "shape":"ReceivedStatus",
     "documentation":"<p>Received status.</p>"
    },
    "ReceivedStatusReason":{
     "shape":"StatusReasonMessage",
     "documentation":"<p>Received status reason.</p>"
    },
    "AllowedOperations":{
     "shape":"AllowedOperationList",
     "documentation":"<p>Allowed operations.</p>"
    }
   },
   "documentation":"<p>Metadata associated with received licenses and grants.</p>"
  },
  "ReceivedStatus":{
   "type":"string",
   "enum":[
    "PENDING_WORKFLOW",
    "PENDING_ACCEPT",
    "REJECTED",
    "ACTIVE",
    "FAILED_WORKFLOW",
    "DELETED",
    "DISABLED",
    "WORKFLOW_COMPLETED"
   ]
  },
  "RedirectException":{
   "type":"structure",
   "members":{
    "Location":{"shape":"Location"},
    "Message":{"shape":"Message"}
   },
   "documentation":"<p>This is not the correct Region for the resource. Try again.</p>",
```

```
      "exception":true
    },
    "RejectGrantRequest":{
     "type":"structure",
     "required":["GrantArn"],
     "members":{
      "GrantArn":{
       "shape":"Arn",
       "documentation":"<p>Amazon Resource Name (ARN) of the grant.</p>"
      }
     }
    },
    "RejectGrantResponse":{
     "type":"structure",
     "members":{
      "GrantArn":{
       "shape":"Arn",
       "documentation":"<p>Grant ARN.</p>"
      },
      "Status":{
       "shape":"GrantStatus",
       "documentation":"<p>Grant status.</p>"
      },
      "Version":{
       "shape":"String",
       "documentation":"<p>Grant version.</p>"
      }
     }
    },
    "RenewType":{
     "type":"string",
     "enum":[
      "None",
      "Weekly",
      "Monthly"
     ]
    },
    "ReportContext":{
     "type":"structure",
     "required":["licenseConfigurationArns"],
     "members":{
      "licenseConfigurationArns":{
       "shape":"ArnList",
       "documentation":"<p>Amazon Resource Name (ARN) of the license configuration that this generator reports
on.</p>"
      }
     },
     "documentation":"<p>Details of the license configuration that this generator reports on.</p>"
```

```
      },
    "ReportFrequency":{
      "type":"structure",
      "members":{
        "value":{
          "shape":"Integer",
          "documentation":"<p>Number of times within the frequency period that a report is generated. The only
supported value is <code>1</code>.</p>"
        },
        "period":{
          "shape":"ReportFrequencyType",
          "documentation":"<p>Time period between each report. The period can be daily, weekly, or monthly.</p>"
        }
      },
      "documentation":"<p>Details about how frequently reports are generated.</p>"
    },
    "ReportFrequencyType":{
      "type":"string",
      "enum":[
        "DAY",
        "WEEK",
        "MONTH"
      ]
    },
    "ReportGenerator":{
      "type":"structure",
      "members":{
        "ReportGeneratorName":{
          "shape":"String",
          "documentation":"<p>Name of the report generator.</p>"
        },
        "ReportType":{
          "shape":"ReportTypeList",
          "documentation":"<p>Type of reports that are generated.</p>"
        },
        "ReportContext":{
          "shape":"ReportContext",
          "documentation":"<p>License configuration type for this generator.</p>"
        },
        "ReportFrequency":{
          "shape":"ReportFrequency",
          "documentation":"<p>Details about how frequently reports are generated.</p>"
        },
        "LicenseManagerReportGeneratorArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the report generator.</p>"
        },
        "LastRunStatus":{
```

```
      "shape":"String",
      "documentation":"<p>Status of the
last report generation attempt.</p>"
    },
    "LastRunFailureReason":{
      "shape":"String",
      "documentation":"<p>Failure message for the last report generation attempt.</p>"
    },
    "LastReportGenerationTime":{
      "shape":"String",
      "documentation":"<p>Time the last report was generated at.</p>"
    },
    "ReportCreatorAccount":{
      "shape":"String",
      "documentation":"<p>The Amazon Web Services account ID used to create the report generator.</p>"
    },
    "Description":{
      "shape":"String",
      "documentation":"<p>Description of the report generator.</p>"
    },
    "S3Location":{
      "shape":"S3Location",
      "documentation":"<p>Details of the S3 bucket that report generator reports are published to.</p>"
    },
    "CreateTime":{
      "shape":"String",
      "documentation":"<p>Time the report was created.</p>"
    },
    "Tags":{

  "shape":"TagList",
      "documentation":"<p>Tags associated with the report generator.</p>"
    }
  },
  "documentation":"<p>Describe the details of a report generator.</p>"
},
"ReportGeneratorList":{
  "type":"list",
  "member":{"shape":"ReportGenerator"}
},
"ReportGeneratorName":{
  "type":"string",
  "max":100,
  "min":1
},
"ReportType":{
  "type":"string",
  "enum":[
```

```
        "LicenseConfigurationSummaryReport",
        "LicenseConfigurationUsageReport"
     ]
    },
    "ReportTypeList":{
     "type":"list",
     "member":{"shape":"ReportType"}
    },
    "ResourceInventory":{
     "type":"structure",
     "members":{
       "ResourceId":{
         "shape":"String",
         "documentation":"<p>ID of the resource.</p>"
       },
       "ResourceType":{
         "shape":"ResourceType",
         "documentation":"<p>Type of resource.</p>"
       },
       "ResourceArn":{
         "shape":"String",
         "documentation":"<p>Amazon Resource Name (ARN) of the resource.</p>"
       },
       "Platform":{
         "shape":"String",
         "documentation":"<p>Platform of the resource.</p>"
       },
       "PlatformVersion":{
         "shape":"String",
         "documentation":"<p>Platform version of the resource in the inventory.</p>"
       },
       "ResourceOwningAccountId":{
         "shape":"String",
         "documentation":"<p>ID of the account that owns the resource.</p>"
       }
     },
     "documentation":"<p>Details about a resource.</p>"
    },
    "ResourceInventoryList":{
     "type":"list",
     "member":{"shape":"ResourceInventory"}
    },
    "ResourceLimitExceededException":{
     "type":"structure",
     "members":{
       "Message":{"shape":"Message"}
     },
     "documentation":"<p>Your resource limits have been exceeded.</p>",
```

```
  "exception":true
},
"ResourceNotFoundException":{
 "type":"structure",
 "members":{
   "Message":{"shape":"Message"}
 },
 "documentation":"<p>The resource cannot be found.</p>",
 "exception":true
},
"ResourceType":{
 "type":"string",
 "enum":[
  "EC2_INSTANCE",
  "EC2_HOST",
  "EC2_AMI",
  "RDS",
  "SYSTEMS_MANAGER_MANAGED_INSTANCE"
 ]
},
"S3Location":{
 "type":"structure",
 "members":{
  "bucket":{
    "shape":"String",
    "documentation":"<p>Name of the S3 bucket reports are published to.</p>"
  },
  "keyPrefix":{
    "shape":"String",
    "documentation":"<p>Prefix of the S3 bucket reports are published to.</p>"
  }
 },
 "documentation":"<p>Details of the S3 bucket that report generator reports are published to.</p>"
},
"ServerInternalException":{
 "type":"structure",
 "members":{
  "Message":{"shape":"Message"}
 },
 "documentation":"<p>The server experienced an internal error. Try again.</p>",
  "exception":true,
 "fault":true
},
"SignedToken":{
 "type":"string",
 "min":4096
},
"StatusReasonMessage":{
```

```
   "type":"string",
   "max":400,
   "pattern":"[\\s\\S]+"
  },
  "String":{"type":"string"},
  "StringList":{
   "type":"list",
   "member":{"shape":"String"}
  },
  "Tag":{
   "type":"structure",
   "members":{
    "Key":{
     "shape":"String",
     "documentation":"<p>Tag key.</p>"
    },
    "Value":{
     "shape":"String",
     "documentation":"<p>Tag value.</p>"
    }
   },
   "documentation":"<p>Details about a tag for a license configuration.</p>"
  },
  "TagKeyList":{
   "type":"list",
   "member":{"shape":"String"}
  },
  "TagList":{
   "type":"list",
   "member":{"shape":"Tag"}
  },
  "TagResourceRequest":{
   "type":"structure",
   "required":[
    "ResourceArn",
    "Tags"
   ],
   "members":{
    "ResourceArn":{
     "shape":"String",
     "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
    },
    "Tags":{
     "shape":"TagList",
     "documentation":"<p>One or more tags.</p>"
    }
   }
  },
```

```
    "TagResourceResponse":{
     "type":"structure",
     "members":{
     }
    },
   "TokenData":{
     "type":"structure",
     "members":{
      "TokenId":{
       "shape":"String",
       "documentation":"<p>Token ID.</p>"
      },
      "TokenType":{
       "shape":"String",
       "documentation":"<p>Type of token generated. The supported value is
<code>REFRESH_TOKEN</code>.</p>"
      },
      "LicenseArn":{
       "shape":"String",
       "documentation":"<p>Amazon Resource Name (ARN) of the license.</p>"
      },
      "ExpirationTime":{
       "shape":"ISO8601DateTime",
       "documentation":"<p>Token expiration time, in ISO8601-UTC format.</p>"
      },
      "TokenProperties":{
       "shape":"MaxSize3StringList",
       "documentation":"<p>Data specified by the caller.</p>"
      },
      "RoleArns":{
       "shape":"ArnList",
       "documentation":"<p>Amazon Resource Names (ARN) of the roles included in the token.</p>"
      },
      "Status":{
       "shape":"String",
       "documentation":"<p>Token status. The possible values are <code>AVAILABLE</code> and
<code>DELETED</code>.</p>"
      }
     },
     "documentation":"<p>Describes a token.</p>"
    },
   "TokenList":{
     "type":"list",
     "member":{"shape":"TokenData"}
    },
   "TokenString":{
     "type":"string",
     "max":4096,
```

```
        "pattern":"\\S+"
      },
    "TokenType":{
      "type":"string",
      "enum":["REFRESH_TOKEN"]
    },
    "UnsupportedDigitalSignatureMethodException":{
      "type":"structure",
      "members":{
        "Message":{"shape":"Message"}
      },
      "documentation":"<p>The digital signature method is unsupported.
Try your request again.</p>",
      "exception":true
    },
    "UntagResourceRequest":{
      "type":"structure",
      "required":[
        "ResourceArn",
        "TagKeys"
      ],
      "members":{
        "ResourceArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        },
        "TagKeys":{
          "shape":"TagKeyList",
          "documentation":"<p>Keys identifying the tags to remove.</p>"
        }
      }
    },
    "UntagResourceResponse":{
      "type":"structure",
      "members":{
      }
    },
    "UpdateLicenseConfigurationRequest":{
      "type":"structure",
      "required":["LicenseConfigurationArn"],
      "members":{
        "LicenseConfigurationArn":{
          "shape":"String",
          "documentation":"<p>Amazon Resource Name (ARN) of the license configuration.</p>"
        },
        "LicenseConfigurationStatus":{
          "shape":"LicenseConfigurationStatus",
          "documentation":"<p>New
```

status of the license configuration.</p>"
    },
    "LicenseRules":{
      "shape":"StringList",
      "documentation":"<p>New license rule. The only rule that you can add after you create a license configuration
is licenseAffinityToHost.</p>"
    },
    "LicenseCount":{
      "shape":"BoxLong",
      "documentation":"<p>New number of licenses managed by the license configuration.</p>"
    },
    "LicenseCountHardLimit":{
      "shape":"BoxBoolean",
      "documentation":"<p>New hard limit of the number of available licenses.</p>"
    },
    "Name":{
      "shape":"String",
      "documentation":"<p>New name of the license configuration.</p>"
    },
    "Description":{
      "shape":"String",
      "documentation":"<p>New description of the license configuration.</p>"
    },
    "ProductInformationList":{
      "shape":"ProductInformationList",
      "documentation":"<p>New
product information.</p>"
    },
    "DisassociateWhenNotFound":{
      "shape":"BoxBoolean",
      "documentation":"<p>When true, disassociates a resource when software is uninstalled.</p>"
    }
  }
},
"UpdateLicenseConfigurationResponse":{
  "type":"structure",
  "members":{
  }
},
"UpdateLicenseManagerReportGeneratorRequest":{
  "type":"structure",
  "required":[
    "LicenseManagerReportGeneratorArn",
    "ReportGeneratorName",
    "Type",
    "ReportContext",
    "ReportFrequency",
    "ClientToken"

```
    ],
    "members":{
      "LicenseManagerReportGeneratorArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the report generator to update.</p>"
      },
      "ReportGeneratorName":{
        "shape":"ReportGeneratorName",
        "documentation":"<p>Name of the report generator.</p>"
      },
      "Type":{
        "shape":"ReportTypeList",
        "documentation":"<p>Type of reports to generate. The following report types are supported:</p> <ul> <li>
<p>License configuration report - Reports the number and details of consumed licenses for a license
configuration.</p> </li> <li> <p>Resource report - Reports the tracked licenses and resource consumption for a
license configuration.</p> </li> </ul>"
      },
      "ReportContext":{
        "shape":"ReportContext",
        "documentation":"<p>The report context.</p>"
      },
      "ReportFrequency":{
        "shape":"ReportFrequency",
        "documentation":"<p>Frequency by which reports are generated.</p>"
      },
      "ClientToken":{
        "shape":"ClientRequestToken",
        "documentation":"<p>Unique, case-sensitive identifier that you provide to ensure the idempotency of the
request.</p>"
      },
      "Description":{
        "shape":"String",
        "documentation":"<p>Description of the report generator.</p>"
      }

    }
    }
    },
    "UpdateLicenseManagerReportGeneratorResponse":{
      "type":"structure",
      "members":{
      }
    },
    "UpdateLicenseSpecificationsForResourceRequest":{
      "type":"structure",
      "required":["ResourceArn"],
      "members":{
        "ResourceArn":{
          "shape":"String",
```

```
      "documentation":"<p>Amazon Resource Name (ARN) of the Amazon Web Services resource.</p>"
    },
    "AddLicenseSpecifications":{
      "shape":"LicenseSpecifications",
      "documentation":"<p>ARNs of the license configurations to add.</p>"
    },
    "RemoveLicenseSpecifications":{
      "shape":"LicenseSpecifications",
      "documentation":"<p>ARNs of the license configurations to remove.</p>"
    }
   }
  },
  "UpdateLicenseSpecificationsForResourceResponse":{
    "type":"structure",
    "members":{
    }
  },
  "UpdateServiceSettingsRequest":{
    "type":"structure",
    "members":{
      "S3BucketArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the Amazon S3 bucket where the License Manager
information is stored.</p>"
      },
      "SnsTopicArn":{
        "shape":"String",
        "documentation":"<p>Amazon Resource Name (ARN) of the Amazon SNS topic used for License Manager
alerts.</p>"
      },
      "OrganizationConfiguration":{
        "shape":"OrganizationConfiguration",
        "documentation":"<p>Enables integration with Organizations for cross-account discovery.</p>"
      },
      "EnableCrossAccountsDiscovery":{
        "shape":"BoxBoolean",
        "documentation":"<p>Activates cross-account discovery.</p>"
      }
    }
  },
  "UpdateServiceSettingsResponse":{
    "type":"structure",
    "members":{
    }
  },
  "UsageOperation":{
    "type":"string",
    "max":50
```

```
        },
      "ValidationException":{
        "type":"structure",
        "members":{
          "Message":{"shape":"Message"}
        },
        "documentation":"<p>The provided input is not valid. Try your request again.</p>",
        "exception":true
      }
    },
  "documentation":"<p>License Manager makes it easier to manage licenses from software vendors across multiple
Amazon Web Services accounts and on-premises servers.</p>"
}
{
  "testCases": [
    {
      "documentation": "For region us-east-1 with FIPS enabled and DualStack enabled",
      "expect": {
        "endpoint": {
          "url": "https://license-manager-user-subscriptions-fips.us-east-1.api.aws"
        }
      },
      "params": {
        "Region": "us-east-1",
        "UseFIPS": true,
        "UseDualStack": true
      }
    },
    {
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enabled",
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      "expect": {
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        "UseDualStack": false
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        "UseDualStack": false
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        "UseDualStack": false
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            "UseFIPS": true,
            "UseDualStack": true
        }
    },
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        "documentation": "For region us-iso-east-1 with FIPS enabled and DualStack disabled",
        "expect": {

         "endpoint": {
                "url": "https://license-manager-fips.us-iso-east-1.c2s.ic.gov"
            }
        },
        "params": {
            "Region": "us-iso-east-1",
            "UseFIPS": true,
            "UseDualStack": false
        }
    },
    {
        "documentation": "For region us-iso-east-1 with FIPS disabled and DualStack enabled",
        "expect": {
            "error": "DualStack is enabled but this partition does not support DualStack"
        },
        "params": {
            "Region": "us-iso-east-1",
            "UseFIPS": false,
            "UseDualStack": true
        }
    },
    {
        "documentation": "For region us-isob-east-1 with FIPS disabled and DualStack disabled",
        "expect": {
            "endpoint": {
                "url": "https://license-manager.us-isob-east-1.sc2s.sgov.gov"
```

```
          }
        },
        "params":
{
          "Region": "us-isob-east-1",
          "UseFIPS": false,
          "UseDualStack": false
        }
      },
      {
        "documentation": "For region us-isob-east-1 with FIPS enabled and DualStack enabled",
        "expect": {
          "error": "FIPS and DualStack are enabled, but this partition does not support one or both"
        },
        "params": {
          "Region": "us-isob-east-1",
          "UseFIPS": true,
          "UseDualStack": true
        }
      },
      {
        "documentation": "For region us-isob-east-1 with FIPS enabled and DualStack disabled",
        "expect": {
          "endpoint": {
            "url": "https://license-manager-fips.us-isob-east-1.sc2s.sgov.gov"
          }
        },
        "params": {
          "Region": "us-isob-east-1",
          "UseFIPS": true,
          "UseDualStack": false
        }
      },
      {
        "documentation": "For region us-isob-east-1 with FIPS disabled and DualStack enabled",
        "expect": {
          "error": "DualStack is enabled but this partition does not support DualStack"
        },
        "params": {
          "Region": "us-isob-east-1",
          "UseFIPS": false,
          "UseDualStack": true
        }
      },
      {
        "documentation": "For custom endpoint with region set and fips disabled and dualstack disabled",
        "expect": {
          "endpoint": {
```

```
          "url": "https://example.com"
        }
      },
      "params": {
        "Region": "us-east-1",
        "UseFIPS": false,
        "UseDualStack": false,
        "Endpoint": "https://example.com"
      }
    },
    {
      "documentation": "For custom endpoint with region not set and fips disabled and dualstack disabled",
      "expect": {
        "endpoint": {
          "url": "https://example.com"
        }
      },
      "params": {
        "UseFIPS": false,
        "UseDualStack": false,
        "Endpoint": "https://example.com"
      }
    },
    {
      "documentation": "For custom endpoint with fips enabled and dualstack disabled",
      "expect": {
        "error": "Invalid Configuration: FIPS and custom endpoint are not supported"
      },
      "params": {
        "Region": "us-east-1",
        "UseFIPS": true,
        "UseDualStack": false,
        "Endpoint": "https://example.com"
      }
    },
    {
      "documentation": "For custom endpoint with fips disabled and dualstack enabled",
      "expect": {
        "error": "Invalid Configuration: Dualstack and custom endpoint are not supported"
      },
      "params": {
        "Region": "us-east-1",
        "UseFIPS": false,
        "UseDualStack": true,
        "Endpoint": "https://example.com"
      }
    },
    {
```

```
        "documentation": "Missing region",
        "expect": {
          "error": "Invalid Configuration: Missing Region"
        }
      }
    }
  ],
  "version": "1.0"
}
```

AWS Signature Version 4 Test Suite

```
{
 "version":"2.0",
 "metadata":{
  "apiVersion":"2018-05-10",
  "endpointPrefix":"license-manager-user-subscriptions",
  "jsonVersion":"1.1",
  "protocol":"rest-json",
  "protocols":["rest-json"],
  "serviceFullName":"AWS License Manager User Subscriptions",
  "serviceId":"License Manager User Subscriptions",
  "signatureVersion":"v4",
  "signingName":"license-manager-user-subscriptions",
  "uid":"license-manager-user-subscriptions-2018-05-10",
  "auth":["aws.auth#sigv4"]
 },
 "operations":{
  "AssociateUser":{
   "name":"AssociateUser",
   "http":{
    "method":"POST",
    "requestUri":"/user/AssociateUser",
    "responseCode":200
   },
   "input":{"shape":"AssociateUserRequest"},
   "output":{"shape":"AssociateUserResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>Associates the user to an EC2 instance to utilize user-based subscriptions.</p> <note>
<p>Your estimated bill for charges on the number of users and related costs will take 48 hours to appear for billing
periods that haven't closed (marked as <b>Pending</b> billing status) in Amazon Web Services Billing. For more
information, see <a href=\"https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/invoice.html\">Viewing
```

your monthly charges in the <i>Amazon Web Services Billing User Guide</i>.</p> </note>",
      "idempotent":true
    },
    "CreateLicenseServerEndpoint":{
      "name":"CreateLicenseServerEndpoint",
      "http":{
        "method":"POST",
        "requestUri":"/license-server/CreateLicenseServerEndpoint",
        "responseCode":200
      },
      "input":{"shape":"CreateLicenseServerEndpointRequest"},
      "output":{"shape":"CreateLicenseServerEndpointResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Creates a network endpoint for the Remote Desktop Services (RDS) license server.</p>",
      "idempotent":true
    },
    "DeleteLicenseServerEndpoint":{
      "name":"DeleteLicenseServerEndpoint",
      "http":{
        "method":"POST",
        "requestUri":"/license-server/DeleteLicenseServerEndpoint",
        "responseCode":200
      },
      "input":{"shape":"DeleteLicenseServerEndpointRequest"},
      "output":{"shape":"DeleteLicenseServerEndpointResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Deletes a <code>LicenseServerEndpoint</code> resource.</p>",
      "idempotent":true
    },
    "DeregisterIdentityProvider":{
      "name":"DeregisterIdentityProvider",
      "http":{

```
    "method":"POST",
    "requestUri":"/identity-provider/DeregisterIdentityProvider",
    "responseCode":200
   },
   "input":{"shape":"DeregisterIdentityProviderRequest"},
   "output":{"shape":"DeregisterIdentityProviderResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}

   ],
   "documentation":"<p>Deregisters the Active Directory identity provider from License Manager user-based
subscriptions.</p>",
   "idempotent":true
  },
  "DisassociateUser":{
   "name":"DisassociateUser",
   "http":{
    "method":"POST",
    "requestUri":"/user/DisassociateUser",
    "responseCode":200
   },
   "input":{"shape":"DisassociateUserRequest"},
   "output":{"shape":"DisassociateUserResponse"},
   "errors":[
    {"shape":"ServiceQuotaExceededException"},
    {"shape":"ConflictException"},
    {"shape":"ValidationException"},
    {"shape":"ThrottlingException"},
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"AccessDeniedException"}
   ],
   "documentation":"<p>Disassociates the user from an EC2 instance providing user-based subscriptions.</p>",
   "idempotent":true
  },
  "ListIdentityProviders":{
   "name":"ListIdentityProviders",

   "http":{
    "method":"POST",
    "requestUri":"/identity-provider/ListIdentityProviders",
    "responseCode":200
```

      },
      "input":{"shape":"ListIdentityProvidersRequest"},
      "output":{"shape":"ListIdentityProvidersResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Lists the Active Directory identity providers for user-based subscriptions.</p>"
    },
    "ListInstances":{
      "name":"ListInstances",
      "http":{
        "method":"POST",
        "requestUri":"/instance/ListInstances",
        "responseCode":200
      },
      "input":{"shape":"ListInstancesRequest"},
      "output":{"shape":"ListInstancesResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"AccessDeniedException"}
      ],
      "documentation":"<p>Lists the EC2 instances providing user-based subscriptions.</p>"
    },
    "ListLicenseServerEndpoints":{
      "name":"ListLicenseServerEndpoints",
      "http":{
        "method":"POST",
        "requestUri":"/license-server/ListLicenseServerEndpoints",
        "responseCode":200
      },
      "input":{"shape":"ListLicenseServerEndpointsRequest"},
      "output":{"shape":"ListLicenseServerEndpointsResponse"},
      "errors":[
        {"shape":"ServiceQuotaExceededException"},
        {"shape":"ConflictException"},
        {"shape":"ValidationException"},
        {"shape":"ThrottlingException"},

```
      {"shape":"InternalServerException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>List the Remote Desktop Services (RDS) License Server endpoints </p>"
  },
  "ListProductSubscriptions":{
    "name":"ListProductSubscriptions",
    "http":{
      "method":"POST",
      "requestUri":"/user/ListProductSubscriptions",
      "responseCode":200
    },
    "input":{"shape":"ListProductSubscriptionsRequest"},
    "output":{"shape":"ListProductSubscriptionsResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Lists the user-based subscription products available from an identity provider.</p>"
  },
  "ListTagsForResource":{
    "name":"ListTagsForResource",
    "http":{
      "method":"GET",
      "requestUri":"/tags/{ResourceArn}",
      "responseCode":200
    },
    "input":{"shape":"ListTagsForResourceRequest"},
    "output":{"shape":"ListTagsForResourceResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Returns the list of tags for the specified resource.</p>"
  },
  "ListUserAssociations":{
    "name":"ListUserAssociations",
    "http":{
      "method":"POST",
      "requestUri":"/user/ListUserAssociations",
      "responseCode":200
    },
```

"input":{"shape":"ListUserAssociationsRequest"},
"output":{"shape":"ListUserAssociationsResponse"},
"errors":[
  {"shape":"ServiceQuotaExceededException"},
  {"shape":"ConflictException"},
  {"shape":"ValidationException"},
  {"shape":"ThrottlingException"},
  {"shape":"InternalServerException"},
  {"shape":"ResourceNotFoundException"},
   {"shape":"AccessDeniedException"}
],
"documentation":"<p>Lists user associations for an identity provider.</p>"
},
"RegisterIdentityProvider":{
 "name":"RegisterIdentityProvider",
 "http":{
   "method":"POST",
   "requestUri":"/identity-provider/RegisterIdentityProvider",
   "responseCode":200
 },
 "input":{"shape":"RegisterIdentityProviderRequest"},
 "output":{"shape":"RegisterIdentityProviderResponse"},
 "errors":[
  {"shape":"ServiceQuotaExceededException"},
  {"shape":"ConflictException"},
  {"shape":"ValidationException"},
  {"shape":"ThrottlingException"},
  {"shape":"InternalServerException"},
  {"shape":"ResourceNotFoundException"},
  {"shape":"AccessDeniedException"}
],
"documentation":"<p>Registers an identity provider for user-based subscriptions.</p>",
"idempotent":true
},
"StartProductSubscription":{
 "name":"StartProductSubscription",
 "http":{
   "method":"POST",
   "requestUri":"/user/StartProductSubscription",
   "responseCode":200
 },
 "input":{"shape":"StartProductSubscriptionRequest"},
 "output":{"shape":"StartProductSubscriptionResponse"},
 "errors":[
  {"shape":"ServiceQuotaExceededException"},
  {"shape":"ConflictException"},
  {"shape":"ValidationException"},
  {"shape":"ThrottlingException"},

```
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Starts a product subscription for a user with the specified identity provider.</p> <note>
<p>Your estimated bill for charges on the number of users and related costs will take 48 hours to appear for billing
periods that haven't closed (marked as <b>Pending</b> billing status) in Amazon Web Services Billing. For more
information, see <a href=\"https://docs.aws.amazon.com/awsaccountbilling/latest/aboutv2/invoice.html\">Viewing
 your monthly charges</a> in the <i>Amazon Web Services Billing User Guide</i>.</p> </note>"
    },
  "StopProductSubscription":{
    "name":"StopProductSubscription",
    "http":{
      "method":"POST",
      "requestUri":"/user/StopProductSubscription",
      "responseCode":200
    },
    "input":{"shape":"StopProductSubscriptionRequest"},
    "output":{"shape":"StopProductSubscriptionResponse"},
    "errors":[
      {"shape":"ServiceQuotaExceededException"},
      {"shape":"ConflictException"},
      {"shape":"ValidationException"},
      {"shape":"ThrottlingException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"},
      {"shape":"AccessDeniedException"}
    ],
    "documentation":"<p>Stops a product subscription for a user with the specified identity provider.</p>"
    },
  "TagResource":{
    "name":"TagResource",

    "http":{
      "method":"PUT",
      "requestUri":"/tags/{ResourceArn}",
      "responseCode":200
    },
    "input":{"shape":"TagResourceRequest"},
    "output":{"shape":"TagResourceResponse"},
    "errors":[
      {"shape":"ValidationException"},
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Adds tags to a resource.</p>",
    "idempotent":true
    },
```

```
"UntagResource":{
 "name":"UntagResource",
 "http":{
  "method":"DELETE",
  "requestUri":"/tags/{ResourceArn}",
  "responseCode":200
 },
 "input":{"shape":"UntagResourceRequest"},
 "output":{"shape":"UntagResourceResponse"},
 "errors":[
  {"shape":"InternalServerException"},
  {"shape":"ResourceNotFoundException"}
 ],
 "documentation":"<p>Removes tags from a resource.</p>",
 "idempotent":true
},
"UpdateIdentityProviderSettings":{
 "name":"UpdateIdentityProviderSettings",
  "http":{
  "method":"POST",
  "requestUri":"/identity-provider/UpdateIdentityProviderSettings",
  "responseCode":200
 },
 "input":{"shape":"UpdateIdentityProviderSettingsRequest"},
 "output":{"shape":"UpdateIdentityProviderSettingsResponse"},
 "errors":[
  {"shape":"ValidationException"},
  {"shape":"ThrottlingException"},
  {"shape":"InternalServerException"},
  {"shape":"AccessDeniedException"}
 ],
 "documentation":"<p>Updates additional product configuration settings for the registered identity
provider.</p>",
 "idempotent":true
 }
},
"shapes":{
 "AccessDeniedException":{
 "type":"structure",
 "members":{
  "message":{"shape":"String"}
 },
 "documentation":"<p>You don't have sufficient access to perform this action.</p>",
 "exception":true
 },
 "ActiveDirectoryIdentityProvider":{
 "type":"structure",
 "members":{
```

```
"ActiveDirectorySettings":{
    "shape":"ActiveDirectorySettings",
    "documentation":"<p>The <code>ActiveDirectorySettings</code> resource contains details about the Active
Directory, including network access details such as domain name and IP addresses, and the credential provider for
user administration.</p>"
  },
  "ActiveDirectoryType":{
    "shape":"ActiveDirectoryType",
    "documentation":"<p>The type of Active Directory  either a self-managed Active Directory or an Amazon
Web Services Managed Active Directory.</p>"
  },
  "DirectoryId":{
    "shape":"Directory",
    "documentation":"<p>The directory ID for an Active Directory identity provider.</p>"
  }
  },
    "documentation":"<p>Details about an Active Directory identity provider.</p>"
  },
  "ActiveDirectorySettings":{
    "type":"structure",
    "members":{
      "DomainCredentialsProvider":{
        "shape":"CredentialsProvider",

   "documentation":"<p>Points to the <code>CredentialsProvider</code> resource that contains information about
the credential provider for user administration.</p>"
  },
  "DomainIpv4List":{
    "shape":"ActiveDirectorySettingsDomainIpv4ListList",
    "documentation":"<p>A list of domain IPv4 addresses that are used for the Active Directory.</p>"
  },
  "DomainName":{
    "shape":"String",
    "documentation":"<p>The domain name for the Active Directory.</p>"
  },
  "DomainNetworkSettings":{
    "shape":"DomainNetworkSettings",
    "documentation":"<p>The <code>DomainNetworkSettings</code> resource contains an array of subnets that
apply for the Active Directory.</p>"
  }
  },
    "documentation":"<p>Contains network access and credential details that are needed for user administration in
the Active Directory.</p>"
  },
  "ActiveDirectorySettingsDomainIpv4ListList":{
    "type":"list",
    "member":{"shape":"IpV4"},
```

```
      "max":2,
     "min":1
    },
   "ActiveDirectoryType":{
    "type":"string",
    "enum":[
      "SELF_MANAGED",
      "AWS_MANAGED"
    ]
   },
   "Arn":{
    "type":"string",
    "pattern":"^arn:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-zA-Z0-9-
\\.]{1,510}/[a-zA-Z0-9-\\.]{1,510}$"
   },
   "AssociateUserRequest":{
    "type":"structure",
    "required":[
      "IdentityProvider",
      "InstanceId",
      "Username"
    ],
    "members":{
      "Domain":{
        "shape":"String",
        "documentation":"<p>The domain name of the Active Directory that contains information for the user to
associate.</p>"
      },
      "IdentityProvider":{
        "shape":"IdentityProvider",
        "documentation":"<p>The identity provider for the user.</p>"
      },
      "InstanceId":{
        "shape":"String",
        "documentation":"<p>The ID of the EC2 instance that provides
the user-based subscription.</p>"
      },
      "Tags":{
        "shape":"Tags",
        "documentation":"<p>The tags that apply for the user association.</p>"
      },
      "Username":{
        "shape":"String",
        "documentation":"<p>The user name from the identity provider.</p>"
      }
    }
   },
   "AssociateUserResponse":{
```

      "type":"structure",
      "required":["InstanceUserSummary"],
      "members":{
       "InstanceUserSummary":{
        "shape":"InstanceUserSummary",
        "documentation":"<p>Metadata that describes the associate user operation.</p>"
       }
      }
     },
     "BoxInteger":{
      "type":"integer",
      "box":true
     },
     "ConflictException":{
      "type":"structure",
      "members":{
       "message":{"shape":"String"}
      },
      "documentation":"<p>The request couldn't be completed because it conflicted with the current state of the
resource.</p>",
      "exception":true,
      "fault":true
     },
     "CreateLicenseServerEndpointRequest":{
      "type":"structure",
      "required":[
       "IdentityProviderArn",
       "LicenseServerSettings"
      ],
      "members":{
       "IdentityProviderArn":{
        "shape":"Arn",
        "documentation":"<p>The Amazon Resource Name (ARN) that identifies the <code>IdentityProvider</code>
resource that contains details about a registered identity provider. In the case of Active Directory, that can be a self-
managed Active Directory or an Amazon Web Services Managed Active Directory that contains user identity
details.</p>"
       },
       "LicenseServerSettings":{
        "shape":"LicenseServerSettings",
        "documentation":"<p>The <code>LicenseServerSettings</code> resource to create for the endpoint. The
settings include the type of license server and the Secrets Manager secret that enables administrators to add or
remove users associated with the license server.</p>"
       },
       "Tags":{
        "shape":"Tags",
        "documentation":"<p>The tags that apply for the license server endpoint.</p>"
       }
      }

```
    },
  "CreateLicenseServerEndpointResponse":{
   "type":"structure",
   "members":{
    "IdentityProviderArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider specified in the
request.</p>"
    },
    "LicenseServerEndpointArn":{
      "shape":"Arn",
      "documentation":"<p>The ARN of the <code>LicenseServerEndpoint</code> resource.</p>"
    }
   }
  },
  "CredentialsProvider":{
   "type":"structure",
   "members":{
    "SecretsManagerCredentialsProvider":{
      "shape":"SecretsManagerCredentialsProvider",
      "documentation":"<p>Identifies the Secrets Manager secret that contains credentials needed for user
administration in the Active Directory.</p>"
    }
   },
   "documentation":"<p>Contains information about the credential provider for user
administration.</p>",
   "union":true
  },
  "DeleteLicenseServerEndpointRequest":{
   "type":"structure",
   "required":[
    "LicenseServerEndpointArn",
    "ServerType"
   ],
   "members":{
    "LicenseServerEndpointArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) that identifies the
<code>LicenseServerEndpoint</code> resource to delete.</p>"
    },
    "ServerType":{
      "shape":"ServerType",
      "documentation":"<p>The type of License Server that the delete request refers to.</p>"
    }
   }
  },
  "DeleteLicenseServerEndpointResponse":{
   "type":"structure",
```

```
    "members":{
     "LicenseServerEndpoint":{
      "shape":"LicenseServerEndpoint",
      "documentation":"<p>Shows details from the <code>LicenseServerEndpoint</code> resource that was
deleted.</p>"
     }
    }
   },
   "DeregisterIdentityProviderRequest":{
    "type":"structure",
    "members":{
     "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>An object that specifies details for the Active Directory identity provider.</p>"
     },
     "IdentityProviderArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) that identifies the identity provider to
deregister.</p>"
     },
     "Product":{
      "shape":"String",
      "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
     }
    }
   },
   "DeregisterIdentityProviderResponse":{
    "type":"structure",
    "required":["IdentityProviderSummary"],
    "members":{
     "IdentityProviderSummary":{
      "shape":"IdentityProviderSummary",
      "documentation":"<p>Metadata that describes the results
 of an identity provider operation.</p>"
     }
    }
   },
   "Directory":{
    "type":"string",
    "pattern":"^(d|sd)-[0-9a-f]{10}$"
   },
   "DisassociateUserRequest":{
    "type":"structure",
    "members":{
     "Domain":{
      "shape":"String",
```

      "documentation":"<p>The domain name of the Active Directory that contains information for the user to disassociate.</p>"
    },
    "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>An object that specifies details for the Active Directory identity provider.</p>"
    },
    "InstanceId":{
      "shape":"String",
      "documentation":"<p>The ID of the EC2 instance which provides user-based subscriptions.</p>"
    },
    "InstanceUserArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the user to disassociate from the EC2 instance.</p>"
    },
    "Username":{
      "shape":"String",
      "documentation":"<p>The user name from the Active Directory identity provider for the user.</p>"
    }
  }
},
"DisassociateUserResponse":{
  "type":"structure",
  "required":["InstanceUserSummary"],
  "members":{
    "InstanceUserSummary":{
      "shape":"InstanceUserSummary",
      "documentation":"<p>Metadata that describes the associate user operation.</p>"
    }
  }
},
"DomainNetworkSettings":{
  "type":"structure",
  "required":["Subnets"],
  "members":{
    "Subnets":{
      "shape":"DomainNetworkSettingsSubnetsList",
      "documentation":"<p>Contains a list of subnets that apply for the Active Directory domain.</p>"
    }
  },
  "documentation":"<p>Contains network settings for the Active Directory domain.</p>"
},
"DomainNetworkSettingsSubnetsList":{
  "type":"list",
  "member":{"shape":"Subnet"},
  "min":1
},

```
    "Filter":{
      "type":"structure",
       "members":{
        "Attribute":{
          "shape":"String",
          "documentation":"<p>The name of an attribute to use as a filter.</p>"
        },
        "Operation":{
         "shape":"String",
         "documentation":"<p>The type of search (For example, eq, geq, leq)</p>"
        },
        "Value":{
         "shape":"String",
         "documentation":"<p>Value of the filter.</p>"
        }
      },
      "documentation":"<p>A filter name and value pair that is used to return more specific results from a describe or
list operation. You can use filters can be used to match a set of resources by specific criteria, such as tags, attributes,
or IDs.</p>"
    },
    "FilterList":{
      "type":"list",
      "member":{"shape":"Filter"}
    },
    "IdentityProvider":{
      "type":"structure",
      "members":{
        "ActiveDirectoryIdentityProvider":{
          "shape":"ActiveDirectoryIdentityProvider",
          "documentation":"<p>The <code>ActiveDirectoryIdentityProvider</code>
resource contains settings and other details about a specific Active Directory identity provider.</p>"
        }
      },
      "documentation":"<p>Refers to an identity provider.</p>",
      "union":true
    },
    "IdentityProviderSummary":{
      "type":"structure",
      "required":[
        "IdentityProvider",
        "Product",
        "Settings",
        "Status"
      ],
      "members":{
        "FailureMessage":{
          "shape":"String",
          "documentation":"<p>The failure message associated with an identity provider.</p>"
```

```
    },
    "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>The <code>IdentityProvider</code> resource contains information about an identity
provider.</p>"
    },
    "IdentityProviderArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider.</p>"
    },
    "Product":{
      "shape":"String",
      "documentation":"<p>The
 name of the user-based subscription product.</p>"
    },
    "Settings":{
      "shape":"Settings",
      "documentation":"<p>The <code>Settings</code> resource contains details about the registered identity
providers product related configuration settings, such as the subnets to provision VPC endpoints.</p>"
    },
    "Status":{
      "shape":"String",
      "documentation":"<p>The status of the identity provider.</p>"
    }
    },
    "documentation":"<p>Describes an identity provider.</p>"
  },
  "IdentityProviderSummaryList":{
    "type":"list",
    "member":{"shape":"IdentityProviderSummary"}
  },
  "InstanceSummary":{
    "type":"structure",
    "required":[
      "InstanceId",
      "Products",
      "Status"
    ],
    "members":{
      "InstanceId":{
        "shape":"String",
        "documentation":"<p>The ID of the EC2 instance, which provides user-based subscriptions.</p>"
      },
      "LastStatusCheckDate":{
        "shape":"String",
        "documentation":"<p>The date of the last status check.</p>"
      },
      "Products":{
```

```
      "shape":"StringList",
      "documentation":"<p>A list of provided user-based subscription products.</p>"
    },
    "Status":{
      "shape":"String",
      "documentation":"<p>The status of an EC2 instance resource.</p>"
    },
    "StatusMessage":{
      "shape":"String",
      "documentation":"<p>The status message for an EC2 instance.</p>"
    }
  },
  "documentation":"<p>Describes an EC2 instance providing user-based subscriptions.</p>"
},
"InstanceSummaryList":{
  "type":"list",
  "member":{"shape":"InstanceSummary"}
},
"InstanceUserSummary":{
  "type":"structure",
  "required":[
    "IdentityProvider",
    "InstanceId",
    "Status",
    "Username"
  ],
  "members":{
    "AssociationDate":{

 "shape":"String",
      "documentation":"<p>The date a user was associated with an EC2 instance.</p>"
    },
    "DisassociationDate":{
      "shape":"String",
      "documentation":"<p>The date a user was disassociated from an EC2 instance.</p>"
    },
    "Domain":{
      "shape":"String",
      "documentation":"<p>The domain name of the Active Directory that contains the user information for the
product subscription.</p>"
    },
    "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>The <code>IdentityProvider</code> resource specifies details about the identity
provider.</p>"
    },
    "InstanceId":{
      "shape":"String",
```

```
          "documentation":"<p>The ID of the EC2 instance that provides user-based subscriptions.</p>"
        },
        "InstanceUserArn":{
          "shape":"Arn",
          "documentation":"<p>The Amazon Resource Name (ARN) that identifies the instance user.</p>"

        },
        "Status":{
          "shape":"String",
          "documentation":"<p>The status of a user associated with an EC2 instance.</p>"
        },
        "StatusMessage":{
          "shape":"String",
          "documentation":"<p>The status message for users of an EC2 instance.</p>"
        },
        "Username":{
          "shape":"String",
          "documentation":"<p>The user name from the identity provider for the user.</p>"
        }
      },
      "documentation":"<p>Describes users of an EC2 instance providing user-based subscriptions.</p>"
    },
    "InstanceUserSummaryList":{
      "type":"list",
      "member":{"shape":"InstanceUserSummary"}
    },
    "InternalServerException":{
      "type":"structure",
      "members":{
        "message":{"shape":"String"}
      },
      "documentation":"<p>An exception occurred with the service.</p>",
      "error":{"httpStatusCode":500},
      "exception":true,
      "fault":true
    },
    "IpV4":{
      "type":"string",

      "pattern":"^(?:(25[0-5]|2[0-4][0-9]|1[0-9][0-9]|[1-9][0-9]|[0-9])(\\.(?!$)|$)){4}$"
    },
    "LicenseServer":{
      "type":"structure",
      "members":{
        "HealthStatus":{
          "shape":"LicenseServerHealthStatus",
          "documentation":"<p>The health status of the RDS license server.</p>"
        },
```

```
      "Ipv4Address":{
        "shape":"String",
        "documentation":"<p>A list of domain IPv4 addresses that are used for the RDS license server.</p>"
      },
      "ProvisioningStatus":{
        "shape":"LicenseServerEndpointProvisioningStatus",
        "documentation":"<p>The current state of the provisioning process for the RDS license server.</p>"
      }
    },
    "documentation":"<p>Information about a Remote Desktop Services (RDS) license server.</p>"
  },
  "LicenseServerEndpoint":{
    "type":"structure",
    "members":{
      "CreationTime":{
        "shape":"Timestamp",
        "documentation":"<p>The timestamp when License
Manager created the license server endpoint.</p>"
      },
      "IdentityProviderArn":{
        "shape":"String",
        "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider that's associated with the
RDS license server endpoint.</p>"
      },
      "LicenseServerEndpointArn":{
        "shape":"Arn",
        "documentation":"<p>The ARN of the <code>ServerEndpoint</code> resource for the RDS license
server.</p>"
      },
      "LicenseServerEndpointId":{
        "shape":"LicenseServerEndpointId",
        "documentation":"<p>The ID of the license server endpoint.</p>"
      },
      "LicenseServerEndpointProvisioningStatus":{
        "shape":"LicenseServerEndpointProvisioningStatus",
        "documentation":"<p>The current state of the provisioning process for the RDS license server endpoint</p>"
      },
      "LicenseServers":{
        "shape":"LicenseServerList",
        "documentation":"<p>An array of <code>LicenseServer</code>
resources that represent the license servers that are accessed through this endpoint.</p>"
      },
      "ServerEndpoint":{
        "shape":"ServerEndpoint",
        "documentation":"<p>The <code>ServerEndpoint</code> resource contains the network address of the RDS
license server endpoint.</p>"
      },
      "ServerType":{
```

      "shape":"ServerType",
      "documentation":"<p>The type of license server.</p>"
     },
     "StatusMessage":{
      "shape":"String",
      "documentation":"<p>The message associated with the provisioning status, if there is one.</p>"
     }
    },
    "documentation":"<p>Contains details about a network endpoint for a Remote Desktop Services (RDS) license server.</p>"
   },
   "LicenseServerEndpointId":{"type":"string"},
   "LicenseServerEndpointList":{
    "type":"list",
    "member":{"shape":"LicenseServerEndpoint"}
   },
   "LicenseServerEndpointProvisioningStatus":{
    "type":"string",
    "enum":[
     "PROVISIONING",
     "PROVISIONING_FAILED",
     "PROVISIONED",
     "DELETING",
     "DELETION_FAILED",
     "DELETED"
    ]
   },
   "LicenseServerHealthStatus":{
    "type":"string",
    "enum":[
     "HEALTHY",
     "UNHEALTHY",
     "NOT_APPLICABLE"
    ]
   },
   "LicenseServerList":{
    "type":"list",
    "member":{"shape":"LicenseServer"}
   },
   "LicenseServerSettings":{
    "type":"structure",
    "required":[
     "ServerSettings",
     "ServerType"
    ],
    "members":{
     "ServerSettings":{
      "shape":"ServerSettings",

          "documentation":"<p>The <code>ServerSettings</code> resource contains the settings for your server.</p>"
        },
        "ServerType":{
          "shape":"ServerType",
          "documentation":"<p>The type of license server.</p>"
        }
      },
      "documentation":"<p>The settings to configure your license server.</p>"
    },
    "ListIdentityProvidersRequest":{
      "type":"structure",
      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>You can use the following filters to streamline results:</p>   <p>Product</p>   <p>DirectoryId</p> "
        },
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>The maximum number of results to return from a single request.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>"
        }
      }
    },
    "ListIdentityProvidersResponse":{
      "type":"structure",
      "required":["IdentityProviderSummaries"],
      "members":{
        "IdentityProviderSummaries":{
          "shape":"IdentityProviderSummaryList",
          "documentation":"<p>An array of <code>IdentityProviderSummary</code> resources that contain details about the
 Active Directory identity providers that meet the request criteria.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
        }
      }
    },
    "ListInstancesRequest":{
      "type":"structure",

      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>You can use the following filters to streamline results:</p>   <p>Status</p>   <p>InstanceId</p> "
        },
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>The maximum number of results to return from a single request.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>"
        }
      }
    },
    "ListInstancesResponse":{
      "type":"structure",
      "members":{
        "InstanceSummaries":{
          "shape":"InstanceSummaryList",
          "documentation":"<p>An array of <code>InstanceSummary</code> resources that contain details about the instances that provide user-based subscriptions and also meet the request criteria.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
        }
      }
    },
    "ListLicenseServerEndpointsRequest":{
      "type":"structure",
      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>You can use the following filters to streamline results:</p>   <p>IdentityProviderArn</p> "
        },
        "MaxResults":{
          "shape":"ListLicenseServerEndpointsRequestMaxResultsInteger",
          "documentation":"<p>The maximum number of results to return from a single request.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously

truncated response.</p>"
        }
      }
    },
    "ListLicenseServerEndpointsRequestMaxResultsInteger":{
      "type":"integer",
      "box":true,
      "max":100,
      "min":1
    },
    "ListLicenseServerEndpointsResponse":{
      "type":"structure",
      "members":{
        "LicenseServerEndpoints":{
          "shape":"LicenseServerEndpointList",
          "documentation":"<p>An array of <code>LicenseServerEndpoint</code> resources that contain detailed information about the RDS License Servers that meet the request criteria.</p>"
        },

        "NextToken":{
          "shape":"String",
          "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
        }
      }
    },
    "ListProductSubscriptionsRequest":{
      "type":"structure",
      "required":["IdentityProvider"],
      "members":{
        "Filters":{
          "shape":"FilterList",
          "documentation":"<p>You can use the following filters to streamline results:</p>   <p>Status</p>   <p>Username</p>   <p>Domain</p> "
        },
        "IdentityProvider":{
          "shape":"IdentityProvider",
          "documentation":"<p>An object that specifies details for the identity provider.</p>"
        },
        "MaxResults":{
          "shape":"BoxInteger",
          "documentation":"<p>The maximum number of results to return from
 a single request.</p>"
        },
        "NextToken":{
          "shape":"String",
          "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously

truncated response.</p>"
```
    },
    "Product":{
      "shape":"String",
      "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
    }
   }
  },
  "ListProductSubscriptionsResponse":{
   "type":"structure",
   "members":{
    "NextToken":{
      "shape":"String",
      "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
    },
    "ProductUserSummaries":{
      "shape":"ProductUserSummaryList",
      "documentation":"<p>Metadata that describes the list product subscriptions operation.</p>"
    }
   }
  },
  "ListTagsForResourceRequest":{
   "type":"structure",
   "required":["ResourceArn"],
   "members":{
    "ResourceArn":{
      "shape":"ResourceArn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the resource whose tags you want to
retrieve.</p>",
      "location":"uri",
      "locationName":"ResourceArn"
    }
   }
  },
  "ListTagsForResourceResponse":{
   "type":"structure",
   "members":{
    "Tags":{
      "shape":"Tags",
      "documentation":"<p>The tags for the specified resource.</p>"
    }
   }
  },
  "ListUserAssociationsRequest":{
```

```
    "type":"structure",
    "required":[
      "IdentityProvider",
      "InstanceId"
    ],
    "members":{
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>You
 can use the following filters to streamline results:</p> <ul> <li> <p>Status</p> </li> <li> <p>Username</p> </li>
<li> <p>Domain</p> </li> </ul>"
      },
      "IdentityProvider":{
        "shape":"IdentityProvider",
        "documentation":"<p>An object that specifies details for the identity provider.</p>"
      },
      "InstanceId":{
        "shape":"String",
        "documentation":"<p>The ID of the EC2 instance, which provides user-based subscriptions.</p>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>The maximum number of results to return from a single request.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously
truncated response.</p>"
      }
    }
  },
  "ListUserAssociationsResponse":{
    "type":"structure",
    "members":{
      "InstanceUserSummaries":{
        "shape":"InstanceUserSummaryList",
        "documentation":"<p>Metadata that describes the list user association operation.</p>"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
      }
    }
  },
  "ProductUserSummary":{
    "type":"structure",
```

```
    "required":[
     "IdentityProvider",
     "Product",
     "Status",
     "Username"
    ],
    "members":{
     "Domain":{
      "shape":"String",
      "documentation":"<p>The domain name of the Active Directory that contains the user information for the
product subscription.</p>"
     },
     "IdentityProvider":{
      "shape":"IdentityProvider",
      "documentation":"<p>An object that specifies
details for the identity provider.</p>"
     },
     "Product":{
      "shape":"String",
      "documentation":"<p>The name of the user-based subscription product.</p>"
     },
     "ProductUserArn":{
      "shape":"Arn",
      "documentation":"<p>The Amazon Resource Name (ARN) for this product user.</p>"
     },
     "Status":{
      "shape":"String",
      "documentation":"<p>The status of a product for this user.</p>"
     },
     "StatusMessage":{
      "shape":"String",
      "documentation":"<p>The status message for a product for this user.</p>"
     },
     "SubscriptionEndDate":{
      "shape":"String",
      "documentation":"<p>The end date of a subscription.</p>"
     },
     "SubscriptionStartDate":{
      "shape":"String",
      "documentation":"<p>The start date of a subscription.</p>"
     },
     "Username":{
      "shape":"String",
      "documentation":"<p>The user name
from the identity provider for this product user.</p>"
     }
    },
    "documentation":"<p>A summary of the user-based subscription products for a specific user.</p>"
```

```
    },
  "ProductUserSummaryList":{
    "type":"list",
    "member":{"shape":"ProductUserSummary"}
  },
  "RdsSalSettings":{
    "type":"structure",
    "required":["RdsSalCredentialsProvider"],
    "members":{
      "RdsSalCredentialsProvider":{
        "shape":"CredentialsProvider",
        "documentation":"<p>The <code>CredentialsProvider</code> resource contains a reference to the credentials
provider that's used for RDS license server user administration.</p>"
      }
    },
    "documentation":"<p>Server settings that are specific to a Remote Desktop Services (RDS) license server.</p>"
  },
  "RegisterIdentityProviderRequest":{
    "type":"structure",
    "required":[
      "IdentityProvider",
      "Product"
    ],
    "members":{
      "IdentityProvider":{

        "shape":"IdentityProvider",
        "documentation":"<p>An object that specifies details for the identity provider to register.</p>"
      },
      "Product":{
        "shape":"String",
        "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
      },
      "Settings":{
        "shape":"Settings",
        "documentation":"<p>The registered identity providers product related configuration settings such as the
subnets to provision VPC endpoints.</p>"
      },
      "Tags":{
        "shape":"Tags",
        "documentation":"<p>The tags that apply to the identity provider's registration.</p>"
      }
    }
  },
  "RegisterIdentityProviderResponse":{
    "type":"structure",
```

```
        "required":["IdentityProviderSummary"],
      "members":{
        "IdentityProviderSummary":{
          "shape":"IdentityProviderSummary",
          "documentation":"<p>Metadata that describes the results of an identity provider operation.</p>"
        }
      }
    },
    "ResourceArn":{
      "type":"string",
      "pattern":"^arn:([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-\\.]{1,63}):([a-z0-9-
\\.]{1,510})/([a-z0-9-\\.]{1,510})$"
    },
    "ResourceNotFoundException":{
      "type":"structure",
      "members":{
        "message":{"shape":"String"}
      },
      "documentation":"<p>The resource couldn't be found.</p>",
      "error":{
        "httpStatusCode":404,
        "senderFault":true
      },
      "exception":true
    },
    "SecretsManagerCredentialsProvider":{
      "type":"structure",
      "members":{
        "SecretId":{
          "shape":"SecretsManagerCredentialsProviderSecretIdString",
          "documentation":"<p>The ID of the Secrets Manager secret that contains credentials.</p>"
        }
      },

      "documentation":"<p>Contains a credentials secret that's stored in Secrets Manager.</p>"
    },
    "SecretsManagerCredentialsProviderSecretIdString":{
      "type":"string",
      "min":1
    },
    "SecurityGroup":{
      "type":"string",
      "max":200,
      "min":5,
      "pattern":"^sg-(([0-9a-z]{8})|([0-9a-z]{17}))$"
    },
    "ServerEndpoint":{
      "type":"structure",
```

```
    "members":{
     "Endpoint":{
      "shape":"String",
      "documentation":"<p>The network address of the endpoint.</p>"
     }
    },
    "documentation":"<p>A network endpoint through which you can access one or more servers.</p>"
   },
   "ServerSettings":{
    "type":"structure",
    "members":{
     "RdsSalSettings":{
      "shape":"RdsSalSettings",
      "documentation":"<p>The <code>RdsSalSettings</code> resource contains settings to configure a specific
Remote Desktop Services (RDS) license server.</p>"
     }
    },
    "documentation":"<p>Contains
 settings for a specific server.</p>",
    "union":true
   },
   "ServerType":{
    "type":"string",
    "enum":["RDS_SAL"]
   },
   "ServiceQuotaExceededException":{
    "type":"structure",
    "members":{
     "message":{"shape":"String"}
    },
    "documentation":"<p>The request failed because a service quota is exceeded.</p>",
    "exception":true
   },
   "Settings":{
    "type":"structure",
    "required":[
     "SecurityGroupId",
     "Subnets"
    ],
    "members":{
     "SecurityGroupId":{
      "shape":"SecurityGroup",
      "documentation":"<p>A security group ID that allows inbound TCP port 1688 communication between
resources in your VPC and the VPC endpoint for activation servers.</p>"
     },
     "Subnets":{
      "shape":"SettingsSubnetsList",
      "documentation":"<p>The subnets defined for the registered identity provider.</p>"
```

```
      }
    },
    "documentation":"<p>The registered identity providers
 product related configuration settings such as the subnets to provision VPC endpoints, and the security group ID
that is associated with the VPC endpoints. The security group should permit inbound TCP port 1688 communication
from resources in the VPC.</p>"
  },
  "SettingsSubnetsList":{
   "type":"list",
   "member":{"shape":"Subnet"},
   "min":1
  },
  "StartProductSubscriptionRequest":{
   "type":"structure",
   "required":[
    "IdentityProvider",
    "Product",
    "Username"
   ],
   "members":{
    "Domain":{
     "shape":"String",
     "documentation":"<p>The domain name of the Active Directory that contains the user for whom to start the
product subscription.</p>"
    },
    "IdentityProvider":{
     "shape":"IdentityProvider",
     "documentation":"<p>An object that specifies details for the identity provider.</p>"
    },
    "Product":{
     "shape":"String",
     "documentation":"<p>The
 name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> |
<code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
    },
    "Tags":{
     "shape":"Tags",
     "documentation":"<p>The tags that apply to the product subscription.</p>"
    },
    "Username":{
     "shape":"String",
     "documentation":"<p>The user name from the identity provider of the user.</p>"
    }
   }
  },
  "StartProductSubscriptionResponse":{
   "type":"structure",
```

    "required":["ProductUserSummary"],
    "members":{
      "ProductUserSummary":{
        "shape":"ProductUserSummary",
        "documentation":"<p>Metadata that describes the start product subscription operation.</p>"
      }
    }
  },
  "StopProductSubscriptionRequest":{
    "type":"structure",
    "members":{
      "Domain":{
        "shape":"String",
        "documentation":"<p>The domain name of the Active Directory that contains the user for whom to stop the product subscription.</p>"
      },
      "IdentityProvider":{
        "shape":"IdentityProvider",
        "documentation":"<p>An object that specifies details for the identity provider.</p>"
      },
      "Product":{
        "shape":"String",
        "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values: <code>VISUAL_STUDIO_ENTERPRISE</code> | <code>VISUAL_STUDIO_PROFESSIONAL</code> | <code>OFFICE_PROFESSIONAL_PLUS</code> | <code>REMOTE_DESKTOP_SERVICES</code> </p>"
      },
      "ProductUserArn":{
        "shape":"Arn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the product user.</p>"
      },
      "Username":{
        "shape":"String",
        "documentation":"<p>The user name from the identity provider for the user.</p>"
      }
    }
  },
  "StopProductSubscriptionResponse":{
    "type":"structure",
    "required":["ProductUserSummary"],
    "members":{
      "ProductUserSummary":{
        "shape":"ProductUserSummary",
        "documentation":"<p>Metadata that describes the start product subscription operation.</p>"
      }
    }
  },
  "String":{"type":"string"},
  "StringList":{

```
  "type":"list",
  "member":{"shape":"String"}
 },
 "Subnet":{
  "type":"string",
  "pattern":"^subnet-[a-z0-9]{8,17}"
 },
 "Subnets":{
  "type":"list",
  "member":{"shape":"Subnet"}
 },
 "TagKeyList":{
  "type":"list",
  "member":{"shape":"String"},
  "max":50,
  "min":0,
  "sensitive":true
 },
 "TagResourceRequest":{
  "type":"structure",
  "required":[
    "ResourceArn",
    "Tags"
  ],
  "members":{
    "ResourceArn":{
      "shape":"ResourceArn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the resource that you want to tag.</p>",

      "location":"uri",
      "locationName":"ResourceArn"
    },
    "Tags":{
      "shape":"Tags",
      "documentation":"<p>The tags to apply to the specified resource.</p>"
    }
  }
 },
 "TagResourceResponse":{
  "type":"structure",
  "members":{
  }
 },
 "Tags":{
  "type":"map",
  "key":{"shape":"String"},
  "value":{"shape":"String"},
  "max":50,
```

      "min":0,
      "sensitive":true
     },
     "ThrottlingException":{
      "type":"structure",
      "members":{
       "message":{"shape":"String"}
      },
      "documentation":"<p>The request was denied because of request throttling. Retry the request.</p>",
      "exception":true
     },
     "Timestamp":{"type":"timestamp"},
     "UntagResourceRequest":{
      "type":"structure",
      "required":[
       "ResourceArn",
       "TagKeys"
      ],
      "members":{
       "ResourceArn":{
        "shape":"ResourceArn",
        "documentation":"<p>The Amazon
Resource Name (ARN) of the resource that you want to remove tags from.</p>",
        "location":"uri",
        "locationName":"ResourceArn"
       },
       "TagKeys":{
        "shape":"TagKeyList",
        "documentation":"<p>The tag keys to remove from the resource.</p>",
        "location":"querystring",
        "locationName":"tagKeys"
       }
      }
     },
     "UntagResourceResponse":{
      "type":"structure",
      "members":{
      }
     },
     "UpdateIdentityProviderSettingsRequest":{
      "type":"structure",
      "required":["UpdateSettings"],
      "members":{
       "IdentityProvider":{"shape":"IdentityProvider"},
       "IdentityProviderArn":{
        "shape":"Arn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the identity provider to update.</p>"
       },

```
    "Product":{
      "shape":"String",
      "documentation":"<p>The name of the user-based subscription product.</p> <p>Valid values:
<code>VISUAL_STUDIO_ENTERPRISE</code>
 |<code>VISUAL_STUDIO_PROFESSIONAL</code>|<code>OFFICE_PROFESSIONAL_PLUS</code> |
<code>REMOTE_DESKTOP_SERVICES</code> </p>"
    },
    "UpdateSettings":{
      "shape":"UpdateSettings",
      "documentation":"<p>Updates the registered identity providers product related configuration settings. You can
update any combination of settings in a single operation such as the:</p> <ul> <li> <p>Subnets which you want to
add to provision VPC endpoints.</p> </li> <li> <p>Subnets which you want to remove the VPC endpoints
from.</p> </li> <li> <p>Security group ID which permits traffic to the VPC endpoints.</p> </li> </ul>"
    }
   }
  },
  "UpdateIdentityProviderSettingsResponse":{
   "type":"structure",
   "required":["IdentityProviderSummary"],
   "members":{
    "IdentityProviderSummary":{"shape":"IdentityProviderSummary"}
   }
  },
  "UpdateSettings":{
   "type":"structure",
   "required":[
    "AddSubnets",
    "RemoveSubnets"
   ],
   "members":{
    "AddSubnets":{
      "shape":"Subnets",
      "documentation":"<p>The ID of one or more subnets in which License Manager will create a VPC endpoint
for products that require connectivity to activation servers.</p>"
    },
    "RemoveSubnets":{
      "shape":"Subnets",
      "documentation":"<p>The ID of one or more subnets to remove.</p>"
    },
    "SecurityGroupId":{
      "shape":"SecurityGroup",
      "documentation":"<p>A security group ID that allows inbound TCP port 1688 communication between
resources in your VPC and the VPC endpoints for activation servers.</p>"
    }
   },
   "documentation":"<p>Updates the registered identity providers product related configuration settings such as the
subnets to provision VPC endpoints.</p>"
  },
```

```
    "ValidationException":{
      "type":"structure",
      "members":{
        "message":{"shape":"String"}
      },
      "documentation":"<p>A parameter
 is not valid.</p>",
      "exception":true
    }
  },
  "documentation":"<p>With License Manager, you can create user-based subscriptions to utilize licensed software
with a per user subscription fee on Amazon EC2 instances.</p>"
}
{
  "version": "1.0",
  "parameters": {
    "Region": {
      "builtIn": "AWS::Region",
      "required": false,
      "documentation": "The AWS region used to dispatch the request.",
      "type": "String"
    },
    "UseDualStack": {
      "builtIn": "AWS::UseDualStack",
      "required": true,
      "default": false,
      "documentation": "When true, use the dual-stack endpoint. If the configured endpoint does not support dual-
stack, dispatching the request MAY return an error.",
      "type": "Boolean"
    },
    "UseFIPS": {
      "builtIn": "AWS::UseFIPS",
      "required": true,
      "default": false,
      "documentation": "When true, send this request to the FIPS-compliant regional endpoint. If the configured
endpoint does not have a FIPS compliant endpoint, dispatching the request will return an error.",
      "type": "Boolean"
    },
    "Endpoint": {

    "builtIn": "SDK::Endpoint",
      "required": false,
      "documentation": "Override the endpoint used to send this request",
      "type": "String"
    }
  },
  "rules": [
    {
```

```json
        "conditions": [
          {
            "fn": "isSet",
            "argv": [
              {
                "ref": "Endpoint"
              }
            ]
          }
        ],
        "rules": [
          {
            "conditions": [
              {
                "fn": "booleanEquals",
                "argv": [
                  {
                    "ref": "UseFIPS"
                  },
                  true
                ]
              }
            ],
            "error": "Invalid Configuration: FIPS and custom endpoint are not supported",
            "type": "error"
          },
          {
            "conditions": [],
            "rules": [
              {
                "conditions": [
                  {
                    "fn": "booleanEquals",
                    "argv": [
                      {
                        "ref": "UseDualStack"
                      },
                      true
                    ]
                  }
                ],
                "error": "Invalid Configuration: Dualstack and custom endpoint are not supported",
                "type": "error"
              },
              {
                "conditions": [],
                "endpoint": {
                  "url": {
```

```
              "ref": "Endpoint"
            },
            "properties": {},
            "headers": {}
          },
          "type": "endpoint"
        }
      ],
      "type": "tree"
    }
  ],
  "type": "tree"
},
{
  "conditions": [],
  "rules": [
    {
      "conditions": [
        {
          "fn": "isSet",
          "argv": [
            {
              "ref": "Region"
            }
          ]
        }
      ],
      "rules": [
        {
          "conditions": [
            {
              "fn": "aws.partition",
              "argv": [
                {
                  "ref": "Region"
                }
              ],
              "assign": "PartitionResult"
            }
          ],
          "rules": [
            {
              "conditions": [
                {
                  "fn": "booleanEquals",
                  "argv": [
```

```
                    {
                      "ref": "UseFIPS"
                    },
                    true
                  ]
                },

          {
                  "fn": "booleanEquals",
                  "argv": [
                    {
                      "ref": "UseDualStack"
                    },
                    true
                  ]
                }
              ],
              "rules": [
                {
                  "conditions": [
                    {
                      "fn": "booleanEquals",
                      "argv": [
                        true,
                        {

      "fn": "getAttr",
                          "argv": [
                            {
                              "ref": "PartitionResult"
                            },
                            "supportsFIPS"
                          ]
                        }
                      ]
                    },
                    {
                      "fn": "booleanEquals",
                      "argv": [
                        true,
                        {

  "fn": "getAttr",
                          "argv": [
                            {
                              "ref": "PartitionResult"
                            },
                            "supportsDualStack"
```

```
                    ]
                  }
                ]
              }
            ],
            "rules": [
              {
                "conditions": [],
                "rules": [
                  {

          "conditions": [],
                    "endpoint": {
                      "url": "https://license-manager-linux-subscriptions-
fips.{Region}.{PartitionResult#dualStackDnsSuffix}",
                      "properties": {},
                      "headers": {}
                    },
                    "type": "endpoint"
                  }
                ],
                "type": "tree"
              }
            ],
            "type": "tree"
          },

    {
                "conditions": [],
                "error": "FIPS and DualStack are enabled, but this partition does not support one or
both",
                "type": "error"
              }
            ],
            "type": "tree"
          },
          {
            "conditions": [
              {
                "fn": "booleanEquals",
                "argv": [
                  {
                    "ref": "UseFIPS"
                  },
                  true
                ]
              }
```

```
            ],
        "rules": [
          {
            "conditions": [
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                "fn": "booleanEquals",
                "argv": [
                  {
                    "fn": "getAttr",
                    "argv": [
                      {
                        "ref": "PartitionResult"
                      },
                      "supportsFIPS"
                    ]
                  },
                  true
                ]
              }
            ],
            "rules": [
              {
                "conditions": [],
                "rules": [
                  {
                    "conditions": [],
                    "endpoint": {
                      "url": "https://license-manager-linux-subscriptions-fips.{Region}.{PartitionResult#dnsSuffix}",
                      "properties": {},
                      "headers": {}
                    },
                    "type": "endpoint"
                  }
                ],
                "type": "tree"
              }
            ],
            "type": "tree"
          },
          {
            "conditions": [],
            "error": "FIPS is enabled but this partition does not support FIPS",
            "type": "error"
          }
        ],
```

```
                    "type": "tree"
                },
                {

        "conditions": [
                {
                    "fn": "booleanEquals",
                    "argv": [
                        {
                            "ref": "UseDualStack"
                        },
                        true
                    ]
                }
            ],
            "rules": [
                {
                    "conditions": [
                        {
                            "fn": "booleanEquals",
                            "argv": [
                                true,

    {
                                "fn": "getAttr",
                                "argv": [
                                    {
                                        "ref": "PartitionResult"
                                    },
                                    "supportsDualStack"
                                ]
                            }
                        ]
                    }
                ],
                "rules": [
                    {
                        "conditions": [],
                        "rules": [

            {
                                "conditions": [],
                                "endpoint": {
                                    "url": "https://license-manager-linux-
subscriptions.{Region}.{PartitionResult#dualStackDnsSuffix}",
                                    "properties": {},
                                    "headers": {}
                                },
```

                                "type": "endpoint"
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                          ],
                            "type": "tree"
                        }
                    ],
                      "type": "tree"

            },
                  {
                      "conditions": [],
                      "error": "DualStack is enabled but this partition does not support DualStack",
                      "type": "error"
                    }
                  ],
                    "type": "tree"
                },
                {
                    "conditions": [],
                    "rules": [
                        {
                            "conditions": [],
                            "endpoint": {
                              "url": "https://license-manager-linux-
subscriptions.{Region}.{PartitionResult#dnsSuffix}",
                                "properties": {},

                  "headers": {}
                        },
                            "type": "endpoint"
                      }
                    ],
                      "type": "tree"
                  }
              ],
                "type": "tree"
            }
          ],
            "type": "tree"
        },
        {
          "conditions": [],
          "error": "Invalid Configuration: Missing Region",
          "type": "error"
        }
      ],
      "type": "tree"
    }

      ]
    }
    {
     "pagination": {
       "ListAssociationsForLicenseConfiguration": {
         "input_token": "NextToken",
         "limit_key": "MaxResults",
         "output_token": "NextToken",
         "result_key": "LicenseConfigurationAssociations"
       },
       "ListLicenseConfigurations": {
         "input_token": "NextToken",
         "limit_key": "MaxResults",
         "output_token": "NextToken",
         "result_key": "LicenseConfigurations"
       },
       "ListLicenseSpecificationsForResource": {
         "input_token": "NextToken",
         "limit_key": "MaxResults",
         "output_token": "NextToken",
         "result_key": "LicenseSpecifications"
       },
       "ListResourceInventory": {
         "input_token": "NextToken",
         "limit_key": "MaxResults",
         "output_token": "NextToken",
         "result_key": "ResourceInventoryList"
       },
       "ListUsageForLicenseConfiguration": {
         "input_token": "NextToken",
         "limit_key": "MaxResults",
         "output_token": "NextToken",
         "result_key": "LicenseConfigurationUsageList"
       }
     }
    }
    {
     "pagination": {
       "ListLinuxSubscriptionInstances": {
         "input_token": "NextToken",
         "output_token": "NextToken",
         "limit_key": "MaxResults",
         "result_key": "Instances"
       },
       "ListLinuxSubscriptions": {
         "input_token": "NextToken",
         "output_token": "NextToken",
         "limit_key": "MaxResults",

```
      "result_key": "Subscriptions"
    },
    "ListRegisteredSubscriptionProviders": {
      "input_token": "NextToken",
      "output_token": "NextToken",
      "limit_key": "MaxResults",
      "result_key": "RegisteredSubscriptionProviders"
    }
  }
}
{
  "version":"2.0",
  "metadata":{
    "apiVersion":"2018-05-10",
    "endpointPrefix":"license-manager-linux-subscriptions",
    "jsonVersion":"1.1",
    "protocol":"rest-json",
    "protocols":["rest-json"],
    "serviceFullName":"AWS License Manager Linux Subscriptions",
    "serviceId":"License Manager Linux Subscriptions",
    "signatureVersion":"v4",
    "signingName":"license-manager-linux-subscriptions",
    "uid":"license-manager-linux-subscriptions-2018-05-10",
    "auth":["aws.auth#sigv4"]
  },
  "operations":{
    "DeregisterSubscriptionProvider":{
      "name":"DeregisterSubscriptionProvider",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/DeregisterSubscriptionProvider",
        "responseCode":200
      },
      "input":{"shape":"DeregisterSubscriptionProviderRequest"},
      "output":{"shape":"DeregisterSubscriptionProviderResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Remove a third-party subscription provider from the Bring Your Own License (BYOL) subscriptions registered to your account.</p>",
      "idempotent":true
    },
    "GetRegisteredSubscriptionProvider":{
      "name":"GetRegisteredSubscriptionProvider",
      "http":{
```

        "method":"POST",
        "requestUri":"/subscription/GetRegisteredSubscriptionProvider",
        "responseCode":200
      },
      "input":{"shape":"GetRegisteredSubscriptionProviderRequest"},
      "output":{"shape":"GetRegisteredSubscriptionProviderResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ResourceNotFoundException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Get details for a Bring Your Own License (BYOL) subscription that's registered to your account.</p>",
      "idempotent":true
    },
    "GetServiceSettings":{
      "name":"GetServiceSettings",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/GetServiceSettings",
        "responseCode":200
      },
      "input":{"shape":"GetServiceSettingsRequest"},
      "output":{"shape":"GetServiceSettingsResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Lists the Linux subscriptions service settings for your account.</p>",
      "idempotent":true
    },
    "ListLinuxSubscriptionInstances":{
      "name":"ListLinuxSubscriptionInstances",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/ListLinuxSubscriptionInstances",
        "responseCode":200
      },
      "input":{"shape":"ListLinuxSubscriptionInstancesRequest"},
      "output":{"shape":"ListLinuxSubscriptionInstancesResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Lists the running Amazon EC2 instances that were discovered with commercial Linux

subscriptions.</p>",
      "idempotent":true
    },
    "ListLinuxSubscriptions":{
      "name":"ListLinuxSubscriptions",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/ListLinuxSubscriptions",
        "responseCode":200
      },
      "input":{"shape":"ListLinuxSubscriptionsRequest"},
      "output":{"shape":"ListLinuxSubscriptionsResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>Lists the Linux subscriptions that have been discovered. If you have linked your
organization, the returned results will include data aggregated across your accounts in Organizations.</p>",
      "idempotent":true
    },
    "ListRegisteredSubscriptionProviders":{
      "name":"ListRegisteredSubscriptionProviders",
      "http":{
        "method":"POST",
        "requestUri":"/subscription/ListRegisteredSubscriptionProviders",
        "responseCode":200
      },
      "input":{"shape":"ListRegisteredSubscriptionProvidersRequest"},
      "output":{"shape":"ListRegisteredSubscriptionProvidersResponse"},
      "errors":[
        {"shape":"InternalServerException"},
        {"shape":"ThrottlingException"},
        {"shape":"ValidationException"}
      ],
      "documentation":"<p>List Bring Your Own License (BYOL) subscription registration resources for your
account.</p>",
      "idempotent":true
    },
    "ListTagsForResource":{
      "name":"ListTagsForResource",
      "http":{
        "method":"GET",
        "requestUri":"/tags/{resourceArn}",
        "responseCode":200
      },
      "input":{"shape":"ListTagsForResourceRequest"},
      "output":{"shape":"ListTagsForResourceResponse"},

```
    "errors":[

  {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"ValidationException"}
  ],
  "documentation":"<p>List the metadata tags that are assigned to the specified Amazon Web Services resource.</p>"
  },
  "RegisterSubscriptionProvider":{
   "name":"RegisterSubscriptionProvider",
   "http":{
    "method":"POST",
    "requestUri":"/subscription/RegisterSubscriptionProvider",
    "responseCode":200
   },
   "input":{"shape":"RegisterSubscriptionProviderRequest"},
   "output":{"shape":"RegisterSubscriptionProviderResponse"},
   "errors":[
    {"shape":"InternalServerException"},
    {"shape":"ThrottlingException"},
    {"shape":"ValidationException"}
   ],
   "documentation":"<p>Register the supported third-party subscription provider for your Bring Your Own License (BYOL) subscription.</p>",
   "idempotent":true
  },
  "TagResource":{
   "name":"TagResource",
   "http":{
    "method":"PUT",
    "requestUri":"/tags/{resourceArn}",
    "responseCode":200
   },
   "input":{"shape":"TagResourceRequest"},
   "output":{"shape":"TagResourceResponse"},
   "errors":[
    {"shape":"InternalServerException"},
    {"shape":"ResourceNotFoundException"},
    {"shape":"ValidationException"}
   ],
   "documentation":"<p>Add metadata tags to the specified Amazon Web Services resource.</p>",
   "idempotent":true
  },
  "UntagResource":{
   "name":"UntagResource",
   "http":{
    "method":"DELETE",
```

```
      "requestUri":"/tags/{resourceArn}",
      "responseCode":200
    },
    "input":{"shape":"UntagResourceRequest"},
    "output":{"shape":"UntagResourceResponse"},
    "errors":[
      {"shape":"InternalServerException"},
      {"shape":"ResourceNotFoundException"}
    ],
    "documentation":"<p>Remove one or more metadata tag from the specified Amazon Web Services
resource.</p>",
    "idempotent":true
    },
  "UpdateServiceSettings":{
    "name":"UpdateServiceSettings",
    "http":{
      "method":"POST",
      "requestUri":"/subscription/UpdateServiceSettings",
      "responseCode":200
    },
    "input":{"shape":"UpdateServiceSettingsRequest"},
    "output":{"shape":"UpdateServiceSettingsResponse"},
    "errors":[
      {"shape":"InternalServerException"},
      {"shape":"ThrottlingException"},
      {"shape":"ValidationException"}
    ],
    "documentation":"<p>Updates the service settings for Linux subscriptions.</p>",
    "idempotent":true
    }
  },
  "shapes":{
    "Boolean":{
      "type":"boolean",
      "box":true
    },
    "BoxInteger":{
      "type":"integer",
      "box":true
    },
    "BoxLong":{
      "type":"long",
      "box":true
    },
    "DeregisterSubscriptionProviderRequest":{
      "type":"structure",
      "required":["SubscriptionProviderArn"],
      "members":{
```

```
          "SubscriptionProviderArn":{
            "shape":"SubscriptionProviderArn",
            "documentation":"<p>The Amazon Resource Name (ARN) of the subscription provider resource to
deregister.</p>"
          }
        }
      },
      "DeregisterSubscriptionProviderResponse":{
        "type":"structure",
        "members":{
        }
      },
      "Filter":{
        "type":"structure",
        "members":{
          "Name":{
            "shape":"String",
            "documentation":"<p>The type of name to filter by.</p>"
          },
          "Operator":{
            "shape":"Operator",
            "documentation":"<p>An operator for filtering results.</p>"
          },
          "Values":{
            "shape":"StringList",
            "documentation":"<p>One or more values for the name to filter by.</p>"
          }
        },
        "documentation":"<p>A filter object that is used to return more specific results from a describe operation. Filters
can be used to match a set of resources by specific criteria.</p>"
      },
      "FilterList":{
        "type":"list",
        "member":{"shape":"Filter"}
      },
      "GetRegisteredSubscriptionProviderRequest":{
        "type":"structure",
        "required":["SubscriptionProviderArn"],
        "members":{
          "SubscriptionProviderArn":{
            "shape":"SubscriptionProviderArn",
            "documentation":"<p>The Amazon Resource Name (ARN) of the BYOL registration resource to get details
for.</p>"
          }
        }
      },
      "GetRegisteredSubscriptionProviderResponse":{
        "type":"structure",
```

```
      "members":{
        "LastSuccessfulDataRetrievalTime":{
          "shape":"String",
          "documentation":"<p>The timestamp from the last time License Manager retrieved subscription details from
your registered third-party Linux subscription provider.</p>"
        },
        "SecretArn":{
          "shape":"SecretArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the third-party access secret stored in Secrets
Manager for the BYOL registration resource specified in the request.</p>"
        },

    "SubscriptionProviderArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) for the BYOL registration resource specified in
the request.</p>"
        },
        "SubscriptionProviderSource":{
          "shape":"SubscriptionProviderSource",
          "documentation":"<p>The subscription provider for the BYOL registration resource specified in the
request.</p>"
        },
        "SubscriptionProviderStatus":{
          "shape":"SubscriptionProviderStatus",
          "documentation":"<p>The status of the Linux subscription provider access token from the last successful
subscription data request.</p>"
        },
        "SubscriptionProviderStatusMessage":{
          "shape":"String",
          "documentation":"<p>The detailed message from your subscription provider token status.</p>"
        }
      }
    },
    "GetServiceSettingsRequest":{
      "type":"structure",
      "members":{
      }
    },
    "GetServiceSettingsResponse":{
      "type":"structure",
      "members":{
        "HomeRegions":{
          "shape":"StringList",
          "documentation":"<p>The Region in which License Manager displays the aggregated data for Linux
subscriptions.</p>"
        },
        "LinuxSubscriptionsDiscovery":{
          "shape":"LinuxSubscriptionsDiscovery",
```

          "documentation":"<p>Lists if discovery has been enabled for Linux subscriptions.</p>"
        },
      "LinuxSubscriptionsDiscoverySettings":{
        "shape":"LinuxSubscriptionsDiscoverySettings",
        "documentation":"<p>Lists the settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
        },
      "Status":{
        "shape":"Status",
        "documentation":"<p>Indicates the status of Linux subscriptions settings being applied.</p>"
        },
      "StatusMessage":{
        "shape":"StringMap",
        "documentation":"<p>A
message which details the Linux subscriptions service settings current status.</p>"
        }
      }
    },
  "Instance":{
    "type":"structure",
    "members":{
      "AccountID":{
        "shape":"String",
        "documentation":"<p>The account ID which owns the instance.</p>"
        },
      "AmiId":{
        "shape":"String",
        "documentation":"<p>The AMI ID used to launch the instance.</p>"
        },
      "DualSubscription":{
        "shape":"String",
        "documentation":"<p>Indicates that you have two different license subscriptions for the same software on your
instance.</p>"
        },
      "InstanceID":{
        "shape":"String",
        "documentation":"<p>The instance ID of the resource.</p>"
        },
      "InstanceType":{
        "shape":"String",
        "documentation":"<p>The instance type of the resource.</p>"
        },
      "LastUpdatedTime":{
        "shape":"String",
        "documentation":"<p>The
time in which the last discovery updated the instance details.</p>"
        },
      "OsVersion":{

```
      "shape":"String",
      "documentation":"<p>The operating system software version that runs on your instance.</p>"
     },
    "ProductCode":{
      "shape":"ProductCodeList",
      "documentation":"<p>The product code for the instance. For more information, see <a
href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/linux-subscriptions-usage-
operation.html\">Usage operation values</a> in the <i>License Manager User Guide</i> .</p>"
     },
    "Region":{
      "shape":"String",
      "documentation":"<p>The Region the instance is running in.</p>"
     },
    "RegisteredWithSubscriptionProvider":{
      "shape":"String",
      "documentation":"<p>Indicates that your instance uses a BYOL license subscription from a third-party Linux
subscription provider that you've registered with License Manager.</p>"
      },
    "Status":{
      "shape":"String",
      "documentation":"<p>The status of the instance.</p>"
     },
    "SubscriptionName":{
      "shape":"String",
      "documentation":"<p>The name of the license subscription that the instance uses.</p>"
     },
    "SubscriptionProviderCreateTime":{
      "shape":"String",
      "documentation":"<p>The timestamp when you registered the third-party Linux subscription provider for the
subscription that the instance uses.</p>"
     },
    "SubscriptionProviderUpdateTime":{
      "shape":"String",
      "documentation":"<p>The timestamp from the last time that the instance synced with the registered third-party
Linux subscription provider.</p>"
     },
    "UsageOperation":{
      "shape":"String",
      "documentation":"<p>The usage operation of the instance. For more information, see For more information,
see <a href=\"https://docs.aws.amazon.com/license-manager/latest/userguide/linux-subscriptions-usage-
operation.html\">Usage
 operation values</a> in the <i>License Manager User Guide</i>.</p>"
    }
   },
   "documentation":"<p>Details discovered information about a running instance using Linux subscriptions.</p>"
  },
  "InstanceList":{
   "type":"list",
```

```
    "member":{"shape":"Instance"}
   },
   "InternalServerException":{
    "type":"structure",
    "members":{
      "message":{"shape":"String"}
    },
    "documentation":"<p>An exception occurred with the service.</p>",
    "exception":true,
    "fault":true
   },
   "LinuxSubscriptionsDiscovery":{
    "type":"string",
    "enum":[
      "Enabled",
      "Disabled"
    ]
   },
   "LinuxSubscriptionsDiscoverySettings":{
    "type":"structure",
    "required":[
      "OrganizationIntegration",
      "SourceRegions"
    ],
    "members":{
      "OrganizationIntegration":{
        "shape":"OrganizationIntegration",
        "documentation":"<p>Details
if you have enabled resource discovery across your accounts in Organizations.</p>"
      },
      "SourceRegions":{
        "shape":"StringList",
        "documentation":"<p>The Regions in which to discover data for Linux subscriptions.</p>"
      }
    },
    "documentation":"<p>Lists the settings defined for discovering Linux subscriptions.</p>"
   },
   "ListLinuxSubscriptionInstancesRequest":{
    "type":"structure",
    "members":{
      "Filters":{
        "shape":"FilterList",
        "documentation":"<p>An array of structures that you can use to filter the results by your specified criteria. For
example, you can specify <code>Region</code> in the <code>Name</code>, with the <code>contains</code>
operator to list all subscriptions that match a partial string in the <code>Value</code>, such as <code>us-
west</code>.</p> <p>For each filter, you can specify one of the following values for the <code>Name</code> key
to streamline results:</p>
```

 ` <p> <code>AccountID</code> </p>   <p> <code>AmiID</code> </p>   <p> <code>DualSubscription</code> </p>   <p> <code>InstanceID</code> </p>   <p> <code>InstanceType</code> </p>   <p> <code>ProductCode</code> </p>   <p> <code>Region</code> </p>   <p> <code>Status</code> </p>   <p> <code>UsageOperation</code> </p>   <p>For each filter, you can use one of the following <code>Operator</code> values to define the behavior of the filter:</p>   <p> <code>contains</code> </p>   <p> <code>equals</code> </p>   <p> <code>Notequal</code> </p> "`
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"`<p>The maximum items to return in a request.</p>`"
      },
      "NextToken":{
        "shape":"ListLinuxSubscriptionInstancesRequestNextTokenString",
        "documentation":"`<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>`"
      }
    },
    "documentation":"`<p>NextToken length limit is half of ddb accepted limit. Increase this limit if parameters in request increases.</p>`"
  },
  "ListLinuxSubscriptionInstancesRequestNextTokenString":{
    "type":"string",
    "max":16384,
    "min":1
  },
  "ListLinuxSubscriptionInstancesResponse":{
    "type":"structure",
    "members":{
      "Instances":{
        "shape":"InstanceList",
        "documentation":"`<p>An array that contains instance objects.</p>`"
      },
      "NextToken":{
        "shape":"String",
        "documentation":"`<p>The next token used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>`"
      }
    }
  },
  "ListLinuxSubscriptionsRequest":{
    "type":"structure",
    "members":{
      "Filters":{
        "shape":"FilterList",
        "documentation":"`<p>An array of structures that you can use to filter the results to those that match one or more sets of key-value pairs that you specify. For example, you can filter by the name of`

```
<code>Subscription</code> with an optional operator to see subscriptions that match, partially match, or don't
match a certain subscription's name.</p> <p>The valid names for this filter are:</p> <ul> <li> <p>
<code>Subscription</code> </p> </li> </ul> <p>The valid Operators for this filter are:</p> <ul> <li> <p>
<code>contains</code> </p> </li> <li> <p> <code>equals</code> </p> </li> <li> <p> <code>Notequal</code>
</p> </li> </ul>"
      },
      "MaxResults":{
        "shape":"BoxInteger",
        "documentation":"<p>The maximum items to return in a request.</p>"
      },
      "NextToken":{
        "shape":"ListLinuxSubscriptionsRequestNextTokenString",
        "documentation":"<p>A token to specify where
 to start paginating. This is the nextToken from a previously truncated response.</p>"
      }
    },
    "documentation":"<p>NextToken length limit is half of ddb accepted limit. Increase this limit if parameters in
request increases.</p>"
  },
  "ListLinuxSubscriptionsRequestNextTokenString":{
    "type":"string",
    "max":16384,
    "min":1
  },
  "ListLinuxSubscriptionsResponse":{
    "type":"structure",
    "members":{
      "NextToken":{
        "shape":"String",
        "documentation":"<p>The next token used for paginated responses. When this field isn't empty, there are
additional elements that the service hasn't included in this request. Use this token with the next request to retrieve
additional objects.</p>"
      },
      "Subscriptions":{
        "shape":"SubscriptionList",
        "documentation":"<p>An array that contains subscription objects.</p>"
      }
    }
  },
  "ListRegisteredSubscriptionProvidersRequest":{
    "type":"structure",
    "members":{
      "MaxResults":{
        "shape":"ListRegisteredSubscriptionProvidersRequestMaxResultsInteger",
        "documentation":"<p>The maximum items to return in a request.</p>"
      },
      "NextToken":{
        "shape":"String",
```

        "documentation":"<p>A token to specify where to start paginating. This is the nextToken from a previously truncated response.</p>"
      },
      "SubscriptionProviderSources":{
        "shape":"SubscriptionProviderSourceList",
        "documentation":"<p>To filter your results, specify which subscription providers to return in the list.</p>"
      }
    }
  },
  "ListRegisteredSubscriptionProvidersRequestMaxResultsInteger":{
    "type":"integer",
    "box":true,
    "max":100,
    "min":1
  },
  "ListRegisteredSubscriptionProvidersResponse":{
    "type":"structure",
    "members":{
      "NextToken":{
        "shape":"String",
        "documentation":"<p>The next token
 used for paginated responses. When this field isn't empty, there are additional elements that the service hasn't included in this request. Use this token with the next request to retrieve additional objects.</p>"
      },
      "RegisteredSubscriptionProviders":{
        "shape":"RegisteredSubscriptionProviderList",
        "documentation":"<p>The list of BYOL registration resources that fit the criteria you specified in the request.</p>"
      }
    }
  },
  "ListTagsForResourceRequest":{
    "type":"structure",
    "required":["resourceArn"],
    "members":{
      "resourceArn":{
        "shape":"SubscriptionProviderArn",
        "documentation":"<p>The Amazon Resource Name (ARN) of the resource for which to list metadata tags.</p>",
        "location":"uri",
        "locationName":"resourceArn"
      }
    }
  },
  "ListTagsForResourceResponse":{
    "type":"structure",
    "members":{
      "tags":{

```
        "shape":"Tags",

    "documentation":"<p>The metadata tags for the requested resource.</p>"
      }
     }
    },
    "Operator":{
     "type":"string",
     "enum":[
      "Equal",
      "NotEqual",
      "Contains"
     ],
     "max":20,
     "min":1
    },
    "OrganizationIntegration":{
     "type":"string",
     "enum":[
      "Enabled",
      "Disabled"
     ]
    },
    "ProductCodeList":{
     "type":"list",
     "member":{"shape":"String"}
    },
    "RegisterSubscriptionProviderRequest":{
     "type":"structure",
     "required":[
      "SecretArn",
      "SubscriptionProviderSource"
     ],
     "members":{
      "SecretArn":{
       "shape":"SecretArn",
       "documentation":"<p>The Amazon Resource Name (ARN) of the secret where you've stored your subscription
provider's access token. For RHEL subscriptions managed through the Red Hat Subscription Manager (RHSM), the
secret contains your Red Hat Offline token.</p>"
      },
      "SubscriptionProviderSource":{
       "shape":"SubscriptionProviderSource",
       "documentation":"<p>The supported Linux subscription provider to register.</p>"
      },
      "Tags":{
       "shape":"Tags",
       "documentation":"<p>The metadata tags to assign to your registered Linux subscription provider
resource.</p>"
```

```
            }
          }
        },
      "RegisterSubscriptionProviderResponse":{
       "type":"structure",
       "members":{
         "SubscriptionProviderArn":{
          "shape":"String",
          "documentation":"<p>The Amazon Resource Name (ARN) of the Linux subscription provider resource that
you registered.</p>"
         },
         "SubscriptionProviderSource":{
          "shape":"SubscriptionProviderSource",
          "documentation":"<p>The Linux subscription provider that you registered.</p>"
         },
         "SubscriptionProviderStatus":{
          "shape":"SubscriptionProviderStatus",
          "documentation":"<p>Indicates the status of the registration action for
the Linux subscription provider that you requested.</p>"
         }
        }
      },
      "RegisteredSubscriptionProvider":{
       "type":"structure",
       "members":{
         "LastSuccessfulDataRetrievalTime":{
          "shape":"String",
          "documentation":"<p>The timestamp from the last time that License Manager accessed third-party
subscription data for your account from your registered Linux subscription provider.</p>"
         },
         "SecretArn":{
          "shape":"SecretArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the Secrets Manager secret that stores your
registered Linux subscription provider access token. For RHEL account subscriptions, this is the offline token.</p>"
         },
         "SubscriptionProviderArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the Linux subscription provider resource that
you registered.</p>"
         },
         "SubscriptionProviderSource":{

        "shape":"SubscriptionProviderSource",
          "documentation":"<p>A supported third-party Linux subscription provider. License Manager currently
supports Red Hat subscriptions.</p>"
         },
         "SubscriptionProviderStatus":{
          "shape":"SubscriptionProviderStatus",
```

      "documentation":"<p>Indicates the status of your registered Linux subscription provider access token from the last time License Manager retrieved subscription data. For RHEL account subscriptions, this is the status of the offline token.</p>"
    },
    "SubscriptionProviderStatusMessage":{
      "shape":"String",
      "documentation":"<p>A detailed message that's associated with your BYOL subscription provider token status.</p>"
    }
  },
  "documentation":"<p>A third-party provider for operating system (OS) platform software and license subscriptions, such as Red Hat. When you register a third-party Linux subscription provider, License Manager can get subscription
 data from the registered provider.</p>"
 },
 "RegisteredSubscriptionProviderList":{
  "type":"list",
  "member":{"shape":"RegisteredSubscriptionProvider"}
 },
 "ResourceNotFoundException":{
  "type":"structure",
  "members":{
   "message":{"shape":"String"}
  },
  "documentation":"<p>Unable to find the requested Amazon Web Services resource.</p>",
  "exception":true
 },
 "SecretArn":{
  "type":"string",
  "pattern":"^arn:[a-z0-9-\\.]{1,63}:secretsmanager:[a-z0-9-\\.]{0,63}:[a-z0-9-\\.]{0,63}:secret:[^/]{1,1023}$"
 },
 "Status":{
  "type":"string",
  "enum":[
   "InProgress",
   "Completed",
   "Successful",
   "Failed"
  ]
 },
 "String":{"type":"string"},
 "StringList":{
  "type":"list",
  "member":{"shape":"StringListMemberString"},
  "max":100,
  "min":1
 },
 "StringListMemberString":{

```
    "type":"string",
    "max":100,
    "min":1
  },
  "StringMap":{
    "type":"map",
    "key":{"shape":"String"},
    "value":{"shape":"String"}
  },
  "Subscription":{
    "type":"structure",
    "members":{
      "InstanceCount":{
        "shape":"BoxLong",
        "documentation":"<p>The total amount of running instances using this subscription.</p>"
      },
      "Name":{
        "shape":"String",
        "documentation":"<p>The name of the subscription.</p>"
      },
      "Type":{
        "shape":"String",
        "documentation":"<p>The type of subscription. The type can be subscription-included with Amazon EC2,
Bring Your Own Subscription model (BYOS), or from the Amazon Web Services Marketplace. Certain
subscriptions may use licensing from the Amazon Web Services Marketplace as well as OS licensing from Amazon
EC2 or BYOS.</p>"
      }
    },
    "documentation":"<p>An object which details a discovered Linux subscription.</p>"
  },
  "SubscriptionList":{
    "type":"list",
    "member":{"shape":"Subscription"}
  },
  "SubscriptionProviderArn":{
    "type":"string",
    "pattern":"^arn:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,63}:[a-z0-9-\\.]{1,510}/[a-
z0-9-\\.]{1,510}$"
  },
  "SubscriptionProviderSource":{
    "type":"string",
    "enum":["RedHat"]
  },
  "SubscriptionProviderSourceList":{
    "type":"list",
    "member":{"shape":"SubscriptionProviderSource"}
  },
  "SubscriptionProviderStatus":{
```

```
      "type":"string",
      "enum":[
        "ACTIVE",
        "INVALID",
        "PENDING"
      ]
    },
    "TagKeyList":{
      "type":"list",
      "member":{"shape":"String"},
      "max":50,
      "min":0,
      "sensitive":true
    },
    "TagResourceRequest":{
      "type":"structure",
      "required":[
        "resourceArn",
        "tags"
      ],
      "members":{
        "resourceArn":{
          "shape":"SubscriptionProviderArn",
          "documentation":"<p>The Amazon Resource Name (ARN) of the Amazon
 Web Services resource to which to add the specified metadata tags.</p>",
          "location":"uri",
          "locationName":"resourceArn"
        },
        "tags":{
          "shape":"Tags",
          "documentation":"<p>The metadata tags to assign to the Amazon Web Services resource. Tags are formatted
as key value pairs.</p>"
        }
      }
    },
    "TagResourceResponse":{
      "type":"structure",
      "members":{
      }
    },
    "Tags":{
      "type":"map",
      "key":{"shape":"String"},
      "value":{"shape":"String"},
      "max":50,
      "min":0,
      "sensitive":true
    },
```

```
  "ThrottlingException":{
   "type":"structure",
   "members":{
    "message":{"shape":"String"}
   },
   "documentation":"<p>The request was denied due to request throttling.</p>",
   "exception":true
  },
  "UntagResourceRequest":{
   "type":"structure",
   "required":[
    "resourceArn",
    "tagKeys"
   ],
   "members":{
    "resourceArn":{
      "shape":"SubscriptionProviderArn",
      "documentation":"<p>The Amazon Resource Name (ARN) of the Amazon Web Services resource to remove
the metadata tags from.</p>",
      "location":"uri",
      "locationName":"resourceArn"
    },
    "tagKeys":{
     "shape":"TagKeyList",
     "documentation":"<p>A list of metadata tag keys to remove from the requested resource.</p>",
     "location":"querystring",
     "locationName":"tagKeys"
    }
   }
  },
  "UntagResourceResponse":{
   "type":"structure",
   "members":{
   }
  },
  "UpdateServiceSettingsRequest":{
   "type":"structure",
   "required":[
    "LinuxSubscriptionsDiscovery",
    "LinuxSubscriptionsDiscoverySettings"
   ],
   "members":{
    "AllowUpdate":{
     "shape":"Boolean",
     "documentation":"<p>Describes if updates are allowed to the service settings for Linux subscriptions. If you
allow updates, you can aggregate
 Linux subscription data in more than one home Region.</p>"
    },
```

```
    "LinuxSubscriptionsDiscovery":{
      "shape":"LinuxSubscriptionsDiscovery",
      "documentation":"<p>Describes if the discovery of Linux subscriptions is enabled.</p>"
    },
    "LinuxSubscriptionsDiscoverySettings":{
      "shape":"LinuxSubscriptionsDiscoverySettings",
      "documentation":"<p>The settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
    }
  }
},
"UpdateServiceSettingsResponse":{
  "type":"structure",
  "members":{
    "HomeRegions":{
      "shape":"StringList",
      "documentation":"<p>The Region in which License Manager displays the aggregated data for Linux
subscriptions.</p>"
    },
    "LinuxSubscriptionsDiscovery":{
      "shape":"LinuxSubscriptionsDiscovery",
      "documentation":"<p>Lists
 if discovery has been enabled for Linux subscriptions.</p>"
    },
    "LinuxSubscriptionsDiscoverySettings":{
      "shape":"LinuxSubscriptionsDiscoverySettings",
      "documentation":"<p>The settings defined for Linux subscriptions discovery. The settings include if
Organizations integration has been enabled, and which Regions data will be aggregated from.</p>"
    },
    "Status":{
      "shape":"Status",
      "documentation":"<p>Indicates the status of Linux subscriptions settings being applied.</p>"
    },
    "StatusMessage":{
      "shape":"StringMap",
      "documentation":"<p>A message which details the Linux subscriptions service settings current status.</p>"
    }
  }
},
"ValidationException":{
  "type":"structure",
  "members":{
    "message":{"shape":"String"}
  },
  "documentation":"<p>The provided input is not valid. Try your request again.</p>",
  "exception":true
}
```

    },
    "documentation":"<p>With License Manager, you can discover and track your commercial Linux subscriptions on running Amazon EC2 instances.</p>"
  }
  {
    "ResponseMetadata": {
      "RequestId": "9a285199-c8d6-47c2-bdb2-314cb47d599d"
    }
  }
  {
  "version": "1.0",
  "examples": {
  }
  }

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          "UseFIPS": false,
          "UseDualStack": false
        }
      },
      {
        "documentation": "For region cn-north-1 with FIPS enabled and DualStack enabled",
        "expect": {
          "endpoint": {
            "url": "https://license-manager-linux-subscriptions-fips.cn-north-1.api.amazonwebservices.com.cn"
          }
        },
        "params": {
          "Region": "cn-north-1",
          "UseFIPS": true,
          "UseDualStack": true
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        "documentation": "For region cn-north-1 with FIPS enabled and DualStack disabled",
        "expect": {
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          }
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```json
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    },
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      "expect": {
        "endpoint": {
          "url": "https://license-manager-linux-subscriptions-fips.us-gov-east-1.api.aws"
        }
      },
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        "Region": "us-gov-east-1",
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        "UseDualStack": true
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        "endpoint": {
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        }
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      },
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        "UseFIPS": true,
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      "documentation": "For region us-iso-east-1 with FIPS enabled and DualStack disabled",
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```

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              "url": "https://license-manager-linux-subscriptions-fips.us-iso-east-1.c2s.ic.gov"
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          "UseFIPS": true,
          "UseDualStack": false
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    },
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          }
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       }
    },
    {
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          "UseDualStack": true
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          "UseDualStack": false
        }
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          }
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        "params": {
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          "UseFIPS": false,
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      },
      {

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          }
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          "UseDualStack": false,
          "Endpoint": "https://example.com"
        }
      },

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      "expect": {
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{
        "error": "Invalid Configuration: FIPS and custom endpoint are not supported"
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        "UseFIPS": true,
        "UseDualStack": false,
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      }
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    {
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      "expect": {
        "error": "Invalid Configuration: Dualstack and custom endpoint are not supported"
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        "UseFIPS": false,
        "UseDualStack": true,
        "Endpoint": "https://example.com"
      }
    },
    {
      "documentation": "Missing region",
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        "error": "Invalid Configuration: Missing Region"
      }
    }
  ],
  "version": "1.0"
}
```

1.229 boto3 1.37.25

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1.230 click-plugins 1.1.1

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1.246 googleapis-common-protos 1.70.0

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1.262 python-setuptools 78.1.1

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distutils=setuptools/config/distutils.schema.json

Please avoid changing it manually.

You can report issues or suggest changes directly to `validate-pyproject`
(or to the relevant plugin repository)

- https://github.com/abravalheri/validate-pyproject/issues

***

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- `__init__.py`
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Python was created in the early 1990s by Guido van Rossum at Stichting
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principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see https://www.cnri.reston.va.us)
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In May 2000, Guido and the Python core development team moved to
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1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
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1.275 pysaml 7.5.0

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1.277 bzt 1.16.34

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1.282 django-migrations-git-conflicts 1.0

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1.283 react-hot-keys 2.7.3

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* react-hotkeys v2.7.3

* React component to listen to keydown and keyup keyboard events, defining and dispatching keyboard shortcuts.

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/**!

* hotkeys-js v3.13.2

* A simple micro-library for defining and dispatching keyboard shortcuts. It has no dependencies.

*

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* https://github.com/jaywcjlove/hotkeys-js.git

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1.284 urwid 2.6.16

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changes were used in the work (which must be distributed under
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with the Library, with the complete machine-readable "work that
uses the Library", as object code and/or source code, so that the
user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
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b) Use a suitable shared library mechanism for linking with the
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copy of the library already present on the user's computer system,
rather than copying library functions into the executable, and (2)
will operate properly with a modified version of the library, if
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installs one, as long as the modified version is
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c) Accompany the work with a written offer, valid for at
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1.290 django-stubs 5.1.1

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1.291 django-compressor 4.4

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1.292 cachecontrol 0.14.3

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1.293 robotframework 7.1.1

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1.294 robotframework-pabot 0.91

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1.295 elementpath 4.8.0

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1.299 rjsmin 1.2.1

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 * Added Python 3 check for calling encode/decode with invalid codecs.
 * Added Python 3 check for accessing sys.maxint.
 * Added Python 3 check for bad import statements.
 * Added Python 3 check for accessing deprecated methods on the 'string' module,
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 * too-many-boolean-expressions
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 * Support for deprecated-modules in modules not installed,
 * Refactor wrong-import-order to integrate it with `isort` library
 * Add check too-complex with mccabe for cyclomatic complexity
 * Refactor wrong-import-position to skip try-import and nested cases

* Add consider-merging-isinstance, superfluous-else-return

* Fix consider-using-ternary for 'True

and True and True or True' case

* Add bad-docstring-quotes and docstring-first-line-empty

* Add missing-timeout

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 * Added new check for incorrect len(SEQUENCE) usage,

 * Added new extension for comparison against empty string constants,

 * Added new extension which detects comparing integers to zero,

 * Added new useless-return checker,

 * Added new try-except-raise checker

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- Hornwitser

 <github@hornwitser.no>: fix import graph

- Fureigh <rhys.fureigh@gsa.gov>

- David Douard <david.douard@sdfa3.org>

- Daniel Balparda <balparda@google.com> (Google): GPyLint maintainer (Google's pylint variant)

- Bastien Vallet <bastien.vallet@gmail.com> (Djailla)

- Aru Sahni <arusahni@gmail.com>: Git ignoring, regex-based ignores

- Andreas Freimuth <andreas.freimuth@united-bits.de>: fix indentation checking with tabs

- Alexandru Coman <fcoman@bitdefender.com>

- jpkotta <jpkotta@gmail.com>

- Thomas Grainger <tagrain@gmail.com>

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- Taewon D. Kim <kimt33@mcmaster.ca>

- Sneaky Pete <sneakypete81@gmail.com>

- Sergey B Kirpichev <skirpichev@gmail.com>

- Sandro Tosi <sandro.tosi@gmail.com>: Debian packaging

- Rogdham <contact@rogdham.net>

- Rene Zhang <rz99@cornell.edu>

- Paul Lichtenberger <paul.lichtenberger.rgbg@gmail.com>

- Or Bahari <or.ba402@gmail.com>

- Mr. Senko <atodorov@mrsenko.com>

- Mike Frysinger <vapier@gmail.com>

- Martin von Gagern <gagern@google.com>

 (Google): Added 'raising-format-tuple' warning.

- Martin Vielsmaier <martin@vielsmaier.net>

- Martin Pool <mbp@google.com> (Google):

 * warnings for anomalous backslashes

 * symbolic names for messages (like 'unused')

 * etc.

- Martin Bati <MartinBasti@users.noreply.github.com>

 * Added new check for shallow copy of os.environ

 * Added new check for useless `with threading.Lock():` statement

- Marcus Nslund <naslundx@gmail.com> (naslundx)

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- Benjamin Drung <benjamin.drung@profitbricks.com>: contributing Debian Developer

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- Roberto Leinardi <leinardi@gmail.com>: PyCharm plugin maintainer

- Ricardo Gemignani <ricardo.gemignani@gmail.com>

- Pieter Engelbrecht <pengelbrecht@rems2.com>

- Philipp Albrecht <flying-sheep@web.de> (pylbrecht)

- Nicolas Dickreuter <dickreuter@gmail.com>

- Nick Bastin <nick.bastin@gmail.com>

- Nathaniel Manista <nathaniel@google.com>: suspicious lambda checking

- Maksym Humetskyi <Humetsky@gmail.com> (mhumetskyi)

 * Fixed ignored empty functions by similarities checker with "ignore-signatures" option enabled

* Ignore function decorators signatures as well by similarities checker with "ignore-signatures" option enabled

* Ignore class

methods and nested functions signatures as well by similarities checker with "ignore-signatures" option enabled

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- Konstantin Manna <Konstantin@Manna.uno>

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- Joshua Cannon <joshdcannon@gmail.com>

- John Leach <jfleach@jfleach.com>

- James Morgensen <james.morgensen@gmail.com>: ignored-modules option applies to import errors.

- Jaehoon Hwang <jaehoonhwang@users.noreply.github.com> (jaehoonhwang)

- Huw Jones <huw@huwcbjones.co.uk>

- Gideon <87426140+GideonBear@users.noreply.github.com>

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- Frost Ming <frostming@tencent.com>

- Federico Bond <federicobond@gmail.com>

- Erik Wright <erik.wright@shopify.com>

- Erik Eriksson <molobrakos@users.noreply.github.com>: Added overlapping-except error check.

- Daniel Mouritzen <dmrtzn@gmail.com>

- Dan Hemberger <846186+hemberger@users.noreply.github.com>

- Chris Rebert <code@rebertia.com>: unidiomatic-typecheck.

- Aurelien Campeas

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- Wes Turner <westurner@google.com> (Google): added new check 'inconsistent-quotes'

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- Matthew Beckers <17108752+mattlbeck@users.noreply.github.com> (mattlbeck)

- Mark Roman Miller <mtmiller@users.noreply.github.com>: fix inline defs in too-many-statements

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- Mads Kiilerich <mads@kiilerich.com>

- Maarten ter Huurne <maarten@treewalker.org>

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- John Kirkham <jakirkham@gmail.com>

- Jens H. Nielsen <Jens.Nielsen@microsoft.com>

- Jake Lishman <jake.lishman@ibm.com>

- Ioana Tagirta <ioana.tagirta@gmail.com>: fix bad thread instantiation check

- Ikraduya Edian <ikraduya@gmail.com>: Added new checks 'consider-using-generator' and 'use-a-generator'.

- Hugues Bruant <hugues.bruant@affirm.com>

- Hashem Nasarat <Hnasar@users.noreply.github.com>

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- Grygorii Iermolenko <gyermolenko@gmail.com>

- Grizzly Nyo <grizzly.nyo@gmail.com>

- Gabriel R. Sezefredo <g@briel.dev>: Fixed "exception-escape" false positive with generators

- Filipe Brandenburger <filbranden@google.com>

- Fantix King <fantix@uchicago.edu> (UChicago)

- Eric McDonald <221418+emcd@users.noreply.github.com>

- Elias Dorneles <eliasdorneles@gmail.com>: minor adjust to config defaults and docs

- Elazrod56 <thomas.lf5629@gmail.com>

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 Harland <derek.harland@finq.co.nz>

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- Chris Murray <chris@chrismurray.scot>

- Chris Lamb <chris@chris-lamb.co.uk>

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- Carli Freudenberg <carli.freudenberg@energymeteo.de> (CarliJoy)
 * Fixed issue 5281, added Unicode checker
 * Improve non-ascii-name checker

- Bruce Dawson <randomascii@users.noreply.github.com>
- Brian Shaginaw <brian.shaginaw@warbyparker.com>: prevent error on exception check for functions
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- agutole <toldo_carp@hotmail.com>
- Zeckie <49095968+Zeckie@users.noreply.github.com>
- Zeb Nicholls <zebedee.nicholls@climate-energy-college.org>
  * Made W9011 compatible with 'of' syntax in return types
- Yuval Langer <yuvallanger@mail.tau.ac.il>
- Yury Gribov <tetra2005@gmail.com>
- Yuri Bochkarev <baltazar.bz@gmail.com>: Added
  epytext support to docparams extension.
- Youngsoo Sung <ysung@bepro11.com>
- Yory <39745367+yory8@users.noreply.github.com>
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- Wing Lian <wing.lian@gmail.com>
- Will Shanks <wsha@posteo.net>
- Viorel tirbu <viorels@gmail.com>: intern-builtin warning.
- VictorT <victor.taix@gmail.com>
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- Trevor Bekolay <tbekolay@gmail.com>
  * Added --list-msgs-enabled command
- Tomer Chachamu <tomer.chachamu@gmail.com>: simplifiable-if-expression
- Tomasz Michalski <tomasz.michalski@rtbhouse.com>
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  Tomasz Magulski <tomasz@magullab.io>
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- Theodore Ni <3806110+tjni@users.noreply.github.com>
- Tanvi Moharir <74228962+tanvimoharir@users.noreply.github.com>: Fix for invalid toml config
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- Stphane Wirtel <stephane@wirtel.be>: nonlocal-without-binding
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- Rebecca Turner <rbt@sent.as> (9999years)
- Randall Leeds <randall@bleeds.info>
- Ramon Saraiva <ramonsaraiva@gmail.com>
- Ramiro Leal-Cavazos <ramiroleal050@gmail.com> (ramiro050): Fixed bug preventing pylint from working with Emacs tramp
- RSTdefg <34202999+RSTdefg@users.noreply.github.com>
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 N. West <98110034+rnwst@users.noreply.github.com>
- Qwiddle13 <32040075+Qwiddle13@users.noreply.github.com>
- Quentin Young <qlyoung@users.noreply.github.com>
- Prajwal Borkar <sunnyborkar7777@gmail.com>
- Petr Pulc <petrpulc@gmail.com>: require whitespace around annotations
- Peter Dawyndt <Peter.Dawyndt@UGent.be>
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- Patrik <patrik.mrx@gmail.com>
- Pascal Corpet <pcorpet@users.noreply.github.com>
- Pablo Galindo Salgado <Pablogsal@gmail.com>
 * Fix false positive 'Non-iterable value' with async comprehensions.
- Osher De Paz <odepaz@redhat.com>
- Oisn Moran <OisinMoran@users.noreply.github.com>
- Obscuron <Abscuron@gmail.com>
- Noam Yorav-Raphael <noamraph@gmail.com>
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- Naglis Jonaitis <827324+naglis@users.noreply.github.com>
- Moody <mooodyhunter@outlook.com>
- Mitchell Young <mitchelly@gmail.com>: minor adjustment to docparams
- Mitar <mitar.github@tnode.com>
- Ming Lyu <CareF.Lm@gmail.com>
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- Markus Siebenhaar <41283549+siehar@users.noreply.github.com>
- Marco Edward Gorelli <marcogorelli@protonmail.com>: Documented Jupyter integration
- Marcin Kurczewski <rr-@sakuya.pl> (rr-)
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- Josselin Feist <josselin@trailofbits.com>

- Jonathan Kotta <KottaJonathan@JohnDeere.com>

- John Paraskevopoulos <io.paraskev@gmail.com>: add 'differing-param-doc' and 'differing-type-doc'

- John McGehee <jmcgehee@altera.com>

- John Gabriele <jgabriele@fastmail.fm>

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- Jeroen Seegers <jeroenseegers@users.noreply.github.com>:

 * Fixed `toml` dependency issue

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- Jakub Kulk <Kulikjak@gmail.com>

- Jakob Normark <jakobnormark@gmail.com>

- Jacques Kvam <jwkvam@gmail.com>

- Jace Browning <jacebrowning@gmail.com>: updated default report format with clickable paths

- JT Olds <jtolds@xnet5.com>

- Iggy Eom <iggy.eom@sendbird.com>

- Hayden Richards <62866982+SupImDos@users.noreply.github.com>

 * Fixed "no-self-use" for async methods

 * Fixed "docparams" extension for async functions and methods

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- Carl Crowder <bitbucket@carlcrowder.com>: don't evaluate the value of arguments for 'dangerous-default-value'

-

 Carey Metcalfe <carey@cmetcalfe.ca>: demoted `try-except-raise` from error to warning

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- Avram Lubkin <avylove@rockhopper.net>

- Athos Ribeiro <athoscr@fedoraproject.org>: Fixed dict-keys-not-iterating false positive for inverse containment checks

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- Anthony Foglia <afoglia@users.noreply.github.com> (Google): Added simple string slots check.

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- Ahirnish Pareek <ahirnish@gmail.com>: 'keyword-arg-before-var-arg' check

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- Aditya Gupta <adityagupta1089@users.noreply.github.com> (adityagupta1089)
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- Axel Muller
- Benjamin Niemann: allow block level enabling/disabling of messages
- Bernard Nauwelaerts
- Bill Wendling
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- Sebastian Ulrich
- Takashi Hirashima
- Thomas Snowden: fix missing-docstring for inner functions
- Wolfgang Grafen
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1.305 react-codemirror2 8.0.1

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1.306 poetry 1.8.5

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1.307 beautiful-soup 4.13.3

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1.308 @reduxjs/toolkit 2.6.0

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1.310 openapi-core 0.18.0

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1.311 rcssmin 1.1.1

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`cssmin.py` - A Python port of the YUI CSS compressor.

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1.312 django-ratelimit 4.1.0
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1.313 python-ldap 3.4.4

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1.316 types-pyyaml 6.0.12.20250326

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Python was created in the early 1990s by Guido van Rossum at Stichting
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principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
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In May
 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
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0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
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1.6.1	1.6	2001	CNRI	yes (2)
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==========================
Advice for new contributors
==========================

New contributor and not sure what to do? Want to help but just don't know how
to get started? This is the section for you.

.. admonition:: Get up and running!

  If you are new to contributing to Django, the :doc:`/intro/contributing`
  tutorial will give you an introduction to the tools and the workflow.

This page contains more general advice on ways you can contribute to Django,
and how to approach that.

If you are looking for a reference on the details of making code contributions,
see the :doc:`/internals/contributing/writing-code/index` documentation.

First steps
===========

Start with these steps to discover Django's development process.

* **Triage tickets**

 If an `unreviewed ticket`_ reports a bug, try and reproduce it. If you
 can reproduce it and it seems valid, make a note that you confirmed the bug
 and accept the ticket. Make sure the ticket is filed under the correct
 component
 area. Consider writing a patch that adds a test for the bug's
 behavior, even if you don't fix the bug itself. See more at
 :ref:`how-can-i-help-with-triaging`

* **Look for tickets that are accepted and review patches to build familiarity
 with the codebase and the process**

 Mark the appropriate flags if a patch needs docs or tests. Look through the
 changes a patch makes, and keep an eye out for syntax that is incompatible

with older but still supported versions of Python. :doc:`Run the tests
</internals/contributing/writing-code/unit-tests>` and make sure they pass.
Where possible and relevant, try them out on a database other than SQLite.
Leave comments and feedback!

* **Keep old patches up to date**

Oftentimes the codebase will change between a patch being submitted and the
time it gets reviewed. Make sure it still applies cleanly and functions as
expected. Updating a patch is both useful and important! See more on
:doc:`writing-code/submitting-patches`.

*
Write some documentation

Django's documentation is great but it can always be improved. Did you find
a typo? Do you think that something should be clarified? Go ahead and
suggest a documentation patch! See also the guide on
:doc:`writing-documentation`.

.. note::

   The `reports page`_ contains links to many useful Trac queries, including
   several that are useful for triaging tickets and reviewing patches as
   suggested above.

   .. _reports page: https://code.djangoproject.com/wiki/Reports

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.. _unreviewed ticket: https://code.djangoproject.com/query?status=!closed&stage=Unreviewed

Guidelines
==========

As
a newcomer on a large project, it's easy to experience frustration. Here's
some advice to make your work on Django more useful and rewarding.

* **Pick a subject area that you care about, that you are familiar with, or

that you want to learn about**

You don't already have to be an expert on the area you want to work on; you
become an expert through your ongoing contributions to the code.

* **Analyze tickets' context and history**

Trac isn't an absolute; the context is just as important as the words.
When reading Trac, you need to take into account who says things, and when
they were said. Support for an idea two years ago doesn't necessarily mean
that the idea will still have support. You also need to pay attention to who
hasn't spoken -- for example, if an experienced contributor hasn't been
recently involved in a discussion, then a ticket may not have the support
required to get into
Django.

* **Start small**

It's easier to get feedback on a little issue than on a big one. See the
`easy pickings`_.

* **If you're going to engage in a big task, make sure that your idea has
support first**

This means getting someone else to confirm that a bug is real before you fix
the issue, and ensuring that there's consensus on a proposed feature before
you go implementing it.

* **Be bold! Leave feedback!**

Sometimes it can be scary to put your opinion out to the world and say "this
ticket is correct" or "this patch needs work", but it's the only way the
project moves forward. The contributions of the broad Django community
ultimately have a much greater impact than that of any one person. We can't
do it without **you**!

* **Err on the side of caution when marking things Ready For Check-in**

If you're really not certain if a ticket is ready, don't mark it as
such. Leave a comment instead, letting others know your thoughts. If you're
mostly certain,
but not completely certain, you might also try asking on IRC
to see if someone else can confirm your suspicions.

* **Wait for feedback, and respond to feedback that you receive**

Focus on one or two tickets, see them through from start to finish, and
repeat. The shotgun approach of taking on lots of tickets and letting some

fall by the wayside ends up doing more harm than good.

* **Be rigorous**

When we say ":pep:`8`, and must have docs and tests", we mean it. If a patch
doesn't have docs and tests, there had better be a good reason. Arguments
like "I couldn't find any existing tests of this feature" don't carry much
weight--while it may be true, that means you have the extra-important job of
writing the very first tests for that feature, not that you get a pass from
writing tests altogether.

* **Be patient**

It's not always easy for your ticket or your patch to be reviewed quickly.
This isn't personal. There are a lot of tickets and pull requests to
get
through.

Keeping your patch up to date is important. Review the ticket on Trac to
ensure that the *Needs tests*, *Needs documentation*, and *Patch needs
improvement* flags are unchecked once you've addressed all review comments.

Remember that Django has an eight-month release cycle, so there's plenty of
time for your patch to be reviewed.

Finally, a well-timed reminder can help. See :ref:`contributing code FAQ
<new-contributors-faq>` for ideas here.

.. _easy pickings: https://code.djangoproject.com/query?status=!closed&easy=1
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1.318 xmlschema 2.5.1

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1.324 sh 2.1.0

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1.325 virtualenv 20.31.2

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1.338 requests-pkcs12 1.25

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1.339 rapidfuzz 3.13.0

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functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

 Otherwise, if the work is a derivative of the Library, you may
distribute the
 object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

 6. As an exception to the Sections above, you may also combine or
link a "work that uses the Library" with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

 You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
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during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of this License. Also, you must do one
of these things:

  a) Accompany
 the work with the complete corresponding
   machine-readable source code for the Library including whatever
   changes were used in the work (which must be distributed under
   Sections 1 and 2 above); and, if the work is an executable linked
   with the Library, with the complete machine-readable "work that
   uses the Library", as object code and/or source code, so that the

user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

  b) Use a suitable shared library mechanism for linking with the
  Library. A suitable mechanism is one that (1) uses at run time a
  copy of the library already present on the user's computer system,
  rather than copying library functions into the executable, and (2)
  will operate
properly with a modified version of the library, if
  the user installs one, as long as the modified version is
  interface-compatible with the version that the work was made with.

  c) Accompany the work with a written offer, valid for at
  least three years, to give the same user the materials
  specified in Subsection 6a, above, for a charge no more
  than the cost of performing this distribution.

  d) If distribution of the work is made by offering access to copy
  from a designated place, offer equivalent access to copy the above
  specified materials from the same place.

  e) Verify that the user has already received a copy of these
  materials or that you have already sent this user a copy.

 For an executable, the required form of the "work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the materials to be distributed need not include anything that is
normally
 distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies
the executable.

 It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

 7. You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library
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library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise

permitted, and provided that you do these two things:

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  based on the Library, uncombined with any
other library
  facilities. This must be distributed under the terms of the
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  b) Give prominent notice with the combined library of the fact
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1. Source Code.

The "source code" for a work means the preferred form of the work
for making modifications to it. "Object code" means any non-source
form of a work.

A "Standard Interface" means an interface that either is an official
standard defined by a recognized standards body, or, in the case of
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The
"System Libraries" of an executable work include anything, other
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Major Component, or to implement a Standard Interface for which an
implementation is available to the public in source code form. A
"Major Component", in this context, means a major essential component
(kernel, window system, and so on) of the specific operating system
(if any) on which the executable work runs, or a compiler used to
produce the work, or an object code interpreter used to run it.

The "Corresponding Source" for a work in object code form means all

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control those activities. However, it does not include the work's
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 available free
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includes interface definition files associated with source files for
the work, and the source code for shared libraries and dynamically
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(including a physical distribution medium), accompanied by a
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and valid for as
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the same way through the same place at no
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1.341 react-codemirror2 6.0.1

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1.342 django-timezone-field 7.1

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1.343 object-sizeof 2.6.5

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1.345 protobuf 6.31.1

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  * Emacs mode for Protocol Buffers (editors/protobuf-mode.el).
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  * HPUX support.
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   * Detect whether zlib is new enough in configure script.
  * Fixes for Solaris 10 32/64-bit confusion.
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  * Optimize Java serialization code when writing a small message to a stream.
  * Optimize Java serialization of strings so that UTF-8 encoding happens only
    once per string per serialization call.
  * Clean up some Java warnings.
  * Fix bug with permanent callbacks that delete themselves when run.
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William Orr <will@worrbase.com>
  * Fixed detection of sched_yield on Solaris.
  * Added atomicops for Solaris
Andrew Paprocki <andrew@ishiboo.com>
  * Fixed minor IBM xlC compiler build issues
  * Added atomicops for AIX (POWER)
Nipunn Koorapati <nipunn1313@gmail.com>
  * Provide a type alias field ValueType
on EnumTypeWrapper
  * Match service argument names to abstract interface

1.346 kombu 5.5.4

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1.347 google-auth 2.40.3

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1.348 google-api-core 2.25.1

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1.349 pygments 2.19.2

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```
---input---
!%$^*__--__._+++===-crazy-symbol

---tokens---
'!%$^*__--__._+++===-crazy-symbol' Name.Variable
'\n'        Text.Whitespace
'# Step 1 of 3: from Hakaru to Maple LO (linear operator)\n' Comment.Single

'\n'        Text.Whitespace

'toLO'        Name
' '          Text.Whitespace
':='          Operator
' '          Text.Whitespace
```

'module'   Keyword
'()'   Punctuation
'\n '   Text.Whitespace
'export'   Keyword
'\n '   Text.Whitespace
'ModuleApply' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'm'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'h'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'h'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'gensym'   Name
'('   Punctuation
'"'   Punctuation
'h'   Name
'"'   Punctuation
');'   Punctuation
'\n
   '   Text.Whitespace
'_Env_HakaruSolve' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'false'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'LO'   Name
'('   Punctuation
'h'   Name
','   Operator
' '   Text.Whitespace
'integrate' Name
'('   Punctuation

```
'm'          Name
','          Operator
' '          Text.Whitespace
'h'          Name
','          Operator
' '          Text.Whitespace
'[]))'       Punctuation
'\n '        Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'proc'       Keyword
';'          Punctuation
'\n\n '      Text.Whitespace
'export'     Keyword
'\n '        Text.Whitespace
'integrate'  Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'proc'       Keyword
'('          Punctuation
'm'          Name
','          Operator
' '          Text.Whitespace
'h'
   Name
','          Operator
' '          Text.Whitespace
'loops'      Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'list'       Name
'('          Punctuation
'name'       Name
' '          Text.Whitespace
'='          Operator
' '          Text.Whitespace
'range'      Name
')'          Punctuation
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'[]'         Punctuation
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
```

'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace
'n'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
','   Operator
' '   Text.Whitespace
'res'   Name
','   Operator
' '   Text.Whitespace
'l'   Name
','   Operator
' '   Text.Whitespace
'br'

          Name
','   Operator
' '   Text.Whitespace
'm0'   Name
';'   Punctuation
'\n\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'm'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'known_continuous' Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'integrate_known' Name
'('   Punctuation
'Int'   Name
','   Operator
' '   Text.Whitespace
'Ints'   Name
','   Operator
' '   Text.Whitespace
'"""'   Punctuation
'xx'   Name
'"""'   Punctuation
','   Operator
' '   Text.Whitespace

```
'm'         Name
','         Operator
' '         Text.Whitespace
'h'         Name
','         Operator
' '         Text.Whitespace
'loops'     Name
')'         Punctuation
'\n   '     Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'm'

            Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'known_discrete' Name
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'integrate_known' Name
'('         Punctuation
'Sum'       Name
','         Operator
' '         Text.Whitespace
'Sums'      Name
','         Operator
' '         Text.Whitespace
'"""'       Punctuation
'kk'        Name
'"""'       Punctuation
','         Operator
' '         Text.Whitespace
'm'         Name
','         Operator
' '         Text.Whitespace
'h'         Name
','         Operator
' '         Text.Whitespace
'loops'     Name
')'         Punctuation
'\n   '     Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'm'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
```

'"""'   Punctuation
'Ret'   Name
'('   Punctuation
'anything'   Name
')'
              Punctuation
'"""'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'applyintegrand' Name
'('   Punctuation
'h'   Name
','   Operator
' '   Text.Whitespace
'mk_ary'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'loops'   Name
'))'   Punctuation
'\n   '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'm'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"""'   Punctuation
'Bind'   Name
'('   Punctuation
'anything'   Name
','   Operator
' '   Text.Whitespace
'name'   Name
','   Operator
' '   Text.Whitespace
'anything'   Name
')'   Punctuation
'"""'
              Punctuation
' '   Text.Whitespace

'then'   Keyword
'\n   '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'mk_idx'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'loops'   Name
'));'   Punctuation
'\n
    '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'Integrand' Name
'('   Punctuation
'op'   Name.Builtin

```
'('           Punctuation
'2'           Literal.Number.Integer
','           Operator
'm'           Name
')'           Punctuation
','           Operator
' '           Text.Whitespace
'"""'         Punctuation
'integrate'   Name
'"""'         Punctuation
'('           Punctuation
'res'         Name
','           Operator
' '           Text.Whitespace
'x'           Name
','           Operator
' '           Text.Whitespace
'loops'       Name
'))'          Punctuation
','           Operator
' '           Text.Whitespace
'x'           Name
'='           Operator
'h'           Name
');'          Punctuation
'\n    '      Text.Whitespace
'integrate'   Name
'('           Punctuation
'op'          Name.Builtin
'('           Punctuation
'1'
              Literal.Number.Integer
','           Operator
'm'           Name
')'           Punctuation
','           Operator
' '           Text.Whitespace
'res'         Name
','           Operator
' '           Text.Whitespace
'loops'       Name
');'          Punctuation
'\n   '       Text.Whitespace
'elif'        Keyword
' '           Text.Whitespace
'm'           Name
' '           Text.Whitespace
'::'          Operator
```

```
' '        Text.Whitespace
'"""'        Punctuation
'specfunc'   Name
'('        Punctuation
'Msum'       Name
')'        Punctuation
'"""'        Punctuation
' '        Text.Whitespace
'and'        Keyword
' '        Text.Whitespace
'('        Punctuation
'nops'       Name.Builtin
'('        Punctuation
'loops'      Name
')'        Punctuation
' '        Text.Whitespace
'='        Operator
' '        Text.Whitespace
'0'        Literal.Number.Integer
' '        Text.Whitespace
'or'        Keyword
' '        Text.Whitespace
'nops'

      Name.Builtin
'('        Punctuation
'm'        Name
')'        Punctuation
' '        Text.Whitespace
'='        Operator
' '        Text.Whitespace
'1'        Literal.Number.Integer
')'        Punctuation
' '        Text.Whitespace
'then'       Keyword
'\n '    Text.Whitespace
'`+`'      Name
'('        Punctuation
'op'        Name.Builtin
'('        Punctuation
'map'       Name.Builtin
'('        Punctuation
'integrate'  Name
','        Operator
' '        Text.Whitespace
'['        Punctuation
'op'        Name.Builtin
'('        Punctuation
'm'        Name
```

')]'   Punctuation
','   Operator
' '   Text.Whitespace
'h'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
')))'   Punctuation
'\n   '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'm'   Name
' '   Text.Whitespace
'::'   Operator
'
    '   Text.Whitespace
'"""'   Punctuation
'Weight'   Name
'('   Punctuation
'anything' Name
','   Operator
' '   Text.Whitespace
'anything' Name
')'   Punctuation
'"""'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'foldl'   Name
'('   Punctuation
'product'   Name
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'loops'   Name
'))'   Punctuation
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace

```
'integrate'   Name
'('           Punctuation
'op'          Name.Builtin
'('           Punctuation
'2'           Literal.Number.Integer
','           Operator
'm'
              Name
')'           Punctuation
','           Operator
' '           Text.Whitespace
'h'           Name
','           Operator
' '           Text.Whitespace
'loops'       Name
')'           Punctuation
\n    '       Text.Whitespace
'elif'        Keyword
' '           Text.Whitespace
'm'           Name
' '           Text.Whitespace
'::'          Operator
' '           Text.Whitespace
't_pw_or_part' Name
' '           Text.Whitespace
'then'        Keyword
\n     '      Text.Whitespace
'Partition'   Name
':'           Operator
'-'           Operator
'AppPartOrPw' Name
\n            ' Text.Whitespace
'('           Punctuation
' '           Text.Whitespace
'proc'        Keyword
'('           Punctuation
'p'           Name
')'           Punctuation
\n               ' Text.Whitespace
'if'          Keyword
' '           Text.Whitespace
'not'         Keyword
' '           Text.Whitespace
'Partition'   Name
':'           Operator
'-'           Operator
'ConditionsDepend'
```

Name
'('   Punctuation
'p'   Name
','   Operator
' '   Text.Whitespace
'lhs'   Name.Builtin
'~'   Operator
'('   Punctuation
'loops'   Name
'))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'Partition' Name
':'   Operator
'-'   Operator
'Pmap'   Name
'('   Punctuation
'z'   Name
'->'   Operator
'integrate' Name
'('   Punctuation
'z'   Name
','   Operator
'h'   Name
','   Operator
'loops'   Name
')'   Punctuation
','   Operator
'p'   Name
')'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
'\n   '
 Text.Whitespace
','   Operator
' '   Text.Whitespace
'm'   Name
','   Operator
' '   Text.Whitespace
'['   Punctuation

```
'"'         Punctuation
'no_split_disj' Name
'"'         Punctuation
']);'       Punctuation
'\n   '     Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'm'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
't_case'    Name
' '         Text.Whitespace
'and'       Keyword
' '         Text.Whitespace
'not'       Keyword
' '         Text.Whitespace
'depends'   Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'map'       Name.Builtin
'('         Punctuation
'lhs'       Name.Builtin
','         Operator
' '         Text.Whitespace
'loops'
        Name
'))'        Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n   '     Text.Whitespace
'subsop'    Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
'='         Operator
'map'       Name.Builtin
'('         Punctuation
'proc'      Keyword
'('         Punctuation
'b'         Name
' '         Text.Whitespace
```

```
'::'        Operator
' '         Text.Whitespace
'Branch'    Name
'('         Punctuation
'anything'  Name
','         Operator
' '         Text.Whitespace
'anything'  Name
'))'        Punctuation
'\n                ' Text.Whitespace
'eval'      Name.Builtin
'('         Punctuation
'subsop'    Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
'='         Operator
'"'         Punctuation
'integrate' Name
'"'         Punctuation
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','
      Operator
'b'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'x'         Name
','         Operator
' '         Text.Whitespace
'loops'     Name
')'         Punctuation
','         Operator
'b'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'x'         Name
'='         Operator
'h'         Name
')'         Punctuation
'\n                ' Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
','         Operator
```

```
'\n              ' Text.Whitespace
'op'          Name.Builtin
'('           Punctuation
'2'           Literal.Number.Integer
','           Operator
'm'           Name
'))'          Punctuation
','           Operator
'\n           ' Text.Whitespace
'm'           Name
');'          Punctuation
'\n   '       Text.Whitespace
'elif'        Keyword
' '           Text.Whitespace
'm'           Name
' '           Text.Whitespace
'::'
              Operator
' '           Text.Whitespace
'"'           Punctuation
'LO'          Name
'('           Punctuation
'name'        Name
','           Operator
' '           Text.Whitespace
'anything'    Name
')'           Punctuation
'"'           Punctuation
' '           Text.Whitespace
'then'        Keyword
'\n   '       Text.Whitespace
'eval'        Name.Builtin
'('           Punctuation
'op'          Name.Builtin
'('           Punctuation
'2'           Literal.Number.Integer
','           Operator
'm'           Name
')'           Punctuation
','           Operator
' '           Text.Whitespace
'op'          Name.Builtin
'('           Punctuation
'1'           Literal.Number.Integer
','           Operator
'm'           Name
')'           Punctuation
' '           Text.Whitespace
```

'='   Operator
' '   Text.Whitespace
'h'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'm'
 Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'Plate'   Name
'('   Punctuation
'nonnegint' Name
','   Operator
' '   Text.Whitespace
'name'   Name
','   Operator
' '   Text.Whitespace
'anything'   Name
')'   Punctuation
'"'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'# Unroll Plate when the bound is known. We unroll Plate here (instead\n' Comment.Single

'   '   Text.Whitespace
'# of unrolling Ints in reduce, for example) because we have no other\n' Comment.Single

'   '   Text.Whitespace
"# way to integrate certain Plates, namely those whose bodies' control\n" Comment.Single

'   '   Text.Whitespace
'# flows depend on the index.\n' Comment.Single

'   '   Text.Whitespace
'x'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'mk_sym'
    Name
'('   Punctuation
'"'   Punctuation
'pp'   Name

'"'	Punctuation
','	Operator
' '	Text.Whitespace
'h'	Name
');'	Punctuation
'\n '	Text.Whitespace
'x'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'['	Punctuation
'seq'	Name.Builtin
'('	Punctuation
'cat'	Name.Builtin
'('	Punctuation
'x'	Name
','	Operator
'i'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'i'	Name
'='	Operator
'0'	Literal.Number.Integer
'..'	Punctuation
'op'	Name.Builtin
'('	Punctuation
'1'	Literal.Number.Integer
','	Operator
'm'	Name
')'	Punctuation
'-'	Operator
'1'	Literal.Number.Integer
')];'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'op'	Name.Builtin
'('	Punctuation
'1'	Literal.Number.Integer
','	Operator
'm'	Name
')'	Punctuation
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace
'0'	Literal.Number.Integer

```
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'res'        Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'undefined'  Name
';'          Punctuation
'\n    '     Text.Whitespace
'else'       Keyword
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'm'          Name
')'          Punctuation
' '          Text.Whitespace
'='          Operator
' '          Text.Whitespace
'1'          Literal.Number.Integer
' '          Text.Whitespace
'then'
             Keyword
'\n    '     Text.Whitespace
'res'        Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'x'          Name
');'         Punctuation
'\n    '     Text.Whitespace
'else'       Keyword
'\n    '     Text.Whitespace
'res'        Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'idx'        Name
'('          Punctuation
'x'          Name
```

```
','        Operator
'op'       Name.Builtin
'('        Punctuation
'2'        Literal.Number.Integer
','        Operator
'm'        Name
'));'      Punctuation
'\n'       Text.Whitespace

'#         res := piecewise(seq(op([op(2,m)=i-1, op(i,x)]), i=2..op(1,m)),\n' Comment.Single

'#                  op(1,x));\n' Comment.Single

'     '    Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'if'
           Keyword
';'        Punctuation
'\n     '  Text.Whitespace
'res'      Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'mk_idx'   Name
'('        Punctuation
'res'      Name
','        Operator
' '        Text.Whitespace
'loops'    Name
');'       Punctuation
'\n    '   Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'if'       Keyword
';'        Punctuation
'\n    '   Text.Whitespace
'res'      Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'applyintegrand' Name
'('        Punctuation
'h'        Name
','        Operator
' '        Text.Whitespace
'mk_ary'   Name
'('        Punctuation
```

```
'"""'       Punctuation
'ary'       Name
'"""'       Punctuation
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'm'         Name
')'
            Punctuation
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'res'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'loops'     Name
'));'       Punctuation
'\n    '    Text.Whitespace
'for'       Keyword
' '         Text.Whitespace
'i'         Name
' '         Text.Whitespace
'from'      Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'm'         Name
')'         Punctuation
' '         Text.Whitespace
'to'        Keyword
' '         Text.Whitespace
'1'         Literal.Number.Integer
' '         Text.Whitespace
'by'        Keyword
' '         Text.Whitespace
'-'         Operator
```

'1'

       Literal.Number.Integer

' '   Text.Whitespace

'do'   Keyword

'\n   ' Text.Whitespace

'res'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'integrate' Name

'('   Punctuation

'eval'   Name.Builtin

'('   Punctuation

'op'   Name.Builtin

'('   Punctuation

'3'   Literal.Number.Integer

','   Operator

'm'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace

'op'   Name.Builtin

'('   Punctuation

'2'   Literal.Number.Integer

','   Operator

'm'   Name

')'   Punctuation

'='   Operator

'i'   Name

'-'   Operator

'1'   Literal.Number.Integer

')'   Punctuation

','   Operator

'\n   ' Text.Whitespace

'Integrand' Name

'('   Punctuation

'op'   Name.Builtin

'('   Punctuation

'i'   Name

','

     Operator

'x'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace

'res'   Name

')'   Punctuation

','   Operator

' '   Text.Whitespace
'loops'   Name
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'res'   Name
'\n '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'm'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'Plate'   Name
'('   Punctuation
'anything' Name
','   Operator
' '   Text.Whitespace
'name'   Name
','   Operator
' '   Text.Whitespace
'anything' Name
')'   Punctuation
'"'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n '   Text.Whitespace
'integrate'
  Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'h'   Name
','   Operator
' '   Text.Whitespace
'['   Punctuation
'op'   Name.Builtin

'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
'='   Operator
'0'   Literal.Number.Integer
'..'   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'm'   Name
')'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'loops'   Name
')])'   Punctuation
'\n   '   Text.Whitespace
'elif'
        Keyword
' '   Text.Whitespace
'm'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'Context'   Name
'('   Punctuation
'anything' Name
','   Operator
' '   Text.Whitespace
'anything' Name
')'   Punctuation
'"'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'applyop'   Name
'('   Punctuation
'integrate' Name
','   Operator
' '   Text.Whitespace
'2'   Literal.Number.Integer

','	Operator
' '	Text.Whitespace
'm'	Name
','	Operator
' '	Text.Whitespace
'h'	Name
','	Operator
' '	Text.Whitespace
'loops'	Name
')'	Punctuation
'\n '	Text.Whitespace
'elif'	Keyword
' '	Text.Whitespace
'h'	Name
' '	Text.Whitespace
'::'	Operator
' '	

Text.Whitespace

'appliable'	Name
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'x'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'gensym'	Name
'('	Punctuation
'"'	Punctuation
'xa'	Name
'"'	Punctuation
');'	Punctuation
'\n '	Text.Whitespace
'"'	Punctuation
'integrate'	Name
'"'	Punctuation
'('	Punctuation
'm'	Name
','	Operator
' '	Text.Whitespace
'Integrand'	Name
'('	Punctuation
'x'	Name
','	Operator
' '	Text.Whitespace
'h'	Name
'('	Punctuation
'x'	Name

```
'))'        Punctuation
','         Operator
' '         Text.Whitespace
'loops'     Name
')'         Punctuation
'\n   '     Text.Whitespace
'else'      Keyword
'\n    '    Text.Whitespace
'"""'       Punctuation
'procname'  Name
'(_'

            Punctuation
'passed'    Name
')'         Punctuation
'"""'       Punctuation
'\n   '     Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
'\n '       Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
'\n\n\n '   Text.Whitespace
'local'     Keyword
'\n '       Text.Whitespace
'integrate_known' Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'make'      Name
','         Operator
' '         Text.Whitespace
'makes'     Name
','         Operator
' '         Text.Whitespace
'var'       Name
','         Operator
' '         Text.Whitespace
'm'         Name
','         Operator
' '         Text.Whitespace
'h'         Name
','         Operator
' '         Text.Whitespace
```

```
'loops'      Name
' '          Text.Whitespace
'::'         Operator
'
'            Text.Whitespace
'list'       Name
'('          Punctuation
'name'       Name
'='          Operator
'range'      Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'$'          Operator
')'          Punctuation
'\n   '      Text.Whitespace
'local'      Keyword
' '          Text.Whitespace
'x'          Name
','          Operator
' '          Text.Whitespace
'dens'       Name
','          Operator
' '          Text.Whitespace
'bds'        Name
';'          Punctuation
'\n   '      Text.Whitespace
'x'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'mk_sym'     Name
'('          Punctuation
'var'        Name
','          Operator
' '          Text.Whitespace
'h'          Name
');'         Punctuation
'\n   '      Text.Whitespace
'dens'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'density'    Name
'['          Punctuation
'op'
             Name.Builtin
'('          Punctuation
```

'0'   Literal.Number.Integer
','   Operator
'm'   Name
')](('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'm'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'bds'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'bounds'   Name
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'm'   Name
')]('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'm'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'loops'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'[]'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'make'   Name
'('
         Punctuation
'dens'   Name
'('   Punctuation
'x'   Name
')'   Punctuation
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'applyintegrand' Name
'('   Punctuation

'h'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'x'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'bds'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'else'   Keyword
'\n   '   Text.Whitespace
'makes'   Name
'('   Punctuation
'foldl'   Name
'('   Punctuation
'product'   Name
','   Operator
' '   Text.Whitespace
'dens'   Name
'('   Punctuation
'mk_idx'   Name
'('   Punctuation
'x'   Name
','   Operator
'loops'   Name
'))'   Punctuation
','

   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'loops'   Name
'))'   Punctuation
'\n   ' Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'applyintegrand' Name
'('   Punctuation
'h'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
')'   Punctuation

```
','        Operator
'\n         ' Text.Whitespace
'x'        Name
','        Operator
' '         Text.Whitespace
'bds'       Name
','        Operator
' '         Text.Whitespace
'loops'     Name
')'         Punctuation
'\n    '    Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n '       Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
'\n'        Text.Whitespace

'end'       Keyword
' '         Text.Whitespace
'module'     Keyword
';'
        Punctuation
' '         Text.Whitespace
'#toLO\n'    Comment.Single
```

Teach Maple (through depends and eval) about our new binding forms.
forall bind from 1st arg to 2nd arg.
Ints,Sums,ints,sums bind from 2nd arg to 1st arg, and also from each element
of the 4th arg to the other elements on the left and to the 3rd arg.

```
`depends/forall` := proc(bvar, pred, x, $)
 depends(pred, x minus convert(bvar, 'set'))
end proc:

`depends/Ints` := proc(body, bvar, rng, loops, x, y, $)
 local xx, i;
 if nargs = 5 then
   xx := x; # y is ununsed and x lists the variables to look for
 else
   xx := y; # x is some KB and y lists the variables to look for
   if depends(x, y) then return true end if;
 end if;
 # don't remove bvar from xx!
 if depends(body, xx minus {bvar}) then return true end if;
```

```
  for i from nops(loops) to 1 by -1 do
    if depends(op([i,2],loops), xx) then return true end if;
    xx := xx minus {op([i,1],loops)};
  end do;
  depends(rng, xx)
end proc:
`depends/Sums` := eval(`depends/Ints`):
`depends/ints` := eval(`depends/Ints`):
`depends/sums`
  := eval(`depends/Ints`):


`eval/forall` := proc(e, eqs, $)
  local bvar, pred;
  bvar, pred := op(e);
  eval(op(0,e), eqs)(BindingTools:-generic_evalat(bvar, pred, eqs))
end proc:


`eval/Ints` := proc(e, eqs, $)
  local body, bvar, rng, loops, n, i;
  body, bvar, rng, loops := op(1..4, e);
  bvar, body := BindingTools:-generic_evalat(bvar, body, eqs);
  eval(op(0,e), eqs)(body, bvar,
              BindingTools:-generic_evalatstar(rng, loops, eqs),
              op(5..-1,e))
end proc:
`eval/Sums` := eval(`eval/Ints`):
`eval/ints` := eval(`eval/Ints`):
`eval/sums` := eval(`eval/Ints`):


`eval/Int` := proc(e, eqs, $)
  local body, bound, bvar;
  body, bound := op(1..2, e);
  if bound :: name then
    bound, body := BindingTools:-generic_evalat(bound, body, eqs);
  elif bound :: `=` then
    bvar := lhs(bound);
    bvar, body := BindingTools:-generic_evalat(bvar, body, eqs);
    bound := bvar = eval(rhs(bound), eqs);
  else
    body, bound := BindingTools:-generic_evalatstar(body,
  bound, eqs);
  end if;
  eval(op(0,e), eqs)(body, bound, op(eval([op(3..-1,e)], eqs)))
end proc:
`eval/Sum`    := eval(`eval/Int`):
`eval/Product` := eval(`eval/Int`):
`eval/int`    := eval(`eval/Int`):
`eval/sum`    := eval(`eval/Int`):
```

```
`eval/product` := eval(`eval/Int`):

###########################################################################

Loop := module ()
 option package;
 local intssums, enter_piecewise, wrap,
      t_peel, do_peel, do_split, do_graft, do_rebase_lower, do_rebase_upper,
      Binder, Stmt, t_binder, t_stmt, t_exp,
      ModuleLoad;
 export
    # These first few are smart constructors (for themselves):
      ints, sums,
    # while these are "proper functions"
      mk_HArray, genLoop, unproducts, unproduct,
      peel, split, graft, rebase_lower, rebase_upper, Print;
# these names are not assigned (and should not be).  But they are
# used as global names, so document that here.
 global Ints, Sums, csgn, sum, signum;
 uses Hakaru, KB, Utilities;

 t_binder := 'Binder(identical(product, Product, sum, Sum), t_kb)';
 t_stmt   := 'Stmt(anything, list, list)';
 t_exp    := '{Stmt(identical(exp), [], []),
             Stmt(identical(`^`), [anything], [])}';

 ints := proc() intssums('ints', 'int', _passed) end proc;
 sums := proc() intssums('sums', 'sum', _passed) end proc;

 Print := proc(kind::identical(Ints,Sums,ints,sums),e,v::name,r0::range,rs::list(name=range),$)
   local k;
   k := StringTools[Capitalize](StringTools[Chop](convert(kind,string)));
   k := parse(cat("`print/",eval(k),"`"));
   eval(k)(e,v[op(rs)]=r0);
 end proc;

 intssums := proc(makes::name, make::name,
             e::anything, x::name, rr::range, ll::list(name=range),
             kb::t_kb:=empty, $)
   local t, r, l, kb2, w0, pp, i;
   t := `if`(make=int, HReal(open_bounds(rr)), HInt(closed_bounds(rr)));
   r, l, kb2 := genLoop(rr, ll, kb, 'Integrand'(x,e));
   w0, pp := unproducts(e, x, l,
kb2);
   if depends(w0, x) then
     'makes(e, x, rr, ll)'
   else
     pp := 'make'(pp, x=r);
```

```
      for i in l do pp := 'product'(pp, i) end do;
      NewSLO:-simplify_factor_assuming(w0 * pp, kb);
    end if
end proc;


mk_HArray := proc(t::t_type, loops::list(name=range), $)
  local res, i;
  res := t;
  for i in loops do res := HArray(res) end do;
  res
end proc;


genLoop := proc(e, loops::list(name=range), kb::t_kb)
  local kb1, rng, ind, do_subst, i;
  kb1 := kb;
  rng := table();
  ind := table();
  do_subst := e -> foldl(((e,eq) -> eval(e, op([lhs(eq),1],loops)=rhs(eq))),
                    e, entries(ind, 'pairs'));
  for i from nops(loops) to 1 by -1 do
    rng[i] := do_subst(op([i,2],loops));
    ind[i], kb1 := genType(op([i,1],loops), HInt(closed_bounds(rng[i])),
                     kb1, _rest);
  end do;
  do_subst(e), zip(`=`, [entries(ind, 'nolist')],
              [entries(rng, 'nolist')]), kb1
end
proc;


unproducts := proc(w, x::name, loops::list(name=range), kb::t_kb, $)
  local w0, pp, j, w1, w2, loop;
  w0 := 1;
  pp := w;
  for j from nops(loops) to 1 by -1 do
    w1, pp := op(unproduct(pp, x, op(j,loops), [], `*`, kb, kb));
    # separate out each of the factors in w1, as they might have different
    # variable dependencies, which can be exploited by other routines
    w2 := convert(w1, 'list', `*`);
    for loop in [op(j+1..-1, loops)] do
      w2 := map((w -> product(eval(w, x=idx(x,lhs(loop))), loop)), w2);
    end do;
    w0 := w0 * `*`(op(w2));
    # w0 := w0 * foldl(product, w1, op(j+1..-1, loops));
  end do;
  # Rewrite ... * piecewise(i<=kk-1, xs^2, 1)
  #    to ... * xs ^ (2*piecewise(i<=kk-1, 1))
  # because the latter is easier to integrate and recognize with respect to xs
  pp := for_poly(pp, # TODO: move this rewrite into eval_factor (then remove for_poly?)?
```

```
    proc (p)
      local n, s, r;
      if p :: 'And(specfunc(piecewise),
anyfunc(freeof(x), anything, 1))' then
        n := indets(op(1,p),name);
        if op(2,p) :: {'exp(anything)', `^`('freeof'(n),'anything')} then
          s, r := selectremove(depends, convert(op([2,-1],p),'list',`*`), n);
          subsop(-1 = `*`(piecewise(op(1,p), `*`(op(s))), op(r)), op(2,p))
        else
          s, r := selectremove(depends, convert(op(2,p),'list',`*`), n);
          `*`(op(r)) ^ piecewise(op(1,p), 1)
            * `if`(nops(s) > 0, piecewise(op(1,p), `*`(op(s)), 1), 1)
        end if
      else
        p
      end if
    end proc);
  w0, pp
end proc;


# Find [w1,pp] so that
#   wrap(heap,w,mode,kb1,kb0)
#   = w1*product(eval(pp,var=idx(var,lhs(loop))),loop)
# making w1 depend on var as little as possible.
# The flag "mode" should be `+` if "heap" contains an entry of the form
# t_exp, or `*` otherwise.
unproduct := proc(w, var::name, loop::(name=range),
             heap::list, mode::identical(`*`,`+`),
             kb1::t_kb, kb0::t_kb, $)
  local ind, res, dummy, kb, kbThen, i, w1, pp, s, r, x;
  if not depends(w, var) then
    return [wrap(heap, w, mode, kb1, kb0), 1]
  end if;
  # The `..' (indices) of all occurences of `idx(var,..)'
  ind := map2(op, 2, indets(w, 'idx(identical(var), anything)'));
  if nops(ind) = 1 then
    ind := op(ind);
    # Make sure ind contains no bound variables before lifting it!
    # So, check that "extract using indets" and "rename using eval" commute.
    s := indets(ind, 'name');
    s := map(proc(x,$) local y; `if`(depends(ind,x), x=y, NULL) end proc, s);
    if indets(eval(w, s), 'idx(identical(var), anything)')
         = {idx(var, eval(ind, s))} then
      # use kb as a local context, and 'solve' for the innermost bound var
      #   used in ind.
      kb := assert(lhs(loop)=ind, kb1); # BUG! bijectivity assumed!
      # if the assertion makes the KB false, it isn't needed(?)
```

```
      ASSERT(type(kb, t_kb),
        sprintf("assert(%a,%a) produced a false KB!\n", lhs(loop)=ind,kb1)):
      res := subs(idx(var,ind) = idx(var,lhs(loop)), w);
      res := wrap(heap, res, mode, kb, kb0);
      res := subs(idx(var,lhs(loop))=dummy, res);
      if not depends(res, var) then
        return [1, subs(dummy=var, res)]
      end if
    end if
  end if;
  # distribute the unproduct over each part
  if w :: mode then
    res := map(unproduct, `if`(mode=`*`, list_of_mul(w), [op(w)]),
            var, loop, heap, mode, kb1, kb0);
    return [`*`(op(map2(op,1,res))), `*`(op(map2(op,2,res)))]
  end if;
  # for piecewise, just map right in (using KB for context tracking)
  if w :: 'specfunc(piecewise)' then
    kb := kb1;
    for i from 1 to nops(w) do
      if i :: even then
        kbThen := assert(   op(i-1,w) , kb);
        # accumulate the rest, regardless
        kb    := assert(Not(op(i-1,w)), kb);

        # if kbThen
is invalid, deal appropriately
        if not type(kbThen,t_kb) then next end if;

        w1[i], pp[i] := op(unproduct(op(i,w),var,loop,heap,mode,kbThen,kb0));
        # if kb is inconsistent, we're done
        if not type(kb,t_kb) then break end if;
      elif i = nops(w) then
        if not type(kb,t_kb) then next end if;
        w1[i], pp[i] := op(unproduct(op(i,w),var,loop,heap,mode,kb   ,kb0))
      end if
    end do;
    return [`*`(entries(w1,'nolist')), `*`(entries(pp,'nolist'))]
  end if;
  if mode = `*` then
    if w :: (anything^freeof(var)) then
      return unproduct(op(1,w), var, loop,
                [op(heap), Stmt(`^`, [], [op(2,w)])], `*`, kb1, kb0)
    elif w :: exp(anything) then
      return unproduct(op(1,w), var, loop,
                [op(heap), Stmt(exp, [], [])], `+`, kb1, kb0)
    elif w :: (freeof(var)^anything) then
      return unproduct(op(2,w), var, loop,
```

```
                         [op(heap), Stmt(`^`,
[op(1,w)], [])], `+`, kb1, kb0)
      end if
    end if;
    if mode = `+` and w :: `*` then
      s, r := selectremove(depends, w, var);
      if s :: `*` then
        # Nonlinear %1 (time to reread kiselyov-lifted?)
      else
        return unproduct(s, var, loop,
                    [op(heap), Stmt(`*`, [], [r])], `+`, kb1, kb0)
      end if
    end if;
    if w :: And(specfunc(`if`(mode = `*`, {product, Product}, {sum, Sum})),
            anyfunc(anything, name=range(freeof(var)))) then
      x, kb := genType(op([2,1],w), HInt(closed_bounds(op([2,2],w))), kb1,
                w, var, loop, heap);
      return unproduct(eval(op(1,w), op([2,1],w)=x), var, loop,
                [op(heap), Binder(op(0,w), kb1)], mode, kb, kb0)
    end if;
    if mode = `*` and w :: '{`+`, specfunc({sum, Sum})}' then
      # Maybe this w is one of those big sums involving products that are
      # always equal to 1, left behind by the density of Categorical
      w1 := graft(split(peel(w)));
      w1 := combine(rebase_upper(w1));
      w1 := combine(rebase_lower(w1));
      return [wrap(heap, w1, mode, kb1, kb0), 1]
    end if;
    return [wrap(heap, w, mode, kb1, kb0), 1]
  end proc;

  enter_piecewise := proc(ee, kb0::t_kb, mode::identical(`*`,`+`), $)
    local e, kb, mo;
    e  := ee;
    kb := kb0;
    mo := mode();
    while e :: 'specfunc(piecewise)' and nops(e) = 3 do
      if op(3,e) = mo then
        kb := assert(op(1,e), kb);
        e := op(2,e);
      elif op(2,e) = mo then
        kb := assert(Not(op(1,e)), kb);
        e := op(3,e);
      else
        break;
      end if;
    end do;
    ASSERT(type(kb,t_kb), "enter_piecewise: KB of piecewise conditions is not valid, so the input piecewise must
```

```
not be valid.");
   e, kb
end proc;


# heap is a list of t_binder and t_stmt
# one invariant to maintain:
#  wrap(heap, mode(a,b)) = wrap(heap,a) * wrap(heap,b)


# Also, a t_binder is a Product/product/Sum/sum.
# And, a t_stmt is a 1-hole
context of a (multiplicative) AST,
#  used for [a ^ hole, hole ^ b, exp(hole), c * hole].


wrap := proc(heap::list, e1, mode1::identical(`*`,`+`),
         kb1::t_kb, kb0::t_kb, $)
  local e, kb, mode, i, entry, rest, var, new_rng, make, logmake,
    dom_spec, w, wPow, wExp, arrrgs;
  e   := e1;
  kb   := kb1;
  mode := mode1;
  for i from nops(heap) to 1 by -1 do
    entry := op(i,heap);
    if entry :: t_binder then
     if not (op(1,entry) in `if`(mode=`+`, {sum,Sum},
                           {product,Product})) then
       print("Warning: heap mode inconsistency", heap, mode1)
     end if;
     e, kb := enter_piecewise(e, kb, mode);
     rest := kb_subtract(kb, op(2,entry));
     new_rng, rest := selectremove(type, rest,
       {[identical(genType), name, specfunc(HInt)],
        [identical(genLet), name, anything]});
     if not (new_rng :: [list]) then
       error "kb_subtract should return exactly
one gen*"
     end if;
     new_rng := op(new_rng);
     var    := op(2,new_rng);
     if op(1,new_rng) = genType then
       make   := op(1,entry);
       new_rng := range_of_HInt(op(3,new_rng));
     else # op(1,new_rng) = genLet
       make   := eval;
       new_rng := op(3,new_rng);
     end if;
     dom_spec, rest := selectremove(depends,
       map(proc(a::[identical(assert),anything],$) op(2,a) end proc, rest),
       var);
```

```
    # Like e := make(piecewise(And(op(dom_spec)), e, mode()), var=new_rng);
    # but try to simplify by pushing the make and the piecewise into e
    (e, w) := selectremove(depends, convert(e, 'list', `*`), var);
    w := `*`(op(w));
    if mode = `*` then
      (wPow, e) := selectremove(type, e, `^`('freeof'(var), 'anything'));
      (wExp, e) := selectremove(type, e, 'exp(anything)');
      wExp := `+`(op(map2(op, 1, wExp)));
      wExp := expand(wExp, op(indets(wExp, function)));
      logmake := proc(t)
       local s, r;
       s, r := selectremove(depends, convert(t, 'list', `*`), var);
       `*`(op(r),
          `if`(make=eval,eval,Sum)
            (piecewise_And(dom_spec, `*`(op(s)), 0), var=new_rng));
      end proc;
      w := `*`( `if`(w = 1, 1, w ^ logmake(1))
            , op(map((f -> op(1,f) ^ logmake(op(2,f))), wPow))
            , `if`(wExp = 0, 1, exp(maptype(`+`,logmake,wExp))) );
    end if;
    e := w * make(piecewise_And(dom_spec, `*`(op(e)), mode()), var=new_rng);

    # `rest' originally comes from `entry', and this reinserts it after some
    # processing. The original KB was valid, so this one should also be valid.
    kb := foldr(assert, op(2,entry), op(rest));
    ASSERT(type(kb,t_kb), "Loop/wrap{t_binder}: rebuilding kb produced contradiction");

  elif entry :: t_stmt then
    # We evaluate arrrgs first, in case op(1,stmt) is an operation (such
as
    # piecewise) that looks ahead at how many arguments it is passed before
    # they are evaluated.
    arrrgs := op(op(2,entry)), e, op(op(3,entry));
    e      := op(1,entry)(arrrgs);
    if entry :: t_exp then
      if mode <> `+` then
        print("Warning: heap mode inconsistency?", heap, mode1)
      end if;
      mode := `*`;
    end if
  else error "Malformed heap entry %1", entry end if
end do;
if mode <> `*` then
  print("Warning: heap mode inconsistency??", heap, mode1)
end if;
e, kb := enter_piecewise(e, kb, mode);
rest := kb_subtract(kb, kb0);
```

```
      rest := map(proc(a::[identical(assert),anything],$) op(2,a) end proc, rest);
     (wExp, e) := selectremove(type, convert(e, 'list', `*`), 'exp(anything)');
     wExp := `+`(op(map2(op, 1, wExp)));
     wExp := expand(wExp, op(indets(wExp, function)));
     logmake := (t -> t * piecewise_And(rest,1,0));
     `if`(wExp = 0, 1, exp(maptype(`+`,logmake,wExp)))

       * piecewise_And(rest,`*`(op(e)),1);
    end proc;


    # Rewrite product(...piecewise(i+42=lo+42,th,el)...,i=lo..hi)
    # to eval(...th...,i=lo)*product(...el...,i=lo+1..hi)
    t_peel := 'And(specfunc({sum,Sum,product,Product}),
             anyfunc(anything, name=range))';
    peel := proc(e, $)
     subsindets(e, t_peel, do_peel);
    end proc;
    do_peel := proc(e, $)
     local make, body, x, r, cond, line, test, x0, r0, cond0, here, rest;
     if not (e :: t_peel) then return e end if;
     if  op(0,e) in '{sum   ,Sum    }' then make := `+`;
     elif op(0,e) in '{product,Product}' then make := `*`; end if;
     body, r := op(e);
     x, r   := op(r);
     for cond in indets(body, '{`=`(algebraic),`<`,`<=`}') do
      line := `-`(op(cond));
      if 1 <> degree(line, x) then next end if;
      if cond :: `=` then
       cond0 := true;
       if Testzero(eval(line, x=lhs(r))) then
        x0 := lhs(r); r0 := applyop(`+`, 1, r, 1);
       elif Testzero(eval(line, x=rhs(r))) then

      x0 := rhs(r); r0 := applyop(`-`, 2, r, 1);
       else next end if;
      else
       test := proc(x0, x1, $)
        local res;
        res := evalb(not op(0,cond)(eval(line, x=x1), 0));
        `if`(res in '{true,false}'
            and evalb(op(0,cond)(eval(line, x=x0), 0)) = res,
          res,
          FAIL)
       end proc;
       cond0 := test(lhs(r), lhs(r)+1);
       if cond0 <> FAIL then
        x0 := lhs(r); r0 := applyop(`+`, 1, r, 1);
       else
```

```
      cond0 := test(rhs(r), rhs(r)-1);
      if cond0 <> FAIL then
        x0 := rhs(r); r0 := applyop(`-`, 2, r, 1);
      else next end if;
     end if;
    end if;
   here := subs(cond =        cond0 , body);
   rest := subs(cond = evalb(not cond0), body);
   return make(eval(here, x=x0), do_peel(eval(subsop(1=rest, [2,2]=r0, e))));
  end do;
  return e;
end proc;


# Expand sum(a*(b-c),q) to sum(a*b,q)-sum(a*c,q)
split := proc(e, $)
  subsindets(e, 'And(specfunc({sum,Sum}),
               anyfunc(And(`*`,Not(`*`(Not(`+`)))),name=anything))',
          do_split);
end proc;
do_split := proc(e, $)
  local terms, x;
  terms := convert(expand(op(1,e), op(indets(op(1,e), function))),
             'list', `+`);
  x := op([2,1],e);
  `+`(op(map(proc(term, $)
    local s, r;
    s, r := selectremove(depends, convert(term, 'list', `*`), x);
    `*`(op(r), subsop(1=`*`(op(s)),e))
  end proc, terms)))
end proc;


# Simplify f(lo-1)*product(f(i),i=lo..hi) to product(f(i),i=lo-1..hi)
graft := proc(e, $)
  subsindets(e, 'Or(And(`*`,Not(`*`(Not(specfunc({product,Product}))))),
             And(`+`,Not(`+`(Not(specfunc({sum   ,Sum   })))))',
          do_graft);
end proc;
do_graft := proc(e, $)
  local produce, factors, i, j;
  produce := `if`(e::`*`, '{product,Product}',
               '{sum   ,Sum   }');
  factors := sort(convert(e,'list'),

      key = (factor -> -numboccur(factor,produce)));
  for i from nops(factors) to 2 by -1 do
    for j from i-1 to 1 by -1 do
      if op(j,factors) :: 'And'('specfunc'(produce),
                   'anyfunc(anything,name=range)') then
```

```
    if Testzero(op(i,factors) - eval(op([j,1],factors),
        op([j,2,1],factors)=op([j,2,2,1],factors)-1)) then
      factors := subsop(i=NULL,applyop(`-`,[j,2,2,1],factors,1));
      break
    elif Testzero(op(i,factors) - eval(op([j,1],factors),
        op([j,2,1],factors)=op([j,2,2,2],factors)+1)) then
      factors := subsop(i=NULL,applyop(`+`,[j,2,2,2],factors,1));
      break
    end if
   end if
  end do
 end do;
 op(0,e)(op(factors))
end proc;


# Normalize sum(f(i),i=2..hi) to sum(f(i+2),i=0..hi-2)
rebase_lower := proc(e, $)
  subsindets(e, 'And(specfunc({sum,Sum,product,Product}),
              anyfunc(anything,

    name=Not({0,SymbolicInfinity,undefined})..anything))',
        do_rebase_lower);
end proc;
do_rebase_lower := proc(e, $)
  subsop([2,2,1]=0,
      applyop(`-`,
          [2,2,2],
          applyop(eval, 1, e, op([2,1],e)=op([2,1],e)+op([2,2,1],e)),
          op([2,2,1],e)))
end proc;


# Normalize sum(f(i),i=lo..2) to sum(f(i+2),i=lo-2..0)
rebase_upper := proc(e, $)
  subsindets(e, 'And(specfunc({sum,Sum,product,Product}),
              anyfunc(anything,
                name=anything..Not({0,SymbolicInfinity,undefined})))',
        do_rebase_upper);
end proc;
do_rebase_upper := proc(e, $)
  subsop([2,2,2]=0,
      applyop(`-`,
          [2,2,1],
          applyop(eval, 1, e, op([2,1],e)=op([2,1],e)+op([2,2,2],e)),
          op([2,2,2],e)))
end proc;


ModuleLoad := proc($)
 # Override csgn to work a little bit harder on piecewise and sum
```

```
   # (to get rid
of csgn(1/2+1/2*sum(piecewise(...,1,0),...))
   #  produced by int on a Gaussian mixture model)
   unprotect(csgn);
   csgn := overload([
     # Handle if the csgn of a piecewise doesn't depend on which branch
     proc(a :: specfunc(piecewise), $)
       option overload;
       local r, i;
       r := {seq(`if`(i::even or i=nops(a), csgn(op(i,a)), NULL),
             i=1..nops(a))};
       if nops(r)=1 then return op(r) end if;
       if not assigned(_Envsignum0) then
         r := r minus {0};
         if nops(r)=1 then return op(r) end if;
       end if;
       error "invalid input: cannot csgn %1", a;
     end proc,
     # Handle if the csgn of a sum doesn't depend on the bound variable
     proc(a :: And(specfunc({sum, Sum}), anyfunc(anything, name=range)), $)
       option overload;
       local r;
       r := csgn(op(1,a));
       if not depends(r,op([2,1],a)) then
         return signum(op([2,2,2],a)+1-op([2,2,1],a)) * r
       end if;
       error
"invalid input: cannot csgn %1", a;
     end proc,
     csgn]);
   protect(csgn);

   # Do the same to signum.
   unprotect(signum);
   signum := overload([
     # Handle if the signum of a piecewise doesn't depend on which branch
     proc(a :: specfunc(piecewise), $)
       option overload;
       local r, i;
       r := {seq(`if`(i::even or i=nops(a), signum(op(i,a)), NULL),
             i=1..nops(a))};
       if nops(r)=1 then return op(r) end if;
       if not assigned(_Envsignum0) then
         r := r minus {0};
         if nops(r)=1 then return op(r) end if;
       end if;
       error "invalid input: cannot signum %1", a;
     end proc,
```

```
    # Handle if the signum of a sum doesn't depend on the bound variable
    proc(a :: And(specfunc({sum, Sum}), anyfunc(anything, name=range)), $)
      option overload;
      local r;
      r := signum(op(1,a));
      if not depends(r,op([2,1],a)) then
        return signum(op([2,2,2],a)+1-op([2,2,1],a))
* r
      end if;
      error "invalid input: cannot signum %1", a;
    end proc,
    signum]);
  protect(signum);


  # Override sum to fail faster
  unprotect(sum);
  sum := overload([
    proc(f :: Not({`+`,`+`^integer}),
        k :: name=And(range,Not(range(rational))), $)
      option overload;
      if not (`-`(op(rhs(k))) :: 'rational')
        and not (subsindets(f, 'anything^integer', f->op(1,f))
              :: '{`+`,And(`*`,Not(`*`(Not(`+`))))}')
        and depends(indets(f, '{specfunc(idx), specindex(idx)}'), op(1,k))
      then
        'procname(_passed)'
      else
        error "invalid input: cannot fast-fail sum(%1, %2)", _passed
      end if
    end proc,
    sum]);
  protect(sum);

  :-`print/Ints` := curry(thismodule:-Print,Ints);
  :-`print/Sums` := curry(thismodule:-Print,Sums);
  :-`print/ints` := curry(thismodule:-Print,ints);
  :-`print/sums` := curry(thismodule:-Print,sums);


end proc;
ModuleLoad():
end
module; # Loop
'# New ports collection makefile for:    python25\n' Comment


'# Date created:        3 July 2003\n' Comment


'# Whom:            Hye-Shik Chang <perky@FreeBSD.org>\n' Comment
```

'#\n'   Comment

'# $FreeBSD: ports/lang/python25/Makefile,v 1.145 2007/10/03 23:22:04 edwin Exp $\n' Comment

'\n'   Text.Whitespace

'PORTNAME'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python25'   Text
'\n'   Text.Whitespace

'PORTVERSION' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'2'   Literal.Number
'.5.1'   Text
'\n'   Text.Whitespace

'CATEGORIES' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'lang'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'ipv6'   Text
'\n'   Text.Whitespace

'MASTER_SITES' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_MASTER_SITES' Name.Variable
'}'
     Literal.String.Interpol
'\n'   Text.Whitespace

'MASTER_SITE_SUBDIR' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_MASTER_SITE_SUBDIR' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'DISTFILES' Name.Variable
'='   Operator

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_DISTFILE' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'MAINTAINER' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python@FreeBSD.org' Text
'\n'   Text.Whitespace

'COMMENT'   Name.Variable
'?='   Operator
'\t'   Text.Whitespace
'An'   Text
' '   Text.Whitespace
'interpreted' Text
' '   Text.Whitespace
'object-oriented' Text
' '   Text.Whitespace
'programming' Text
' '   Text.Whitespace
'language'   Text
'\n'
         Text.Whitespace

'\n'   Text.Whitespace

'DIST_SUBDIR' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python'   Text
'\n'   Text.Whitespace

'WRKSRC'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/portbld.static' Text
'\n'   Text.Whitespace

'PATCH_WRKSRC' Name.Variable
'='   Operator

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'GNU_CONFIGURE' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'CONFIGURE_TARGET' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'--build'   Text
'='   Operator
'${'   Literal.String.Interpol
'MACHINE_ARCH' Name.Variable
'}'   Literal.String.Interpol
'-portbld-freebsd'
 Text
'${'   Literal.String.Interpol
'OSREL'   Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'CONFIGURE_SCRIPT' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'../configure' Text
' '   Text.Whitespace
'# must be relative\n' Comment.Single

'CONFIGURE_ENV' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'OPT'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'CFLAGS'   Name.Variable
'}'   Literal.String.Interpol
'"'   Literal.String.Double
' '   Text.Whitespace
'SVNVERSION' Name.Variable
'='   Operator
'"echo freebsd"' Literal.String.Double

'\n'   Text.Whitespace

'MAKE_ENV'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'VPATH'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'${'   Literal.String.Interpol
'PYTHON_WRKSRC'
 Name.Variable
'}'   Literal.String.Interpol
'""'   Literal.String.Double
'\n'   Text.Whitespace

'INSTALLS_SHLIB' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'INSTALL_TARGET' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'altinstall' Text
'\n'   Text.Whitespace

'MAN1'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.1'   Text
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'USE_PYTHON' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'PYTHON_VERSION' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'python2.5'   Text

'\n'   Text.Whitespace

'PYTHON_NO_DEPENDS' Name.Variable
'='
        Operator
'\t'   Text.Whitespace
'yes'   Text
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'SHARED_WRKSRC' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/portbld.shared' Text
'\n'   Text.Whitespace

'PLIST'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/PLIST'   Text
'\n'   Text.Whitespace

'PLIST_TEMPLATE' Name.Variable
'?='   Operator
'${'   Literal.String.Interpol
'PKGDIR'   Name.Variable
'}'   Literal.String.Interpol
'/pkg-plist' Text
'\n'   Text.Whitespace

'PLIST_SUB'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'PYVER'   Name.Variable
'='   Operator
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'
        Punctuation
'S'   Name.Variable
'/python//' Punctuation

'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'PYVER_WITHPAT' Name.Variable
'='   Operator
'${'   Literal.String.Interpol
'PORTVERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/.c/c/'   Punctuation
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'DEMODIR'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/share/examples/' Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'TOOLSDIR'   Name.Variable
'='   Operator
'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'
   Literal.String.Interpol
'/share/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'BIN_SCRIPTS' Name.Variable
'='   Operator
'\t'   Text.Whitespace
'idle'   Text
' '   Text.Whitespace
'pydoc'   Text

```
' '       Text.Whitespace
'python'    Text
' '       Text.Whitespace
'python-shared' Text
' '       Text.Whitespace
'smtpd.py'   Text
' '       Text.Whitespace
'python-config' Text
' '       Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'     Text.Whitespace
'python-shared-config' Text
'\n'       Text.Whitespace

'BINLINKS_SUB' Name.Variable
'='       Operator
'\t'      Text.Whitespace
'-e'      Text
' '       Text.Whitespace
"'s,smtpd,smtpd${PYTHON_VER},'" Literal.String.Single
' '       Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'     Text.Whitespace
'-e'
      Text
' '       Text.Whitespace
"'s,(idle|pydoc|python-shared|python),\\1${PYTHON_VER},'" Literal.String.Single
'\n\n'      Text.Whitespace

'OPTIONS'    Name.Variable
'='       Operator
'\t'      Text.Whitespace
'THREADS'    Text
' '       Text.Whitespace
'"Enable thread support"' Literal.String.Double
' '       Text.Whitespace
'on'      Text
' '       Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'     Text.Whitespace
'HUGE_STACK_SIZE' Text
' '       Text.Whitespace
'"Use a larger thread stack"' Literal.String.Double
' '       Text.Whitespace
'off'      Text
```

' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'UCS4'   Text
' '   Text.Whitespace
'"Use UCS4 for unicode support"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'PYMALLOC'
  Text
' '   Text.Whitespace
'"Use python\'s internal malloc"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'IPV6'   Text
' '   Text.Whitespace
'"Enable IPv6 support"' Literal.String.Double
' '   Text.Whitespace
'on'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'FPECTL'   Text
' '   Text.Whitespace
'"Enable floating point exception handling"' Literal.String.Double
' '   Text.Whitespace
'off'   Text
'\n\n'   Text.Whitespace

'.include <bsd.port.pre.mk>\n' Comment.Preproc

'\n'   Text.Whitespace

'.if ${PYTHON_VERSION} == ${PYTHON_DEFAULT_VERSION}\n' Comment.Preproc

'MLINKS'   Name.Variable
'='   Operator
'\t\t'   Text.Whitespace

'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.1'
      Text
' '   Text.Whitespace
'python.1'   Text
'\n'   Text.Whitespace

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'IF_DEFAULT' Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'IF_DEFAULT' Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'# workaround for a bug in base curses.h.\n' Comment

'CFLAGS'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'-D__wchar_t' Text
'='   Operator
'wchar_t'   Text
'\n'   Text.Whitespace

'\n'   Text.Whitespace

'.if !defined(WITHOUT_THREADS)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace

'--with-threads'
 Text
'\n'   Text.Whitespace

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PTHREAD_CFLAGS' Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'.if defined(WITHOUT_HUGE_STACK_SIZE)\n' Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'-DTHREAD_STACK_SIZE' Text
'='   Operator
'0x20000'   Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'-DTHREAD_STACK_SIZE' Text
'='   Operator
'0x100000'   Text
'\n'   Text.Whitespace

'.endif # defined(WITHOUT_HUGE_STACK_SIZE)\n' Comment.Preproc

'CONFIGURE_ENV' Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'LDFLAGS'   Name.Variable
'='   Operator
'"'   Literal.String.Double
'${'   Literal.String.Interpol
'PTHREAD_LIBS'
 Name.Variable
'}'   Literal.String.Interpol
' '   Literal.String.Double
'${'   Literal.String.Interpol
'LDFLAGS'   Name.Variable
'}'   Literal.String.Interpol

'""'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--without-threads' Text
'\n'   Text.Whitespace

'.if defined(LDFLAGS)\n' Comment.Preproc

'CONFIGURE_ENV' Name.Variable
'+='   Operator
'\t\t'   Text.Whitespace
'LDFLAGS'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'${'   Literal.String.Interpol
'LDFLAGS'   Name.Variable
'}'   Literal.String.Interpol
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.endif # defined(LDFLAGS)\n' Comment.Preproc

'.endif # !defined(WITHOUT_THREADS)\n' Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(WITHOUT_UCS4) && !defined(WITH_UCS2)\n'
Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'--enable-unicode' Text
'='   Operator
'ucs4'   Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if defined(WITHOUT_PYMALLOC)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
'   '   Text.Whitespace
'--without-pymalloc' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if ${ARCH} == i386\n' Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'X86_ONLY'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'X86_ONLY'   Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'
   Comment.Preproc

'.if ${ARCH} == amd64 || ${ARCH} == ia64 || ${ARCH} == sparc64 || ${ARCH} == alpha\n' Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'   '   Text.Whitespace
'32BIT_ONLY' Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'   '   Text.Whitespace

'32BIT_ONLY' Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'.if ${ARCH} == sparc64\n' Comment.Preproc

'CFLAGS'   Name.Variable
'+='   Operator
'   '   Text.Whitespace
'-DPYTHON_DEFAULT_RECURSION_LIMIT' Text
'='   Operator
'900'   Literal.Number
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if !exists(/usr/bin/ypcat) # the world with NO_NIS\n' Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='
          Operator
'\t'   Text.Whitespace
'NO_NIS'   Name.Variable
'='   Operator
'"@comment "' Literal.String.Double
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLIST_SUB'   Name.Variable
'+='   Operator
'\t'   Text.Whitespace
'NO_NIS'   Name.Variable
'='   Operator
'""'   Literal.String.Double
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(WITHOUT_IPV6)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--enable-ipv6' Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--disable-ipv6' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if defined(WITH_FPECTL)\n' Comment.Preproc

'CONFIGURE_ARGS' Name.Variable
'+='   Operator
' '   Text.Whitespace
'--with-fpectl'
 Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'.if ${OSVERSION} >= 700000\n' Comment.Preproc

'PLATFORMS'   Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace
'plat-freebsd5' Text
' '   Text.Whitespace
'plat-freebsd6' Text
'\n'   Text.Whitespace

'.elif ${OSVERSION} >= 600000\n' Comment.Preproc

'PLATFORMS'   Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace

'plat-freebsd5' Text
' '   Text.Whitespace
'plat-freebsd7' Text
'\n'   Text.Whitespace

'.else\n'   Comment.Preproc

'PLATFORMS'   Name.Variable
'='   Operator
'plat-freebsd4' Text
' '   Text.Whitespace
'plat-freebsd6' Text
' '   Text.Whitespace
'plat-freebsd7' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'pre-patch'   Name.Function
':'   Operator
'\n'   Text.Whitespace

'\t'
          Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Modules'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Tools/scripts/pydoc' Text
' '   Text.Whitespace
'>'   Text
' '

          Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/pydoc2.5' Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Tools/scripts/idle' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/idle2.5'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '

          Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'1s,^.*$$,#!${PREFIX}/bin/${PYTHON_VERSION},'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'	Text.Whitespace
'${'	Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'	Literal.String.Interpol
'/Lib/smtpd.py' Text
' '	Text.Whitespace
'>'	Text
' '	Text.Whitespace
'${'	Literal.String.Interpol
'WRKDIR'	Name.Variable
'}'	Literal.String.Interpol
'/smtpd2.5.py' Text
'\n\t'	Text.Whitespace
'${'	Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'	Literal.String.Interpol
' '	Text.Whitespace
'-e'	Text
' '	Text.Whitespace
'\\\n'	Literal.String.Escape

'\t\t'	Text.Whitespace
"'s,/usr/doc/python-docs-,${PREFIX}/share/doc/python,g'" Literal.String.Single
' '	Text.Whitespace
'\\\n'	Literal.String.Escape

'\t\t'
	Text.Whitespace
'${'	Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'	Literal.String.Interpol
'/Lib/pydoc.py' Text
'\n\t'	Text.Whitespace
'${'	Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'	Literal.String.Interpol
' '	Text.Whitespace
'-e'	Text
' '	Text.Whitespace
'\\\n'	Literal.String.Escape

'\t\t'	Text.Whitespace
'\'s|^\\(*prefixes = .*\\)\\]$$|\\1, "${X11BASE}"]|g\'' Literal.String.Single
' '	Text.Whitespace
'\\\n'	Literal.String.Escape

'\t\t'	Text.Whitespace

'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Lib/site.py' Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'
 Text.Whitespace
"'s|^\t\\(..ASDLGEN.*\\)$$|\t${TRUE}|g'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile.pre.in' Text
'\n\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'REINPLACE_CMD' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
"'s|*\\(..INSTALL_SCRIPT.*\\)python-config$$|#port \\1|'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile.pre.in' Text
'\n\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'

Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s|^#!.*|#!${PREFIX}/bin/${PYTHON_VERSION}|'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python-config.in' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'-config'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s|^#!.*|#!${PREFIX}/bin/${PYTHON_VERSION:S/thon/thon-shared/}|'"
 Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PATCH_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Misc/python-config.in' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text

'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'-config'   Text
'\n\n'   Text.Whitespace

'.if defined(WITH_FPECTL) && ${ARCH} == i386\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'
             Literal.String.Interpol
'/Modules'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'ECHO'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'"fpectl fpectlmodule.c"' Literal.String.Double
' '   Text.Whitespace
'>>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
'/Modules/Setup.dist' Text
'\n'   Text.Whitespace

'.endif\n'   Comment.Preproc

'\n'   Text.Whitespace

'post-configure' Name.Function
':'   Operator
'\n'   Text.Whitespace

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol

```
' '         Text.Whitespace
'-C'        Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'WRKSRC'    Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-cf'
        Text
' '         Text.Whitespace
'-'         Text
' '         Text.Whitespace
'.'         Text
' '         Text.Whitespace
'|'         Punctuation
' '         Text.Whitespace
'${'        Literal.String.Interpol
'TAR'       Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-C'        Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-xf'       Text
' '         Text.Whitespace
'-'         Text
'\n\t'      Text.Whitespace
'${'        Literal.String.Interpol
'LN'        Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-sf'       Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'         Literal.String.Interpol
'/Lib'      Text
' '         Text.Whitespace
'${'        Literal.String.Interpol
'WRKSRC'
    Name.Variable
'}'         Literal.String.Interpol
'/Lib'      Text
'\n\t'      Text.Whitespace
'${'        Literal.String.Interpol
```

'SED'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(LDLIBRARY=\\).*$$,\\1libpython$$(VERSION).so,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(BLDLIBRARY=\\).*$$,\\1-L. -lpython$$(VERSION),'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(CFLAGSFORSHARED=\\).*$$,\\1$$(CCSHARED),'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(Makefile Modules/config.c:.*\\)Makefile.pre,\\1,'"
 Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(.(BUILDPYTHON)\\: .*\\).(LIBRARY),\\1,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'-e'   Text
' '   Text.Whitespace
"'s,^\\(.(BUILDPYTHON):.*\\).(LIBRARY),\\1,'" Literal.String.Single
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable

'}'   Literal.String.Interpol
'/Makefile' Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Makefile' Text
'\n\n'   Text.Whitespace

'pre-build' Name.Function
':'   Operator
'\n'
        Text.Whitespace

'\t'   Text.Whitespace
'cd'   Name.Builtin
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SETENV'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'MAKE_ENV'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'MAKE'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
' '   Text.Whitespace
'python'   Text
';'   Punctuation
' '   Text.Whitespace

'\\\n'
      Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-f'   Text
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
' '   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
';'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-f'   Text
' '   Text.Whitespace
'python'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'
 Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
'\n\n'   Text.Whitespace

'pre-su-install' Name.Function
':'   Operator
'\n'   Text.Whitespace

'.for platform in ${PLATFORMS}\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'platform'   Name.Variable
'}'   Literal.String.Interpol
'\n'   Text.Whitespace

'.for file in IN.py regen\n' Comment.Preproc

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_DATA' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'
 Literal.String.Interpol
'/Lib/'   Text
'${'   Literal.String.Interpol
'platform'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'file'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'platform'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'\n'   Text.Whitespace

'.endfor\n' Comment.Preproc

'.endfor\n' Comment.Preproc

'\n'   Text.Whitespace

'pre-install' Name.Function
':'   Operator
'\n'   Text.Whitespace

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'CAT'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'
    Literal.String.Interpol
'PLIST_TEMPLATE' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'|'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'AWK'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\'{ print $$0; } \\\n\t/LIBDIR.*\\.py$$/ && !/\\/bad/ { print $$0 "o"; print $$0 "c"; }\'' Literal.String.Single
'\t'   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PLIST'   Name.Variable
'}'   Literal.String.Interpol
'\n\n'   Text.Whitespace

"\t@# if openssl 0.9.8 is detected, _sha{256,512} module won't be installed\n" Comment

'\t'   Text.Whitespace
'('   Operator
'['   Operator
' '   Text.Whitespace
'-f'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKSRC'   Name.Variable
'}'   Literal.String.Interpol
'/.without_own_sha'

Text
' '   Text.Whitespace
']'   Operator
' '   Text.Whitespace
'&&'   Operator
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'GREP'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-v'   Text
' '   Text.Whitespace
"'lib-dynload/_sha'" Literal.String.Single
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PLIST'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PLIST'   Name.Variable
'}'   Literal.String.Interpol
'.tmp'   Text
' '   Text.Whitespace
'&&'   Operator
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'CAT'   Name.Variable
'}'
            Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PLIST'   Name.Variable
'}'   Literal.String.Interpol
'.tmp'   Text
' '   Text.Whitespace
'>'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PLIST'   Name.Variable
'}'   Literal.String.Interpol

')'   Operator
' '   Text.Whitespace
'||'   Operator
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TRUE'   Name.Variable
'}'   Literal.String.Interpol
'\n\n'   Text.Whitespace

'post-install' Name.Function
':'   Operator
'\n'   Text.Whitespace

'\t@# install config providers\n' Comment

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'
        Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'-config'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation

'}'   Literal.String.Interpol
'-config'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\n'   Text.Whitespace

'\t@#
 shared version of executable and library\n' Comment

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_PROGRAM' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
'\n\t'   Text.Whitespace
'cd'   Name.Builtin
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib'   Text
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'LN'
       Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-sf'   Text

''   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so.1'   Text
''   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'LN'   Name.Variable
'}'   Literal.String.Interpol
''   Text.Whitespace
'-sf'   Text
''   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/lib/lib'   Text
'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'   Literal.String.Interpol
'.so'   Text
''

     Text.Whitespace
'${'   Literal.String.Interpol
'PYTHONPREFIX_LIBDIR' Name.Variable
'}'   Literal.String.Interpol
'/config'   Text
'\n\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_PROGRAM' Name.Variable
'}'   Literal.String.Interpol
''   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'SHARED_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/'   Text

'${'   Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
':'   Punctuation
'S'   Name.Variable
'/thon/thon-shared/' Punctuation
'}'   Literal.String.Interpol
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\n'   Text.Whitespace

'\t@# additional files installing by ports\n'
 Comment

'\t'   Text.Whitespace
'${'   Literal.String.Interpol
'INSTALL_SCRIPT' Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/pydoc2.5' Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/idle2.5'   Text
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'${'   Literal.String.Interpol
'WRKDIR'   Name.Variable
'}'   Literal.String.Interpol
'/smtpd2.5.py' Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PREFIX'   Name.Variable
'}'   Literal.String.Interpol
'/bin'   Text
'\n\t'   Text.Whitespace
'@'   Text

```
'${'          Literal.String.Interpol
'MKDIR'       Name.Variable
'}'           Literal.String.Interpol
' '           Text.Whitespace
'${'
              Literal.String.Interpol
'MANPREFIX'   Name.Variable
'}'           Literal.String.Interpol
'/man/man1'   Text
'\n\t'        Text.Whitespace
'${'          Literal.String.Interpol
'INSTALL_MAN' Name.Variable
'}'           Literal.String.Interpol
' '           Text.Whitespace
'${'          Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'           Literal.String.Interpol
'/Misc/python.man' Text
' '           Text.Whitespace
'\\\n'        Literal.String.Escape

'\t\t'        Text.Whitespace
'${'          Literal.String.Interpol
'MANPREFIX'   Name.Variable
'}'           Literal.String.Interpol
'/man/man1/'  Text
'${'          Literal.String.Interpol
'PYTHON_VERSION' Name.Variable
'}'           Literal.String.Interpol
'.1'          Text
'\n\n'        Text.Whitespace

'.if ${PYTHON_VERSION} == ${PYTHON_DEFAULT_VERSION}\n' Comment.Preproc

'\t'          Text.Whitespace
'for'         Keyword
' '           Text.Whitespace
'f'           Text
' '           Text.Whitespace
'in'
              Keyword
' '           Text.Whitespace
'${'          Literal.String.Interpol
'BIN_SCRIPTS' Name.Variable
'}'           Literal.String.Interpol
';'           Punctuation
' '           Text.Whitespace
'do'          Keyword
```

```
' '          Text.Whitespace
'\\\n'       Literal.String.Escape

'\t\t'       Text.Whitespace
'TARGET'     Name.Variable
'='          Operator
'`'          Literal.String.Backtick
'${'         Literal.String.Interpol
'ECHO_CMD'   Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'$$'         Name.Variable
'f'          Text
' '          Text.Whitespace
'|'          Punctuation
' '          Text.Whitespace
'${'         Literal.String.Interpol
'SED'        Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-E'         Text
' '          Text.Whitespace
'${'         Literal.String.Interpol
'BINLINKS_SUB' Name.Variable
'}'          Literal.String.Interpol
'`'          Literal.String.Backtick
';'
             Punctuation
' '          Text.Whitespace
'\\\n'       Literal.String.Escape

'\t\t'       Text.Whitespace
'cd'         Name.Builtin
' '          Text.Whitespace
'${'         Literal.String.Interpol
'PREFIX'     Name.Variable
'}'          Literal.String.Interpol
'/bin'       Text
' '          Text.Whitespace
'&&'         Operator
' '          Text.Whitespace
'${'         Literal.String.Interpol
'LN'         Name.Variable
'}'          Literal.String.Interpol
' '          Text.Whitespace
'-f'         Text
' '          Text.Whitespace
'$$'         Name.Variable
```

'TARGET'   Text
' '   Text.Whitespace
'$$'   Name.Variable
'f'   Text
';'   Punctuation
' '   Text.Whitespace
'\\\n'   Literal.String.Escape

'\t'   Text.Whitespace
'done'   Keyword
'\n'   Text.Whitespace

'.endif\n' Comment.Preproc

'\n'   Text.Whitespace

'.if !defined(NOPORTDOCS)\n' Comment.Preproc

'\t'
            Text.Whitespace
'@'   Text
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TOOLSDIR' Name.Variable
'}'   Literal.String.Interpol
'\n\t'   Text.Whitespace
'@cd'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-cf'   Text
' '   Text.Whitespace
'-'   Text
' '   Text.Whitespace
'Tools'   Text
' '   Text.Whitespace
'|'   Punctuation
' '   Text.Whitespace

'\\\n'   Literal.String.Escape

'\t\t'   Text.Whitespace
'('   Operator
'cd'   Name.Builtin
' '   Text.Whitespace
'${'
          Literal.String.Interpol
'TOOLSDIR'   Name.Variable
'}'   Literal.String.Interpol
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'-xf'   Text
' '   Text.Whitespace
'-'   Text
')'   Operator
'\n\t'   Text.Whitespace
'@'   Text
'${'   Literal.String.Interpol
'MKDIR'   Name.Variable
'}'   Literal.String.Interpol
' '   Text.Whitespace
'${'   Literal.String.Interpol
'DEMODIR'   Name.Variable
'}'   Literal.String.Interpol
'\n\t'   Text.Whitespace
'@cd'   Text
' '   Text.Whitespace
'${'   Literal.String.Interpol
'PYTHON_WRKSRC' Name.Variable
'}'   Literal.String.Interpol
'/Demo'   Text
';'   Punctuation
' '   Text.Whitespace
'${'   Literal.String.Interpol
'TAR'   Name.Variable
'}'
          Literal.String.Interpol
' '   Text.Whitespace
'-cf'   Text
' '   Text.Whitespace
'-'   Text
' '   Text.Whitespace
'*'   Text

```
' '         Text.Whitespace
'|'         Punctuation
' '         Text.Whitespace
'\\\n'      Literal.String.Escape

'\t\t'      Text.Whitespace
'('         Operator
'cd'        Name.Builtin
' '         Text.Whitespace
'${'        Literal.String.Interpol
'DEMODIR'   Name.Variable
'}'         Literal.String.Interpol
';'         Punctuation
' '         Text.Whitespace
'${'        Literal.String.Interpol
'TAR'       Name.Variable
'}'         Literal.String.Interpol
' '         Text.Whitespace
'-xf'       Text
' '         Text.Whitespace
'-'         Text
')'         Operator
'\n'        Text.Whitespace

'.endif\n'  Comment.Preproc

'\n\t'      Text.Whitespace
'@'         Text
'${'        Literal.String.Interpol
'CAT'       Name.Variable
'}'
      Literal.String.Interpol
' '         Text.Whitespace
'${'        Literal.String.Interpol
'PKGMESSAGE'  Name.Variable
'}'         Literal.String.Interpol
'\n\n'      Text.Whitespace

'.include <bsd.port.post.mk>\n' Comment.Preproc
# Step 1 of 3: from Hakaru to Maple LO (linear operator)

toLO := module()
 export
 ModuleApply := proc(m, $)
   local h;
   h := gensym('h');
   _Env_HakaruSolve := false;
   LO(h, integrate(m, h, []))
```

```
end proc;

export
integrate := proc(m, h, loops :: list(name = range) := [], $)
  local x, n, i, res, l, br, m0;

  if m :: known_continuous then
    integrate_known(Int, Ints, 'xx', m, h, loops)
  elif m :: known_discrete then
    integrate_known(Sum, Sums, 'kk', m, h, loops)
  elif m :: 'Ret(anything)' then
    applyintegrand(h, mk_ary(op(1,m), loops))
  elif m :: 'Bind(anything, name, anything)' then
    res := eval(op(3,m), op(2,m) = mk_idx(op(2,m), loops));
    res := eval(Integrand(op(2,m), 'integrate'(res, x, loops)), x=h);
    integrate(op(1,m), res, loops);
  elif m :: 'specfunc(Msum)' and (nops(loops) = 0 or nops(m) = 1) then
    `+`(op(map(integrate, [op(m)], h, loops)))
  elif m :: 'Weight(anything, anything)' then
    foldl(product,
op(1,m), op(loops)) * integrate(op(2,m), h, loops)
  elif m :: t_pw_or_part then
    Partition:-AppPartOrPw
          ( proc(p)
              if not Partition:-ConditionsDepend(p, lhs~(loops)) then
                Partition:-Pmap(z->integrate(z,h,loops),p)
              end if;
            end proc
          , m, ['no_split_disj']);
  elif m :: t_case and not depends(op(1,m), map(lhs, loops)) then
    subsop(2=map(proc(b :: Branch(anything, anything))
              eval(subsop(2='integrate'(op(2,b), x, loops),b), x=h)
            end proc,
            op(2,m)),
        m);
  elif m :: 'LO(name, anything)' then
    eval(op(2,m), op(1,m) = h)
  elif m :: 'Plate(nonnegint, name, anything)' then
    # Unroll Plate when the bound is known. We unroll Plate here (instead
    # of unrolling Ints in reduce, for example) because we have no other
    # way to integrate certain Plates, namely those whose
bodies' control
    # flows depend on the index.
    x := mk_sym('pp', h);
    x := [seq(cat(x,i), i=0..op(1,m)-1)];
    if op(1,m) = 0 then
      res := undefined;
    else
```

```
      if op(1,m) = 1 then
        res := op(1,x);
      else
        res := idx(x,op(2,m));
#         res := piecewise(seq(op([op(2,m)=i-1, op(i,x)]), i=2..op(1,m)),
#                  op(1,x));
      end if;
      res := mk_idx(res, loops);
    end if;
    res := applyintegrand(h, mk_ary('ary'(op(1,m), op(2,m), res), loops));
    for i from op(1,m) to 1 by -1 do
      res := integrate(eval(op(3,m), op(2,m)=i-1),
                Integrand(op(i,x), res), loops);
    end do;
    res
  elif m :: 'Plate(anything, name, anything)' then
    integrate(op(3,m), h, [op(2,m)=0..op(1,m)-1, op(loops)])
  elif m :: 'Context(anything, anything)' then
    applyop(integrate, 2, m, h, loops)
  elif h :: appliable then
   x := gensym('xa');
   'integrate'(m, Integrand(x,
h(x)), loops)
  else
    'procname(_passed)'
  end if
end proc;


  local
  integrate_known := proc(make, makes, var, m, h, loops :: list(name=range), $)
   local x, dens, bds;
   x := mk_sym(var, h);
   dens := density[op(0,m)](op(m));
   bds := bounds[op(0,m)](op(m));
   if loops = [] then
     make(dens(x) * applyintegrand(h, x), x = bds);
   else
     makes(foldl(product, dens(mk_idx(x,loops)), op(loops))
          * applyintegrand(h, x),
        x, bds, loops)
   end if;
  end proc;
end module; #toLO
'# Teach Maple (through depends and eval) about our new binding forms.\n' Comment.Single

'# forall bind from 1st arg to 2nd arg.\n' Comment.Single
```

'# Ints,Sums,ints,sums bind from 2nd arg to 1st arg, and also from each element\n' Comment.Single

'#   of the 4th arg to the other elements on the left and to the 3rd arg.\n' Comment.Single

'\n'   Text.Whitespace

'`depends/forall`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'bvar'   Name
','   Operator
' '   Text.Whitespace
'pred'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n '   Text.Whitespace
'depends'   Name
'('   Punctuation
'pred'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
' '   Text.Whitespace
'minus'
 Keyword
' '   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
'bvar'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'set'   Name
'"'   Punctuation
'))'   Punctuation
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword

':'   Operator
'\n\n'   Text.Whitespace

'`depends/Ints`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'body'   Name
','   Operator
' '   Text.Whitespace
'bvar'   Name
','   Operator
' '   Text.Whitespace
'rng'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace
'y'   Name
','   Operator
' '   Text.Whitespace
'$'
          Operator
')'   Punctuation
'\n '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'xx'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
';'   Punctuation
'\n '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'nargs'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'5'   Literal.Number.Integer
' '   Text.Whitespace
'then'   Keyword

'\n   '   Text.Whitespace
'xx'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'x'   Name
';'   Punctuation
' '   Text.Whitespace
'# y is ununsed and x lists the variables to look for\n' Comment.Single

' '   Text.Whitespace
'else'   Keyword
'\n   '   Text.Whitespace
'xx'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'y'
    Name
';'   Punctuation
' '   Text.Whitespace
'# x is some KB and y lists the variables to look for\n' Comment.Single

'   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'x'   Name
','   Operator
' '   Text.Whitespace
'y'   Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'true'   Name
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword

';'   Punctuation
'\n '   Text.Whitespace
"# don't remove bvar from xx!\n" Comment.Single

' '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'body'
     Name
','   Operator
' '   Text.Whitespace
'xx'   Name
' '   Text.Whitespace
'minus'   Keyword
' '   Text.Whitespace
'{'   Punctuation
'bvar'   Name
'})'   Punctuation
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'true'   Name
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'i'   Name
' '   Text.Whitespace
'from'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'loops'   Name
')'   Punctuation
' '   Text.Whitespace
'to'   Keyword
' '   Text.Whitespace
'1'   Literal.Number.Integer
' '   Text.Whitespace
'by'   Keyword

' '	Text.Whitespace
'-'	Operator
'1'	Literal.Number.Integer
' '	Text.Whitespace
'do'	Keyword
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'depends'	Name
'('	Punctuation
'op'	Name.Builtin
'(['	Punctuation
'i'	Name
','	Operator
'2'	Literal.Number.Integer
']'	Punctuation
','	Operator
'loops'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'xx'	Name
')'	Punctuation
' '	Text.Whitespace
'then'	Keyword
' '	Text.Whitespace
'return'	Keyword
' '	Text.Whitespace
'true'	Name
' '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'xx'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'xx'	Name
' '	Text.Whitespace
'minus'	Keyword
' '	Text.Whitespace
'{'	Punctuation
'op'	Name.Builtin
'(['	Punctuation

'i'   Name
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'loops'   Name
')};'   Punctuation
\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
\n '   Text.Whitespace
'depends'   Name
'('   Punctuation
'rng'   Name
','   Operator
' '   Text.Whitespace
'xx'   Name
')'   Punctuation
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
':'   Operator
'\n'   Text.Whitespace

'`depends/Sums`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`depends/Ints`' Name
')'
             Punctuation
':'   Operator
'\n'   Text.Whitespace

'`depends/ints`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`depends/Ints`' Name
')'   Punctuation

':'   Operator
'\n'   Text.Whitespace

`depends/sums`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
`depends/Ints`' Name
')'   Punctuation
':'   Operator
'\n\n'   Text.Whitespace

`eval/forall`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'eqs'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n '   Text.Whitespace
'local'   Keyword
'
 '   Text.Whitespace
'bvar'   Name
','   Operator
' '   Text.Whitespace
'pred'   Name
';'   Punctuation
'\n '   Text.Whitespace
'bvar'   Name
','   Operator
' '   Text.Whitespace
'pred'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'e'   Name

');'   Punctuation
'\n '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'e'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'eqs'   Name
')('   Punctuation
'BindingTools' Name
':'   Operator
'-'   Operator
'generic_evalat' Name
'('   Punctuation
'bvar'   Name
','   Operator
' '   Text.Whitespace
'pred'   Name
','
            Operator
' '   Text.Whitespace
'eqs'   Name
'))'   Punctuation
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
':'   Operator
'\n\n'   Text.Whitespace

'`eval/Ints`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'eqs'   Name
','   Operator
' '   Text.Whitespace

'$'	Operator
')'	Punctuation
'\n '	Text.Whitespace
'local'	Keyword
' '	Text.Whitespace
'body'	Name
','	Operator
' '	Text.Whitespace
'bvar'	Name
','	Operator
' '	Text.Whitespace
'rng'	Name
','	Operator
' '	Text.Whitespace
'loops'	Name
','	Operator
' '	Text.Whitespace
'n'	Name
','	Operator
' '	Text.Whitespace
' '	Text.Whitespace
'i'	Name
';'	Punctuation
'\n '	Text.Whitespace
'body'	Name
','	Operator
' '	Text.Whitespace
'bvar'	Name
','	Operator
' '	Text.Whitespace
'rng'	Name
','	Operator
' '	Text.Whitespace
'loops'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'op'	Name.Builtin
'('	Punctuation
'1'	Literal.Number.Integer
'..'	Punctuation
'4'	Literal.Number.Integer
','	Operator
' '	Text.Whitespace
'e'	Name
');'	Punctuation
'\n '	Text.Whitespace
'bvar'	Name

','   Operator
' '   Text.Whitespace
'body'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'BindingTools' Name
':'   Operator
'-'   Operator
'generic_evalat' Name
'('   Punctuation
'bvar'
    Name
','   Operator
' '   Text.Whitespace
'body'   Name
','   Operator
' '   Text.Whitespace
'eqs'   Name
');'   Punctuation
'\n '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'e'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'eqs'   Name
')('   Punctuation
'body'   Name
','   Operator
' '   Text.Whitespace
'bvar'   Name
','   Operator
'\n   ' Text.Whitespace
'BindingTools' Name
':'   Operator
'-'   Operator
'generic_evalatstar' Name
'('   Punctuation
'rng'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name

','   Operator
' '   Text.Whitespace
'eqs'   Name
')'   Punctuation
','

 Operator
'\n   ' Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'5'   Literal.Number.Integer
'..'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
'e'   Name
'))'   Punctuation
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
':'   Operator
'\n'   Text.Whitespace

'`eval/Sums`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`eval/Ints`' Name
')'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'`eval/ints`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'`eval/Ints`' Name
')'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'`eval/sums`' Name
' '   Text.Whitespace

```
':='
        Operator
' '         Text.Whitespace
'eval'      Name.Builtin
'('         Punctuation
`eval/Ints`' Name
')'         Punctuation
':'         Operator
'\n\n'      Text.Whitespace

`eval/Int`' Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'eqs'       Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n '       Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'body'      Name
','         Operator
' '         Text.Whitespace
'bound'     Name
','         Operator
' '         Text.Whitespace
'bvar'      Name
';'         Punctuation
'\n '       Text.Whitespace
'body'      Name
','         Operator
' '         Text.Whitespace
'bound'     Name
' '         Text.Whitespace
':='        Operator
'
    '       Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
'..'        Punctuation
```

'2'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'e'   Name
');'   Punctuation
'\n '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'bound'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'name'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'bound'   Name
','   Operator
' '   Text.Whitespace
'body'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'BindingTools' Name
':'   Operator
'-'   Operator
'generic_evalat' Name
'('   Punctuation
'bound'   Name
','   Operator
' '   Text.Whitespace
'body'   Name
','   Operator
' '   Text.Whitespace
'eqs'
      Name
');'   Punctuation
'\n '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'bound'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'`=`'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace

'bvar'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'lhs'   Name.Builtin
'('   Punctuation
'bound'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'bvar'   Name
','   Operator
' '   Text.Whitespace
'body'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'BindingTools' Name
':'   Operator
'-'   Operator
'generic_evalat' Name
'('   Punctuation
'bvar'   Name
','   Operator
' '   Text.Whitespace
'body'   Name
','   Operator
' '   Text.Whitespace
'eqs'
        Name
');'   Punctuation
'\n   '   Text.Whitespace
'bound'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'bvar'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'rhs'   Name.Builtin
'('   Punctuation
'bound'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'eqs'   Name

```
');'       Punctuation
'\n '      Text.Whitespace
'else'     Keyword
'\n    '   Text.Whitespace
'body'     Name
','        Operator
' '        Text.Whitespace
'bound'    Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'BindingTools' Name
':'        Operator
'-'        Operator
'generic_evalatstar' Name
'('        Punctuation
'body'     Name
','        Operator
' '        Text.Whitespace
'bound'    Name
','
  Operator
' '        Text.Whitespace
'eqs'      Name
');'       Punctuation
'\n '      Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'if'       Keyword
';'        Punctuation
'\n '      Text.Whitespace
'eval'     Name.Builtin
'('        Punctuation
'op'       Name.Builtin
'('        Punctuation
'0'        Literal.Number.Integer
','        Operator
'e'        Name
')'        Punctuation
','        Operator
' '        Text.Whitespace
'eqs'      Name
')('       Punctuation
'body'     Name
','        Operator
' '        Text.Whitespace
'bound'    Name
','        Operator
```

```
' '           Text.Whitespace
'op'          Name.Builtin
'('           Punctuation
'eval'        Name.Builtin
'(['          Punctuation
'op'          Name.Builtin
'('           Punctuation
'3'           Literal.Number.Integer
'..'          Punctuation
'-'           Operator
'1'           Literal.Number.Integer
','           Operator
'e'
              Name
')]'          Punctuation
','           Operator
' '           Text.Whitespace
'eqs'         Name
')))'         Punctuation
'\n'          Text.Whitespace

'end'         Keyword
' '           Text.Whitespace
'proc'        Keyword
':'           Operator
'\n'          Text.Whitespace

`eval/Sum`'   Name
'   '         Text.Whitespace
':='          Operator
' '           Text.Whitespace
'eval'        Name.Builtin
'('           Punctuation
`eval/Int`'   Name
')'           Punctuation
':'           Operator
'\n'          Text.Whitespace

`eval/Product`' Name
' '           Text.Whitespace
':='          Operator
' '           Text.Whitespace
'eval'        Name.Builtin
'('           Punctuation
`eval/Int`'   Name
')'           Punctuation
':'           Operator
'\n'          Text.Whitespace
```

```
`eval/int`'  Name
' '       Text.Whitespace
':='       Operator
' '         Text.Whitespace
'eval'       Name.Builtin
'('          Punctuation
`eval/Int`'  Name
')'
     Punctuation
':'          Operator
'\n'         Text.Whitespace

`eval/sum`'  Name
' '       Text.Whitespace
':='       Operator
' '          Text.Whitespace
'eval'       Name.Builtin
'('          Punctuation
`eval/Int`'  Name
')'          Punctuation
':'          Operator
'\n'         Text.Whitespace

`eval/product`' Name
' '          Text.Whitespace
':='       Operator
' '          Text.Whitespace
'eval'       Name.Builtin
'('          Punctuation
`eval/Int`'  Name
')'          Punctuation
':'          Operator
'\n\n'       Text.Whitespace

'###########################################################################\n' Comment.Single

'\n'         Text.Whitespace

'Loop'       Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'module'     Keyword
' '        Text.Whitespace
'()'         Punctuation
'\n '      Text.Whitespace
'option'     Keyword
```

```
' '           Text.Whitespace
'package'    Name
';'
      Punctuation
'\n '      Text.Whitespace
'local'      Keyword
' '           Text.Whitespace
'intssums'   Name
','           Operator
' '           Text.Whitespace
'enter_piecewise' Name
','           Operator
' '           Text.Whitespace
'wrap'       Name
','           Operator
'\n      '  Text.Whitespace
't_peel'     Name
','           Operator
' '           Text.Whitespace
'do_peel'    Name
','           Operator
' '           Text.Whitespace
'do_split'   Name
','           Operator
' '           Text.Whitespace
'do_graft'   Name
','           Operator
' '           Text.Whitespace
'do_rebase_lower' Name
','           Operator
' '           Text.Whitespace
'do_rebase_upper' Name
','           Operator
'\n      '  Text.Whitespace
'Binder'     Name
','           Operator
' '           Text.Whitespace
'Stmt'       Name
','           Operator
' '           Text.Whitespace
't_binder'   Name
','           Operator
' '           Text.Whitespace
't_stmt'     Name
';'
        Operator
' '           Text.Whitespace
't_exp'      Name
```

','   Operator

'\n   ' Text.Whitespace

'ModuleLoad' Name

';'   Punctuation

'\n '   Text.Whitespace

'export'   Keyword

'\n   ' Text.Whitespace

'# These first few are smart constructors (for themselves):\n' Comment.Single

'   ' Text.Whitespace

'ints'   Name

','   Operator

' '   Text.Whitespace

'sums'   Name

','   Operator

'\n   ' Text.Whitespace

'# while these are "proper functions"\n' Comment.Single

'   ' Text.Whitespace

'mk_HArray' Name

','   Operator

' '   Text.Whitespace

'genLoop'   Name

','   Operator

' '   Text.Whitespace

'unproducts' Name

','   Operator

' '   Text.Whitespace

'unproduct' Name

','   Operator

'\n   ' Text.Whitespace

'peel'   Name

','   Operator

' '   Text.Whitespace

'split'   Name

','   Operator

' '

   Text.Whitespace

'graft'   Name

','   Operator

' '   Text.Whitespace

'rebase_lower' Name

','   Operator

' '   Text.Whitespace

'rebase_upper' Name

','   Operator

' '   Text.Whitespace

'Print'   Name

';'   Punctuation
'\n '   Text.Whitespace
'# these names are not assigned (and should not be). But they are\n' Comment.Single

' '   Text.Whitespace
'# used as global names, so document that here.\n' Comment.Single

' '   Text.Whitespace
'global'   Keyword
' '   Text.Whitespace
'Ints'   Name
','   Operator
' '   Text.Whitespace
'Sums'   Name
','   Operator
' '   Text.Whitespace
'csgn'   Name
','   Operator
' '   Text.Whitespace
'sum'   Name
','   Operator
' '   Text.Whitespace
'signum'   Name
';'   Punctuation
'\n '   Text.Whitespace
'uses'   Keyword
' '   Text.Whitespace
'Hakaru'
     Name
','   Operator
' '   Text.Whitespace
'KB'   Name
','   Operator
' '   Text.Whitespace
'Utilities' Name
';'   Punctuation
'\n\n '   Text.Whitespace
't_binder' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'"'   Punctuation
'Binder'   Name
'('   Punctuation
'identical' Name
'('   Punctuation
'product'   Name
','   Operator

```
' '         Text.Whitespace
'Product'    Name
','          Operator
' '          Text.Whitespace
'sum'        Name
','          Operator
' '          Text.Whitespace
'Sum'        Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
't_kb'       Name
')'          Punctuation
'"'          Punctuation
';'          Punctuation
'\n '        Text.Whitespace
't_stmt'     Name
'  '         Text.Whitespace
':='         Operator
' '          Text.Whitespace
'"'          Punctuation
'Stmt'
             Name
'('          Punctuation
'anything'   Name
','          Operator
' '          Text.Whitespace
'list'       Name
','          Operator
' '          Text.Whitespace
'list'       Name
')'          Punctuation
'"'          Punctuation
';'          Punctuation
'\n '        Text.Whitespace
't_exp'      Name
'  '         Text.Whitespace
':='         Operator
' '          Text.Whitespace
'"'          Punctuation
'{'          Punctuation
'Stmt'       Name
'('          Punctuation
'identical'  Name
'('          Punctuation
'exp'        Name
')'          Punctuation
','          Operator
```

' '   Text.Whitespace
'[]'   Punctuation
','   Operator
' '   Text.Whitespace
'[])'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'Stmt'   Name
'('   Punctuation
'identical'   Name
'('   Punctuation
'`^`'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'['   Punctuation
'anything'   Name
']'   Punctuation
','   Operator
' '   Text.Whitespace
'[])}'   Punctuation
'"'   Punctuation
';'   Punctuation
'\n\n '   Text.Whitespace
'ints'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'()'   Punctuation
' '   Text.Whitespace
'intssums'   Name
'('   Punctuation
'"'   Punctuation
'ints'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'int'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'_passed'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword

```
' '        Text.Whitespace
'proc'     Keyword
';'        Punctuation
'\n '      Text.Whitespace
'sums'     Name
' '        Text.Whitespace
':='       Operator
' '
    Text.Whitespace
'proc'     Keyword
'()'       Punctuation
' '        Text.Whitespace
'intssums'  Name
'('        Punctuation
'"'        Punctuation
'sums'     Name
'"'        Punctuation
','        Operator
' '        Text.Whitespace
'"'        Punctuation
'sum'      Name
'"'        Punctuation
','        Operator
' '        Text.Whitespace
'_passed'  Name
')'        Punctuation
' '        Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'proc'     Keyword
';'        Punctuation
'\n\n '    Text.Whitespace
'Print'    Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'proc'     Keyword
'('        Punctuation
'kind'     Name
'::'       Operator
'identical'  Name
'('        Punctuation
'Ints'     Name
','        Operator
'Sums'     Name
','        Operator
'ints'     Name
','        Operator
```

```
'sums'      Name
')'         Punctuation
','
            Operator
'e'         Name
','         Operator
'v'         Name
'::'        Operator
'name'      Name
','         Operator
'r0'        Name
'::'        Operator
'range'     Name
','         Operator
'rs'        Name
'::'        Operator
'list'      Name
'('         Punctuation
'name'      Name
'='         Operator
'range'     Name
')'         Punctuation
','         Operator
'$'         Operator
')'         Punctuation
\n '        Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'k'         Name
';'         Punctuation
\n '        Text.Whitespace
'k'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'StringTools' Name
'['         Punctuation
'Capitalize' Name
'](' Punctuation
'StringTools' Name
'['         Punctuation
'Chop'      Name
']('        Punctuation
'convert'   Name.Builtin
'('         Punctuation
'kind'      Name
','
```

Operator

'string'   Name

')));'   Punctuation

'\n   '   Text.Whitespace

'k'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'parse'   Name.Builtin

'('   Punctuation

'cat'   Name.Builtin

'('   Punctuation

'"`print/"'   Literal.String

','   Operator

'eval'   Name.Builtin

'('   Punctuation

'k'   Name

')'   Punctuation

','   Operator

'"`"'   Literal.String

'));'   Punctuation

'\n   '   Text.Whitespace

'eval'   Name.Builtin

'('   Punctuation

'k'   Name

')('   Punctuation

'e'   Name

','   Operator

'v'   Name

'['   Punctuation

'op'   Name.Builtin

'('   Punctuation

'rs'   Name

')]'   Punctuation

'='   Operator

'r0'   Name

');'   Punctuation

'\n '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'proc'

    Keyword

';'   Punctuation

'\n\n '   Text.Whitespace

'intssums'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'proc'   Keyword
'('   Punctuation
'makes'   Name
'::'   Operator
'name'   Name
','   Operator
' '   Text.Whitespace
'make'   Name
'::'   Operator
'name'   Name
','   Operator
'\n   ' Text.Whitespace
'e'   Name
'::'   Operator
'anything' Name
','   Operator
' '   Text.Whitespace
'x'   Name
'::'   Operator
'name'   Name
','   Operator
' '   Text.Whitespace
'rr'   Name
'::'   Operator
'range'   Name
','   Operator
' '   Text.Whitespace
'll'   Name
'::'   Operator
'list'   Name
'('   Punctuation
'name'   Name
'='   Operator
'range'   Name
')'   Punctuation
','   Operator
'\n
             ' Text.Whitespace
'kb'   Name
'::'   Operator
't_kb'   Name
':='   Operator
'empty'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace

```
'local'      Keyword
' '          Text.Whitespace
't'          Name
','          Operator
' '          Text.Whitespace
'r'          Name
','          Operator
' '          Text.Whitespace
'l'          Name
','          Operator
' '          Text.Whitespace
'kb2'        Name
','          Operator
' '          Text.Whitespace
'w0'         Name
','          Operator
' '          Text.Whitespace
'pp'         Name
','          Operator
' '          Text.Whitespace
'i'          Name
';'          Punctuation
'\n    '     Text.Whitespace
't'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'`if`'       Name
'('          Punctuation
'make'       Name
'='
             Operator
'int'        Name
','          Operator
' '          Text.Whitespace
'HReal'      Name
'('          Punctuation
'open_bounds' Name
'('          Punctuation
'rr'         Name
'))'         Punctuation
','          Operator
' '          Text.Whitespace
'HInt'       Name
'('          Punctuation
'closed_bounds' Name
'('          Punctuation
'rr'         Name
```

')));'   Punctuation
'\n   '   Text.Whitespace
'r'   Name
','   Operator
' '   Text.Whitespace
'l'   Name
','   Operator
' '   Text.Whitespace
'kb2'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'genLoop' Name
'('   Punctuation
'rr'   Name
','   Operator
' '   Text.Whitespace
'll'   Name
','   Operator
' '   Text.Whitespace
'kb'   Name
','   Operator
' '   Text.Whitespace
'"'''   Punctuation
'Integrand' Name
'"'''

           Punctuation
'('   Punctuation
'x'   Name
','   Operator
'e'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'w0'   Name
','   Operator
' '   Text.Whitespace
'pp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'unproducts' Name
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
','   Operator
' '   Text.Whitespace

```
'l'          Name
','          Operator
' '          Text.Whitespace
'kb2'        Name
');'         Punctuation
'\n   '      Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'depends'    Name
'('          Punctuation
'w0'         Name
','          Operator
' '          Text.Whitespace
'x'          Name
')'          Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n   '      Text.Whitespace
'"'          Punctuation
'makes'
       Name
'('          Punctuation
'e'          Name
','          Operator
' '          Text.Whitespace
'x'          Name
','          Operator
' '          Text.Whitespace
'rr'         Name
','          Operator
' '          Text.Whitespace
'll'         Name
')'          Punctuation
'"'          Punctuation
'\n   '      Text.Whitespace
'else'       Keyword
'\n    '     Text.Whitespace
'pp'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'"'          Punctuation
'make'       Name
'"'          Punctuation
'('          Punctuation
'pp'         Name
','          Operator
' '          Text.Whitespace
```

'x'   Name
'='   Operator
'r'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'i'   Name
' '   Text.Whitespace
'in'   Keyword
' '   Text.Whitespace
'l'   Name
' '   Text.Whitespace
'do'

          Keyword
' '   Text.Whitespace
'pp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'"'   Punctuation
'product'   Name
'"'   Punctuation
'('   Punctuation
'pp'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'NewSLO'   Name
':'   Operator
'-'   Operator
'simplify_factor_assuming' Name
'('   Punctuation
'w0'   Name
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'pp'   Name
','   Operator
' '   Text.Whitespace
'kb'   Name

');'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n '   Text.Whitespace
'end'

     Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'mk_HArray' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
't'   Name
'::'   Operator
't_type'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
'::'   Operator
'list'   Name
'('   Punctuation
'name'   Name
'='   Operator
'range'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'res'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace

't'
      Name
';'   Punctuation
'\n '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'i'   Name
' '   Text.Whitespace
'in'   Keyword
' '   Text.Whitespace
'loops'   Name
' '   Text.Whitespace
'do'   Keyword
' '   Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'HArray'   Name
'('   Punctuation
'res'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'res'   Name
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'genLoop' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('
     Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'loops'   Name
'::'   Operator
'list'   Name

'('   Punctuation
'name'   Name
'='   Operator
'range'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'kb'   Name
'::'   Operator
't_kb'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'kb1'   Name
','   Operator
' '   Text.Whitespace
'rng'   Name
','   Operator
' '   Text.Whitespace
'ind'   Name
','   Operator
' '   Text.Whitespace
'do_subst'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'kb1'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'kb'   Name
';'   Punctuation
'\n
   '   Text.Whitespace
'rng'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'table'   Name.Builtin
'();'   Punctuation
'\n   '   Text.Whitespace
'ind'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace

'table'   Name.Builtin
'();'   Punctuation
'\n   '   Text.Whitespace
'do_subst'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'e'   Name
' '   Text.Whitespace
'->'   Operator
' '   Text.Whitespace
'foldl'   Name
'((('   Punctuation
'e'   Name
','   Operator
'eq'   Name
')'   Punctuation
' '   Text.Whitespace
'->'   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'(['   Punctuation
'lhs'
       Name.Builtin
'('   Punctuation
'eq'   Name
')'   Punctuation
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'loops'   Name
')'   Punctuation
'='   Operator
'rhs'   Name.Builtin
'('   Punctuation
'eq'   Name
')))'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'e'   Name
','   Operator
' '   Text.Whitespace

'entries'   Name.Builtin
'('   Punctuation
'ind'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'pairs'   Name
'"'   Punctuation
'));'   Punctuation
'\n   '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'i'   Name
' '   Text.Whitespace
'from'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'loops'   Name
')'
 Punctuation
' '   Text.Whitespace
'to'   Keyword
' '   Text.Whitespace
'1'   Literal.Number.Integer
' '   Text.Whitespace
'by'   Keyword
' '   Text.Whitespace
'-'   Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'do'   Keyword
'\n   '   Text.Whitespace
'rng'   Name
'['   Punctuation
'i'   Name
']'   Punctuation
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'do_subst'   Name
'('   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'i'   Name
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation

```
','           Operator
'loops'       Name
'));'         Punctuation
'\n   '       Text.Whitespace
'ind'         Name
'['           Punctuation
'i'           Name
']'           Punctuation
','           Operator
' '           Text.Whitespace
'kb1'         Name
' '
              Text.Whitespace
':='          Operator
' '           Text.Whitespace
'genType'     Name
'('           Punctuation
'op'          Name.Builtin
'(['          Punctuation
'i'           Name
','           Operator
'1'           Literal.Number.Integer
']'           Punctuation
','           Operator
'loops'       Name
')'           Punctuation
','           Operator
' '           Text.Whitespace
'HInt'        Name
'('           Punctuation
'closed_bounds' Name
'('           Punctuation
'rng'         Name
'['           Punctuation
'i'           Name
']))'         Punctuation
','           Operator
'\n                   ' Text.Whitespace
'kb1'         Name
','           Operator
' '           Text.Whitespace
'_rest'       Name
');'          Punctuation
'\n   '       Text.Whitespace
'end'         Keyword
' '           Text.Whitespace
'do'          Keyword
';'           Punctuation
```

```
'\n  '      Text.Whitespace
'do_subst'    Name
'('          Punctuation
'e'          Name
')'
             Punctuation
','          Operator
' '          Text.Whitespace
'zip'        Name
'('          Punctuation
'`=`'        Name
','          Operator
' '          Text.Whitespace
'['          Punctuation
'entries'    Name.Builtin
'('          Punctuation
'ind'        Name
','          Operator
' '          Text.Whitespace
'"'          Punctuation
'nolist'     Name
'"'          Punctuation
')]'         Punctuation
','          Operator
'\n                     ' Text.Whitespace
'['          Punctuation
'entries'    Name.Builtin
'('          Punctuation
'rng'        Name
','          Operator
' '          Text.Whitespace
'"'          Punctuation
'nolist'     Name
'"'          Punctuation
')])'        Punctuation
','          Operator
' '          Text.Whitespace
'kb1'        Name
'\n '        Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'proc'       Keyword
';'          Punctuation
'\n\n '      Text.Whitespace
'unproducts'
 Name
' '          Text.Whitespace
':='         Operator
```

```
' '        Text.Whitespace
'proc'     Keyword
'('        Punctuation
'w'        Name
','        Operator
' '        Text.Whitespace
'x'        Name
'::'       Operator
'name'     Name
','        Operator
' '        Text.Whitespace
'loops'    Name
'::'       Operator
'list'     Name
'('        Punctuation
'name'     Name
'='        Operator
'range'    Name
')'        Punctuation
','        Operator
' '        Text.Whitespace
'kb'       Name
'::'       Operator
't_kb'     Name
','        Operator
' '        Text.Whitespace
'$'        Operator
')'        Punctuation
'\n   '    Text.Whitespace
'local'    Keyword
' '        Text.Whitespace
'w0'       Name
','        Operator
' '        Text.Whitespace
'pp'       Name
','        Operator
' '        Text.Whitespace
'j'        Name
','        Operator
' '        Text.Whitespace
'w1'
           Name
','        Operator
' '        Text.Whitespace
'w2'       Name
','        Operator
' '        Text.Whitespace
'loop'     Name
```

';'   Punctuation
'\n '   Text.Whitespace
'w0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
';'   Punctuation
'\n   '   Text.Whitespace
'pp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'w'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'j'   Name
' '   Text.Whitespace
'from'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'loops'   Name
')'   Punctuation
' '   Text.Whitespace
'to'   Keyword
' '   Text.Whitespace
'1'   Literal.Number.Integer
' '   Text.Whitespace
'by'

       Keyword
' '   Text.Whitespace
'-'   Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'do'   Keyword
'\n   '   Text.Whitespace
'w1'   Name
','   Operator
' '   Text.Whitespace
'pp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation

```
'unproduct'   Name
'('           Punctuation
'pp'          Name
','           Operator
' '           Text.Whitespace
'x'           Name
','           Operator
' '           Text.Whitespace
'op'          Name.Builtin
'('           Punctuation
'j'           Name
','           Operator
'loops'       Name
')'           Punctuation
','           Operator
' '           Text.Whitespace
'[]'          Punctuation
','           Operator
' '           Text.Whitespace
'`*`'         Name
','           Operator
' '           Text.Whitespace
'kb'          Name
','           Operator
'
 '           Text.Whitespace
'kb'          Name
'));'         Punctuation
'\n    '      Text.Whitespace
'# separate out each of the factors in w1, as they might have different\n' Comment.Single

'    '        Text.Whitespace
'# variable dependencies, which can be exploited by other routines\n' Comment.Single

'    '        Text.Whitespace
'w2'          Name
' '           Text.Whitespace
':='          Operator
' '           Text.Whitespace
'convert'     Name.Builtin
'('           Punctuation
'w1'          Name
','           Operator
' '           Text.Whitespace
'"'           Punctuation
'list'        Name
'"'           Punctuation
','           Operator
```

```
' '        Text.Whitespace
'"'        Punctuation
'`*`'      Name
'"'        Punctuation
');'       Punctuation
'\n   '    Text.Whitespace
'for'      Keyword
' '        Text.Whitespace
'loop'     Name
' '        Text.Whitespace
'in'       Keyword
' '        Text.Whitespace
'['        Punctuation
'op'
           Name.Builtin
'('        Punctuation
'j'        Name
'+'        Operator
'1'        Literal.Number.Integer
'..'       Punctuation
'-'        Operator
'1'        Literal.Number.Integer
','        Operator
' '        Text.Whitespace
'loops'    Name
')]'       Punctuation
' '        Text.Whitespace
'do'       Keyword
'\n    '   Text.Whitespace
'w2'       Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'map'      Name.Builtin
'(('       Punctuation
'w'        Name
' '        Text.Whitespace
'->'       Operator
' '        Text.Whitespace
'product'  Name
'('        Punctuation
'eval'     Name.Builtin
'('        Punctuation
'w'        Name
','        Operator
' '        Text.Whitespace
'x'        Name
'='        Operator
```

'idx'   Name
'('   Punctuation
'x'   Name
','   Operator
'lhs'   Name.Builtin
'('   Punctuation
'loop'

      Name
')))'   Punctuation
','   Operator
' '   Text.Whitespace
'loop'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'w2'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'w0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'w0'   Name
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'w2'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'# w0 := w0 * foldl(product, w1, op(j+1..-1, loops));\n' Comment.Single

'   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '

   Text.Whitespace
'# Rewrite ... * piecewise(i<=kk-1, xs^2, 1)\n' Comment.Single

```
'   '      Text.Whitespace
'#      to ... * xs ^ (2*piecewise(i<=kk-1, 1))\n' Comment.Single


'   '      Text.Whitespace
'# because the latter is easier to integrate and recognize with respect to xs\n' Comment.Single


'   '      Text.Whitespace
'pp'        Name
' '        Text.Whitespace
':='        Operator
' '        Text.Whitespace
'for_poly'   Name
'('        Punctuation
'pp'        Name
','        Operator
' '        Text.Whitespace
'# TODO: move this rewrite into eval_factor (then remove for_poly?)?\n' Comment.Single


'   '      Text.Whitespace
'proc'       Keyword
' '        Text.Whitespace
'('        Punctuation
'p'        Name
')'        Punctuation
'\n    '   Text.Whitespace
'local'      Keyword
' '        Text.Whitespace
'n'        Name
','        Operator
' '        Text.Whitespace
's'        Name
','        Operator
' '

        Text.Whitespace
'r'        Name
';'        Punctuation
'\n    '   Text.Whitespace
'if'        Keyword
' '        Text.Whitespace
'p'        Name
' '        Text.Whitespace
'::'        Operator
' '        Text.Whitespace
'"'        Punctuation
'And'       Name
'('        Punctuation
'specfunc'   Name
```

```
'('          Punctuation
'piecewise'  Name.Builtin
')'          Punctuation
','          Operator
' '          Text.Whitespace
'anyfunc'    Name
'('          Punctuation
'freeof'     Name
'('          Punctuation
'x'          Name
')'          Punctuation
','          Operator
' '          Text.Whitespace
'anything'   Name
','          Operator
' '          Text.Whitespace
'1'          Literal.Number.Integer
'))'         Punctuation
'"'          Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n '        Text.Whitespace
'n'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'indets'
      Name.Builtin
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'p'          Name
')'          Punctuation
','          Operator
'name'       Name
');'         Punctuation
'\n '        Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'op'         Name.Builtin
'('          Punctuation
'2'          Literal.Number.Integer
','          Operator
'p'          Name
')'          Punctuation
' '          Text.Whitespace
```

```
'::'       Operator
' '        Text.Whitespace
'{'        Punctuation
'"'        Punctuation
'exp'      Name
'('        Punctuation
'anything'   Name
')'        Punctuation
'"'        Punctuation
','        Operator
' '        Text.Whitespace
'"'        Punctuation
'`^`'      Name
'"'        Punctuation
'('        Punctuation
'"'        Punctuation
'freeof'    Name
'"'        Punctuation
'('
            Punctuation
'n'        Name
')'        Punctuation
','        Operator
'"'        Punctuation
'anything'   Name
'"'        Punctuation
')}'       Punctuation
' '        Text.Whitespace
'then'     Keyword
'\n        ' Text.Whitespace
's'        Name
','        Operator
' '        Text.Whitespace
'r'        Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'selectremove' Name.Builtin
'('        Punctuation
'depends'   Name
','        Operator
' '        Text.Whitespace
'convert'   Name.Builtin
'('        Punctuation
'op'       Name.Builtin
'(['       Punctuation
'2'        Literal.Number.Integer
','        Operator
```

'-'   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'p'   Name
')'   Punctuation
','   Operator
'"'   Punctuation
'list'   Name
'"'   Punctuation
','

    Operator
'"'   Punctuation
'`*`'   Name
'"'   Punctuation
')'   Punctuation
','   Operator
' '   Text.Whitespace
'n'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'subsop'   Name.Builtin
'('   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'piecewise' Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'p'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
's'   Name
')))'   Punctuation
','   Operator
' '   Text.Whitespace

'op'   Name.Builtin
'('   Punctuation
'r'
        Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'p'   Name
'))'   Punctuation
'\n   ' Text.Whitespace
'else'   Keyword
'\n   ' Text.Whitespace
's'   Name
','   Operator
' '   Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'depends'   Name
','   Operator
' '   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'p'   Name
')'   Punctuation
','   Operator
'"'   Punctuation
'list'   Name
'"'   Punctuation
','   Operator
'"'   Punctuation
'`*`'
    Name
'"'   Punctuation
')'   Punctuation
','   Operator
' '   Text.Whitespace

'n'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'r'   Name
'))'   Punctuation
' '   Text.Whitespace
'^'   Operator
' '   Text.Whitespace
'piecewise'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'p'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
')'   Punctuation
'\n   ' Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'`if`'   Name
'('   Punctuation
'nops'   Name.Builtin
'('   Punctuation
's'   Name
')'   Punctuation
' '   Text.Whitespace
'>'

       Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'piecewise'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'p'   Name
')'   Punctuation

','   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
's'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
')'   Punctuation
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
')'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n   ' Text.Whitespace
'else'   Keyword
'\n   ' Text.Whitespace
'p'   Name
'\n

      ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
');'   Punctuation
'\n   ' Text.Whitespace
'w0'   Name
','   Operator
' '   Text.Whitespace
'pp'   Name
'\n ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n ' Text.Whitespace
'# Find [w1,pp] so that\n' Comment.Single

' '   Text.Whitespace

'# wrap(heap,w,mode,kb1,kb0)\n' Comment.Single

' '   Text.Whitespace
'# = w1*product(eval(pp,var=idx(var,lhs(loop))),loop)\n' Comment.Single

' '   Text.Whitespace
'# making w1 depend on var as little as possible.\n' Comment.Single

' '   Text.Whitespace
'# The flag "mode" should be `+` if "heap" contains an entry of the form\n' Comment.Single

' '   Text.Whitespace
'# t_exp,
 or `*` otherwise.\n' Comment.Single

' '   Text.Whitespace
'unproduct' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'w'   Name
','   Operator
' '   Text.Whitespace
'var'   Name
'::'   Operator
'name'   Name
','   Operator
' '   Text.Whitespace
'loop'   Name
'::'   Operator
'('   Punctuation
'name'   Name
'='   Operator
'range'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'heap'   Name
'::'   Operator
'list'   Name
','   Operator
' '   Text.Whitespace
'mode'   Name
'::'   Operator
'identical' Name
'('   Punctuation

'`*`'   Name
','   Operator
'`+`'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'kb1'   Name
'::'

      Operator
't_kb'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
'::'   Operator
't_kb'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'ind'   Name
','   Operator
' '   Text.Whitespace
'res'   Name
','   Operator
' '   Text.Whitespace
'dummy'   Name
','   Operator
' '   Text.Whitespace
'kb'   Name
','   Operator
' '   Text.Whitespace
'kbThen'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
','   Operator
' '   Text.Whitespace
'w1'   Name
','   Operator
' '   Text.Whitespace
'pp'   Name
','   Operator
' '   Text.Whitespace
's'   Name
','   Operator

```
' '         Text.Whitespace
'r'         Name
';'
            Operator
' '         Text.Whitespace
'x'         Name
';'         Punctuation
'\n  '      Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'not'       Keyword
' '         Text.Whitespace
'depends'   Name
'('         Punctuation
'w'         Name
','         Operator
' '         Text.Whitespace
'var'       Name
')'         Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n   '     Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'['         Punctuation
'wrap'      Name
'('         Punctuation
'heap'      Name
','         Operator
' '         Text.Whitespace
'w'         Name
','         Operator
' '         Text.Whitespace
'mode'      Name
','         Operator
' '         Text.Whitespace
'kb1'       Name
','         Operator
' '         Text.Whitespace
'kb0'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
']'
            Punctuation
'\n   '     Text.Whitespace
'end'       Keyword
```

' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
"# The `..' (indices) of all occurences of `idx(var,..)'\n"	Comment.Single
' '	Text.Whitespace
'ind'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'map2'	Name
'('	Punctuation
'op'	Name.Builtin
','	Operator
' '	Text.Whitespace
'2'	Literal.Number.Integer
','	Operator
' '	Text.Whitespace
'indets'	Name.Builtin
'('	Punctuation
'w'	Name
','	Operator
' '	Text.Whitespace
'"'	Punctuation
'idx'	Name
'('	Punctuation
'identical'	Name
'('	Punctuation
'var'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'anything'	Name
')'	
Punctuation
'"'	Punctuation
'));'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'nops'	Name.Builtin
'('	Punctuation
'ind'	Name
')'	Punctuation
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace

'1'   Literal.Number.Integer
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'ind'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'ind'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'# Make sure ind contains no bound variables before lifting it!\n' Comment.Single

'   '   Text.Whitespace
'# So, check that "extract using indets" and "rename using eval" commute.\n' Comment.Single

'   '   Text.Whitespace
's'   Name
' '   Text.Whitespace
':='   Operator
' '
 Text.Whitespace
'indets'   Name.Builtin
'('   Punctuation
'ind'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'name'   Name
'"'   Punctuation
');'   Punctuation
'\n   '   Text.Whitespace
's'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'map'   Name.Builtin
'('   Punctuation
'proc'   Keyword
'('   Punctuation
'x'   Name
','   Operator
'$'   Operator
')'   Punctuation
' '   Text.Whitespace
'local'   Keyword

```
' '        Text.Whitespace
'y'        Name
';'        Punctuation
' '        Text.Whitespace
'`if`'     Name
'('        Punctuation
'depends'  Name
'('        Punctuation
'ind'      Name
','        Operator
'x'        Name
')'        Punctuation
','        Operator
' '        Text.Whitespace
'x'        Name
'='        Operator
'y'
      Name
','        Operator
' '        Text.Whitespace
'NULL'     Name
')'        Punctuation
' '        Text.Whitespace
'end'      Keyword
' '        Text.Whitespace
'proc'     Keyword
','        Operator
' '        Text.Whitespace
's'        Name
');'       Punctuation
'\n    '   Text.Whitespace
'if'       Keyword
' '        Text.Whitespace
'indets'   Name.Builtin
'('        Punctuation
'eval'     Name.Builtin
'('        Punctuation
'w'        Name
','        Operator
' '        Text.Whitespace
's'        Name
')'        Punctuation
','        Operator
' '        Text.Whitespace
'"""'      Punctuation
'idx'      Name
'('        Punctuation
'identical' Name
```

'('   Punctuation
'var'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'anything'   Name
')'   Punctuation
'"""'   Punctuation
')'   Punctuation
'\n   '
 Text.Whitespace
'='   Operator
' '   Text.Whitespace
'{'   Punctuation
'idx'   Name
'('   Punctuation
'var'   Name
','   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
'('   Punctuation
'ind'   Name
','   Operator
' '   Text.Whitespace
's'   Name
'))}'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
"# use kb as a local context, and 'solve' for the innermost bound var\n" Comment.Single

'   '   Text.Whitespace
'#   used in ind.\n' Comment.Single

'   '   Text.Whitespace
'kb'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'assert'   Name
'('   Punctuation
'lhs'   Name.Builtin
'('   Punctuation
'loop'   Name
')'   Punctuation
'='   Operator
'ind'   Name
','   Operator

```
' '        Text.Whitespace
'kb1'
      Name
');'        Punctuation
' '        Text.Whitespace
'# BUG! bijectivity assumed!\n' Comment.Single


'      '   Text.Whitespace
"# if the assertion makes the KB false, it isn't needed(?)\n" Comment.Single


'      '   Text.Whitespace
'ASSERT'    Name.Builtin
'('        Punctuation
'type'      Name.Builtin
'('        Punctuation
'kb'       Name
','        Operator
' '        Text.Whitespace
't_kb'      Name
')'        Punctuation
','        Operator
'\n        ' Text.Whitespace
'sprintf'   Name
'('        Punctuation
"'assert(%a,%a) produced a false KB!\\n'" Literal.String
','        Operator
' '        Text.Whitespace
'lhs'       Name.Builtin
'('        Punctuation
'loop'      Name
')'        Punctuation
'='        Operator
'ind'      Name
','        Operator
'kb1'       Name
'))'        Punctuation
':'        Operator
'\n      '  Text.Whitespace
'res'       Name
' '        Text.Whitespace
':='
        Operator
' '        Text.Whitespace
'subs'      Name.Builtin
'('        Punctuation
'idx'      Name
'('        Punctuation
'var'       Name
```

Token	Type
','	Operator
'ind'	Name
')'	Punctuation
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace
'idx'	Name
'('	Punctuation
'var'	Name
','	Operator
'lhs'	Name.Builtin
'('	Punctuation
'loop'	Name
'))'	Punctuation
','	Operator
' '	Text.Whitespace
'w'	Name
');'	Punctuation
\n '	Text.Whitespace
'res'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'wrap'	Name
'('	Punctuation
'heap'	Name
','	Operator
' '	Text.Whitespace
'res'	Name
','	Operator
' '	Text.Whitespace
'mode'	Name
','	Operator
' '	Text.Whitespace
'kb'	Name
','	Operator
' '	Text.Whitespace
'kb0'	Name
');'	Punctuation
\n '	Text.Whitespace
'res'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'subs'	Name.Builtin
'('	Punctuation
'idx'	Name

```
'('         Punctuation
'var'       Name
','         Operator
'lhs'       Name.Builtin
'('         Punctuation
'loop'      Name
'))'        Punctuation
'='         Operator
'dummy'     Name
','         Operator
' '         Text.Whitespace
'res'       Name
');'        Punctuation
'\n    '    Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'not'       Keyword
' '         Text.Whitespace
'depends'   Name
'('         Punctuation
'res'       Name
','         Operator
' '         Text.Whitespace
'var'       Name
')'         Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n        ' Text.Whitespace
'return'
    Keyword
' '         Text.Whitespace
'['         Punctuation
'1'         Literal.Number.Integer
','         Operator
' '         Text.Whitespace
'subs'      Name.Builtin
'('         Punctuation
'dummy'     Name
'='         Operator
'var'       Name
','         Operator
' '         Text.Whitespace
'res'       Name
')]'        Punctuation
'\n    '    Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
```

```
'\n    '    Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
'\n    '    Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n    '    Text.Whitespace
'# distribute the unproduct over each part\n' Comment.Single

'    '      Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'w'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'mode'
    Name
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'res'       Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'map'       Name.Builtin
'('         Punctuation
'unproduct' Name
','         Operator
' '         Text.Whitespace
'`if`'      Name
'('         Punctuation
'mode'      Name
'='         Operator
'`*`'       Name
','         Operator
' '         Text.Whitespace
'list_of_mul' Name
'('         Punctuation
'w'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'['         Punctuation
'op'        Name.Builtin
```

'('   Punctuation
'w'   Name
')])'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'var'   Name
','   Operator
' '   Text.Whitespace
'loop'   Name
','   Operator
' '   Text.Whitespace
'heap'   Name
','   Operator
' '

    Text.Whitespace
'mode'   Name
','   Operator
' '   Text.Whitespace
'kb1'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'['   Punctuation
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'map2'   Name
'('   Punctuation
'op'   Name.Builtin
','   Operator
'1'   Literal.Number.Integer
','   Operator
'res'   Name
')))'   Punctuation
','   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'map2'   Name
'('   Punctuation
'op'   Name.Builtin

```
','          Operator
'2'          Literal.Number.Integer
','          Operator
'res'        Name
')))]'       Punctuation
'\n    '     Text.Whitespace
'end'
         Keyword
' '          Text.Whitespace
'if'         Keyword
';'          Punctuation
'\n    '     Text.Whitespace
'# for piecewise, just map right in (using KB for context tracking)\n' Comment.Single

'   '        Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'w'          Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'"'          Punctuation
'specfunc'   Name
'('          Punctuation
'piecewise'  Name.Builtin
')'          Punctuation
'"'          Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'kb'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'kb1'        Name
';'          Punctuation
'\n    '     Text.Whitespace
'for'        Keyword
' '          Text.Whitespace
'i'          Name
' '          Text.Whitespace
'from'       Keyword
' '          Text.Whitespace
'1'          Literal.Number.Integer
'
   '         Text.Whitespace
'to'         Keyword
' '          Text.Whitespace
```

```
'nops'      Name.Builtin
'('         Punctuation
'w'         Name
')'         Punctuation
' '         Text.Whitespace
'do'        Keyword
'\n   '     Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'i'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'even'      Name
' '         Text.Whitespace
'then'      Keyword
'\n      '  Text.Whitespace
'kbThen'    Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'assert'    Name
'('         Punctuation
'   '       Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'i'         Name
'-'         Operator
'1'         Literal.Number.Integer
','         Operator
'w'         Name
')'         Punctuation
' '         Text.Whitespace
','         Operator
' '         Text.Whitespace
'kb'        Name
');'
            Punctuation
'\n      '  Text.Whitespace
'# accumulate the rest, regardless\n' Comment.Single

'        '  Text.Whitespace
'kb'        Name
'   '       Text.Whitespace
':='        Operator
' '         Text.Whitespace
'assert'    Name
'('         Punctuation
```

'Not'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name
'-'   Operator
'1'   Literal.Number.Integer
','   Operator
'w'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'kb'   Name
');'   Punctuation
'\n\n   ' Text.Whitespace
'# if kbThen is invalid, deal appropriately\n' Comment.Single

'   ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'not'   Keyword
' '   Text.Whitespace
'type'   Name.Builtin
'('   Punctuation
'kbThen'   Name
','   Operator
't_kb'   Name
')'   Punctuation
' '

             Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'next'   Keyword
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n\n   ' Text.Whitespace
'w1'   Name
'['   Punctuation
'i'   Name
']'   Punctuation
','   Operator
' '   Text.Whitespace
'pp'   Name
'['   Punctuation
'i'   Name

```
']'          Punctuation
' '          Text.Whitespace
':='          Operator
' '          Text.Whitespace
'op'          Name.Builtin
'('          Punctuation
'unproduct'  Name
'('          Punctuation
'op'          Name.Builtin
'('          Punctuation
'i'          Name
','          Operator
'w'          Name
')'          Punctuation
','          Operator
'var'          Name
','          Operator
'loop'          Name
','          Operator
'heap'          Name
','          Operator
'mode'          Name
','          Operator
'kbThen'
          Name
','          Operator
'kb0'          Name
'));'          Punctuation
'\n          ' Text.Whitespace
"# if kb is inconsistent, we're done\n" Comment.Single

'          ' Text.Whitespace
'if'          Keyword
' '          Text.Whitespace
'not'          Keyword
' '          Text.Whitespace
'type'          Name.Builtin
'('          Punctuation
'kb'          Name
','          Operator
't_kb'          Name
')'          Punctuation
' '          Text.Whitespace
'then'          Keyword
' '          Text.Whitespace
'break'          Keyword
' '          Text.Whitespace
'end'          Keyword
```

' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'elif'	Keyword
' '	Text.Whitespace
'i'	Name
' '	Text.Whitespace
'='	Operator
' '	Text.Whitespace
'nops'	Name.Builtin
'('	Punctuation
'w'	Name
')'	Punctuation
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'not'	Keyword
' '	Text.Whitespace
'type'	Name.Builtin
'('	Punctuation
'kb'	Name
','	Operator
't_kb'	Name
')'	Punctuation
' '	Text.Whitespace
'then'	Keyword
' '	Text.Whitespace
'next'	Keyword
' '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'w1'	Name
'['	Punctuation
'i'	Name
']'	Punctuation
','	Operator
' '	Text.Whitespace
'pp'	Name
'['	Punctuation
'i'	Name
']'	Punctuation

```
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'unproduct'  Name
'('         Punctuation
'op'        Name.Builtin
'('
            Punctuation
'i'         Name
','         Operator
'w'         Name
')'         Punctuation
','         Operator
'var'       Name
','         Operator
'loop'      Name
','         Operator
'heap'      Name
','         Operator
'mode'      Name
','         Operator
'kb'        Name
'  '        Text.Whitespace
','         Operator
'kb0'       Name
'))'        Punctuation
\n    '  Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
\n    '  Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'do'        Keyword
';'         Punctuation
\n    '  Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'['         Punctuation
'`*`'       Name
'('         Punctuation
'entries'   Name.Builtin
'('         Punctuation
'w1'        Name
','         Operator
'""'        Punctuation
```

'nolist'   Name
'"'   Punctuation
'))'   Punctuation
','
              Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'entries'   Name.Builtin
'('   Punctuation
'pp'   Name
','   Operator
'"'   Punctuation
'nolist'   Name
'"'   Punctuation
'))]'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'mode'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'`*`'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'w'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'('   Punctuation
'anything'   Name
'^'   Operator
'freeof'   Name
'('   Punctuation
'var'   Name
'))'
              Punctuation
' '   Text.Whitespace
'then'   Keyword

'\n   ' Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'unproduct' Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'w'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'var'   Name
','   Operator
' '   Text.Whitespace
'loop'   Name
','   Operator
'\n   ' Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'heap'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'Stmt'   Name
'('   Punctuation
'`^`'   Name
','   Operator
' '   Text.Whitespace
'[]'   Punctuation
','   Operator
' '   Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('

          Punctuation
'2'   Literal.Number.Integer
','   Operator
'w'   Name
')])]'   Punctuation
','   Operator
' '   Text.Whitespace
'`*`'   Name
','   Operator
' '   Text.Whitespace
'kb1'   Name

```
','         Operator
' '         Text.Whitespace
'kb0'       Name
')'         Punctuation
'\n     '   Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'w'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
'exp'       Name
'('         Punctuation
'anything'  Name
')'         Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'unproduct' Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'w'         Name
')'         Punctuation
','         Operator
'
    '       Text.Whitespace
'var'       Name
','         Operator
' '         Text.Whitespace
'loop'      Name
','         Operator
'\n                  ' Text.Whitespace
'['         Punctuation
'op'        Name.Builtin
'('         Punctuation
'heap'      Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'Stmt'      Name
'('         Punctuation
'exp'       Name
','         Operator
```

' '	Text.Whitespace
'[]'	Punctuation
','	Operator
' '	Text.Whitespace
'[])]'	Punctuation
','	Operator
' '	Text.Whitespace
'`+`'	Name
','	Operator
' '	Text.Whitespace
'kb1'	Name
','	Operator
' '	Text.Whitespace
'kb0'	Name
')'	Punctuation
'\n '	Text.Whitespace
'elif'	Keyword
' '	Text.Whitespace
'w'	Name
' '	Text.Whitespace
'::'	Operator
' '	
	Text.Whitespace
'('	Punctuation
'freeof'	Name
'('	Punctuation
'var'	Name
')^'	Punctuation
'anything'	Name
')'	Punctuation
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'return'	Keyword
' '	Text.Whitespace
'unproduct'	Name
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'2'	Literal.Number.Integer
','	Operator
'w'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'var'	Name
','	Operator
' '	Text.Whitespace

'loop'   Name
','   Operator
'\n   ' Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'heap'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'Stmt'   Name
'('   Punctuation
'`^`'   Name
','   Operator
' '
          Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'w'   Name
')]'   Punctuation
','   Operator
' '   Text.Whitespace
'[])]'   Punctuation
','   Operator
' '   Text.Whitespace
'`+`'   Name
','   Operator
' '   Text.Whitespace
'kb1'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace

```
'mode'      Name
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
"`+`"       Name
' '         Text.Whitespace
'and'
            Keyword
' '         Text.Whitespace
'w'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
"`*`"       Name
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
's'         Name
','         Operator
' '         Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'depends'   Name
','         Operator
' '         Text.Whitespace
'w'         Name
','         Operator
' '         Text.Whitespace
'var'       Name
');'        Punctuation
'\n    '    Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
's'         Name
' '         Text.Whitespace
'::'        Operator
' '         Text.Whitespace
"`*`"       Name
' '         Text.Whitespace
'then'      Keyword
'\n      '  Text.Whitespace
'# Nonlinear %1 (time to reread kiselyov-lifted?)\n'
            Comment.Single
```

```
'   '        Text.Whitespace
'else'        Keyword
'\n    '  Text.Whitespace
'return'      Keyword
' '          Text.Whitespace
'unproduct'  Name
'('           Punctuation
's'          Name
','           Operator
' '          Text.Whitespace
'var'         Name
','           Operator
' '          Text.Whitespace
'loop'        Name
','           Operator
'\n                ' Text.Whitespace
'['           Punctuation
'op'          Name.Builtin
'('           Punctuation
'heap'        Name
')'           Punctuation
','           Operator
' '          Text.Whitespace
'Stmt'        Name
'('           Punctuation
'`*`'        Name
','           Operator
' '          Text.Whitespace
'[]'          Punctuation
','           Operator
' '          Text.Whitespace
'['           Punctuation
'r'          Name
'])]'         Punctuation
','           Operator
' '          Text.Whitespace
'`+`'        Name
','           Operator
' '          Text.Whitespace
'kb1'
        Name
','           Operator
' '          Text.Whitespace
'kb0'         Name
')'           Punctuation
'\n   '  Text.Whitespace
'end'         Keyword
' '          Text.Whitespace
```

'if'   Keyword
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'w'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'And'   Name
'('   Punctuation
'specfunc'   Name
'('   Punctuation
'`if`'   Name
'('   Punctuation
'mode'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'`*`'   Name
','   Operator
' '   Text.Whitespace
'{'   Punctuation
'product'   Name
','   Operator
' '   Text.Whitespace
'Product'   Name
'}'   Punctuation
','

   Operator
' '   Text.Whitespace
'{'   Punctuation
'sum'   Name
','   Operator
' '   Text.Whitespace
'Sum'   Name
'}))'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'anyfunc'   Name
'('   Punctuation
'anything'   Name
';'   Operator
' '   Text.Whitespace

```
'name'      Name
'='         Operator
'range'     Name
'('         Punctuation
'freeof'    Name
'('         Punctuation
'var'       Name
'))))'      Punctuation
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'x'         Name
','         Operator
' '         Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'genType'   Name
'('         Punctuation
'op'        Name.Builtin
'(['        Punctuation
'2'         Literal.Number.Integer
','         Operator
'1'         Literal.Number.Integer
']'
      Punctuation
','         Operator
'w'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'HInt'      Name
'('         Punctuation
'closed_bounds' Name
'('         Punctuation
'op'        Name.Builtin
'(['        Punctuation
'2'         Literal.Number.Integer
','         Operator
'2'         Literal.Number.Integer
']'         Punctuation
','         Operator
'w'         Name
')))'       Punctuation
','         Operator
' '         Text.Whitespace
'kb1'       Name
```

','	Operator
'\n '	Text.Whitespace
'w'	Name
','	Operator
' '	Text.Whitespace
'var'	Name
','	Operator
' '	Text.Whitespace
'loop'	Name
','	Operator
' '	Text.Whitespace
'heap'	Name
');'	Punctuation
'\n '	Text.Whitespace
'return'	Keyword
' '	Text.Whitespace
'unproduct'	Name
'('	Punctuation
'eval'	Name.Builtin
'('	Punctuation
'op'	Name.Builtin
'('	Punctuation
'1'	Literal.Number.Integer
','	Operator
'w'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'op'	Name.Builtin
'(['	Punctuation
'2'	Literal.Number.Integer
','	Operator
'1'	Literal.Number.Integer
']'	Punctuation
','	Operator
'w'	Name
')'	Punctuation
'='	Operator
'x'	Name
')'	Punctuation
','	Operator
' '	Text.Whitespace
'var'	Name
','	Operator
' '	Text.Whitespace
'loop'	Name
','	Operator

'\n   ' Text.Whitespace
'['   Punctuation
'op'   Name.Builtin
'('   Punctuation
'heap'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'Binder'   Name
'('   Punctuation
'op'

          Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'w'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'kb1'   Name
')]'   Punctuation
','   Operator
' '   Text.Whitespace
'mode'   Name
','   Operator
' '   Text.Whitespace
'kb'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'mode'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'`*`'   Name
' '   Text.Whitespace
'and'   Keyword
' '   Text.Whitespace
'w'   Name

```
' '          Text.Whitespace
'::'         Operator
' '
           Text.Whitespace
'"""'        Punctuation
'{'          Punctuation
'`+`'        Name
','          Operator
' '          Text.Whitespace
'specfunc'   Name
'({'         Punctuation
'sum'        Name
','          Operator
' '          Text.Whitespace
'Sum'        Name
'})}'        Punctuation
'"""'        Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'# Maybe this w is one of those big sums involving products that are\n' Comment.Single

'    '       Text.Whitespace
'# always equal to 1, left behind by the density of Categorical\n' Comment.Single

'    '       Text.Whitespace
'w1'         Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'graft'      Name
'('          Punctuation
'split'      Name
'('          Punctuation
'peel'       Name
'('          Punctuation
'w'          Name
')));'       Punctuation
'\n    '     Text.Whitespace
'w1'         Name
' '          Text.Whitespace
':='
         Operator
' '          Text.Whitespace
'combine'    Name
'('          Punctuation
'rebase_upper' Name
'('          Punctuation
```

'w1'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'w1'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'combine'   Name
'('   Punctuation
'rebase_lower' Name
'('   Punctuation
'w1'   Name
'));'   Punctuation
'\n   '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'['   Punctuation
'wrap'   Name
'('   Punctuation
'heap'   Name
','   Operator
' '   Text.Whitespace
'w1'   Name
','   Operator
' '   Text.Whitespace
'mode'   Name
','   Operator
' '   Text.Whitespace
'kb1'   Name
','   Operator
' '   Text.Whitespace
'kb0'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'1'
          Literal.Number.Integer
']'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'['   Punctuation
'wrap'   Name

```
'('         Punctuation
'heap'      Name
','         Operator
' '         Text.Whitespace
'w'         Name
','         Operator
' '         Text.Whitespace
'mode'      Name
','         Operator
' '         Text.Whitespace
'kb1'       Name
','         Operator
' '         Text.Whitespace
'kb0'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
']'         Punctuation
'\n '       Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
'\n\n '     Text.Whitespace
'enter_piecewise' Name
' '         Text.Whitespace
':='

        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'ee'        Name
','         Operator
' '         Text.Whitespace
'kb0'       Name
'::'        Operator
't_kb'      Name
','         Operator
' '         Text.Whitespace
'mode'      Name
'::'        Operator
'identical' Name
'('         Punctuation
'`*`'       Name
','         Operator
'`+`'       Name
')'         Punctuation
```

','	Operator
' '	Text.Whitespace
'$'	Operator
')'	Punctuation
'\n '	Text.Whitespace
'local'	Keyword
' '	Text.Whitespace
'e'	Name
','	Operator
' '	Text.Whitespace
'kb'	Name
','	Operator
' '	Text.Whitespace
'mo'	Name
';'	Punctuation
'\n '	Text.Whitespace
'e'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'ee'	Name
';'	
	Punctuation
'\n '	Text.Whitespace
'kb'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'kb0'	Name
';'	Punctuation
'\n '	Text.Whitespace
'mo'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'mode'	Name
'();'	Punctuation
'\n '	Text.Whitespace
'while'	Keyword
' '	Text.Whitespace
'e'	Name
' '	Text.Whitespace
'::'	Operator
' '	Text.Whitespace
'"'	Punctuation
'specfunc'	Name
'('	Punctuation
'piecewise'	Name.Builtin

```
')'         Punctuation
'""'        Punctuation
' '         Text.Whitespace
'and'       Keyword
' '         Text.Whitespace
'nops'      Name.Builtin
'('         Punctuation
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'3'         Literal.Number.Integer
'
'           Text.Whitespace
'do'        Keyword
'\n    '    Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'3'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'mo'        Name
' '         Text.Whitespace
'then'      Keyword
'\n    '    Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'assert'    Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'kb'        Name
');'        Punctuation
```

```
'\n      '  Text.Whitespace
'e'         Name
' '         Text.Whitespace
':='        Operator
' '
            Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'e'         Name
');'        Punctuation
'\n    '    Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'mo'        Name
' '         Text.Whitespace
'then'      Keyword
'\n      '  Text.Whitespace
'kb'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'assert'    Name
'('         Punctuation
'Not'       Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
','         Operator
'e'         Name
'))'        Punctuation
','         Operator
' '         Text.Whitespace
'kb'
            Name
');'        Punctuation
'\n      '  Text.Whitespace
```

'e'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'e'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'else'   Keyword
'\n   '   Text.Whitespace
'break'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'ASSERT'   Name.Builtin
'('   Punctuation
'type'   Name.Builtin
'('   Punctuation
'kb'   Name
','   Operator
't_kb'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'"enter_piecewise:

 KB of piecewise conditions is not valid, so the input piecewise must not be valid."' Literal.String
');'   Punctuation
'\n   '   Text.Whitespace
'e'   Name
','   Operator
' '   Text.Whitespace
'kb'   Name
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword

';'   Punctuation
'\n\n '   Text.Whitespace
'# heap is a list of t_binder and t_stmt\n' Comment.Single

' '   Text.Whitespace
'# one invariant to maintain:\n' Comment.Single

' '   Text.Whitespace
'# wrap(heap, mode(a,b)) = wrap(heap,a) * wrap(heap,b)\n' Comment.Single

'\n '   Text.Whitespace
'# Also, a t_binder is a Product/product/Sum/sum.\n' Comment.Single

' '   Text.Whitespace
'# And, a t_stmt is a 1-hole context of a (multiplicative) AST,\n' Comment.Single

' '   Text.Whitespace
'#   used for [a ^ hole, hole ^ b, exp(hole), c * hole].\n' Comment.Single

'\n
 '   Text.Whitespace
'wrap'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'heap'   Name
'::'   Operator
'list'   Name
','   Operator
' '   Text.Whitespace
'e1'   Name
','   Operator
' '   Text.Whitespace
'mode1'   Name
'::'   Operator
'identical' Name
'('   Punctuation
'`*`'   Name
','   Operator
'`+`'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'kb1'   Name
'::'   Operator
't_kb'   Name

','   Operator
' '   Text.Whitespace
'kb0'   Name
'::'   Operator
't_kb'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'e'   Name
','   Operator
'
    '   Text.Whitespace
'kb'   Name
','   Operator
' '   Text.Whitespace
'mode'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
','   Operator
' '   Text.Whitespace
'entry'   Name
','   Operator
' '   Text.Whitespace
'rest'   Name
','   Operator
' '   Text.Whitespace
'var'   Name
','   Operator
' '   Text.Whitespace
'new_rng'   Name
','   Operator
' '   Text.Whitespace
'make'   Name
','   Operator
' '   Text.Whitespace
'logmake'   Name
','   Operator
'\n   '   Text.Whitespace
'dom_spec'   Name
','   Operator
' '   Text.Whitespace
'w'   Name
','   Operator

```
' '        Text.Whitespace
'wPow'      Name
','        Operator
' '        Text.Whitespace
'wExp'      Name
','        Operator
' '        Text.Whitespace
'arrrgs'    Name
';'        Punctuation
'\n
   '     Text.Whitespace
'e'        Name
'  '       Text.Whitespace
':='       Operator
' '        Text.Whitespace
'e1'        Name
';'        Punctuation
'\n   '     Text.Whitespace
'kb'        Name
'  '       Text.Whitespace
':='       Operator
' '        Text.Whitespace
'kb1'       Name
';'        Punctuation
'\n   '     Text.Whitespace
'mode'      Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'mode1'     Name
';'        Punctuation
'\n   '     Text.Whitespace
'for'       Keyword
' '        Text.Whitespace
'i'        Name
' '        Text.Whitespace
'from'      Keyword
' '        Text.Whitespace
'nops'      Name.Builtin
'('        Punctuation
'heap'      Name
')'        Punctuation
' '        Text.Whitespace
'to'        Keyword
' '        Text.Whitespace
'1'        Literal.Number.Integer
' '        Text.Whitespace
'by'        Keyword
```

```
' '
        Text.Whitespace
'-'          Operator
'1'          Literal.Number.Integer
' '          Text.Whitespace
'do'         Keyword
'\n    '     Text.Whitespace
'entry'      Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'op'         Name.Builtin
'('          Punctuation
'i'          Name
','          Operator
'heap'       Name
');'         Punctuation
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'entry'      Name
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
't_binder'   Name
' '          Text.Whitespace
'then'       Keyword
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'not'        Keyword
' '          Text.Whitespace
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'entry'      Name
')'          Punctuation
' '          Text.Whitespace
'in'
        Keyword
' '          Text.Whitespace
'`if`'       Name
'('          Punctuation
'mode'       Name
'='          Operator
'`+`'        Name
```

','   Operator
' '   Text.Whitespace
'{'   Punctuation
'sum'   Name
','   Operator
'Sum'   Name
'}'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'{'   Punctuation
'product'   Name
','   Operator
'Product'   Name
'}))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'print'   Name.Builtin
'('   Punctuation
'"Warning: heap mode inconsistency"' Literal.String
','   Operator
' '   Text.Whitespace
'heap'   Name
','   Operator
' '   Text.Whitespace
'mode1'   Name
')'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'

     Punctuation
'\n   ' Text.Whitespace
'e'   Name
','   Operator
' '   Text.Whitespace
'kb'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'enter_piecewise' Name
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'kb'   Name
','   Operator

```
' '         Text.Whitespace
'mode'      Name
');'        Punctuation
'\n    '    Text.Whitespace
'rest'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'kb_subtract' Name
'('         Punctuation
'kb'        Name
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'2'         Literal.Number.Integer
','         Operator
'entry'     Name
'));'       Punctuation
'\n    '    Text.Whitespace
'new_rng'   Name
','         Operator
' '         Text.Whitespace
'rest'      Name
' '
        Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'type'      Name.Builtin
','         Operator
' '         Text.Whitespace
'rest'      Name
','         Operator
'\n    '    Text.Whitespace
'{['        Punctuation
'identical' Name
'('         Punctuation
'genType'   Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'name'      Name
','         Operator
' '         Text.Whitespace
'specfunc'  Name
'('         Punctuation
```

'HInt'   Name
')]'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'['   Punctuation
'identical' Name
'('   Punctuation
'genLet'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'name'   Name
','   Operator
' '   Text.Whitespace
'anything'   Name
']});'   Punctuation
'\n   ' Text.Whitespace
'if'
  Keyword
' '   Text.Whitespace
'not'   Keyword
' '   Text.Whitespace
'('   Punctuation
'new_rng'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'['   Punctuation
'list'   Name
'])'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"kb_subtract should return exactly one gen*"' Literal.String
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   ' Text.Whitespace
'new_rng'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation

'new_rng'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'var'   Name
'   '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('
            Punctuation
'2'   Literal.Number.Integer
','   Operator
'new_rng'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'new_rng'   Name
')'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'genType'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'make'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'entry'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'new_rng'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'range_of_HInt' Name
'('   Punctuation
'op'

Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'new_rng'   Name
'));'   Punctuation
'\n   ' Text.Whitespace
'else'   Keyword
' '   Text.Whitespace
'# op(1,new_rng) = genLet\n' Comment.Single

'   ' Text.Whitespace
'make'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'eval'   Name.Builtin
';'   Punctuation
'\n   ' Text.Whitespace
'new_rng'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'3'   Literal.Number.Integer
','   Operator
'new_rng'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   ' Text.Whitespace
'dom_spec'   Name
','   Operator
' '   Text.Whitespace
'rest'
     Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'depends'   Name
','   Operator
'\n   ' Text.Whitespace

'map'   Name.Builtin
'('   Punctuation
'proc'   Keyword
'('   Punctuation
'a'   Name
'::'   Operator
'['   Punctuation
'identical' Name
'('   Punctuation
'assert'   Name
')'   Punctuation
','   Operator
'anything'   Name
']'   Punctuation
','   Operator
'$'   Operator
')'   Punctuation
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'a'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
' '   Text.Whitespace
'rest'   Name
')'

 Punctuation
','   Operator
\n   ' Text.Whitespace
'var'   Name
');'   Punctuation
\n\n   ' Text.Whitespace
'# Like e := make(piecewise(And(op(dom_spec)), e, mode()), var=new_rng);\n' Comment.Single

'   '   Text.Whitespace
'# but try to simplify by pushing the make and the piecewise into e\n' Comment.Single

'   '   Text.Whitespace
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace

```
'w'          Name
')'          Punctuation
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'selectremove' Name.Builtin
'('          Punctuation
'depends'    Name
','          Operator
' '          Text.Whitespace
'convert'    Name.Builtin
'('          Punctuation
'e'          Name
','          Operator
' '          Text.Whitespace
'"'          Punctuation
'list'       Name
'"'          Punctuation
','          Operator
' '          Text.Whitespace
'`*`'        Name
')'
             Punctuation
','          Operator
' '          Text.Whitespace
'var'        Name
');'         Punctuation
'\n    '     Text.Whitespace
'w'          Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'`*`'        Name
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'w'          Name
'));'        Punctuation
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'mode'       Name
' '          Text.Whitespace
'='          Operator
' '          Text.Whitespace
'`*`'        Name
' '          Text.Whitespace
'then'       Keyword
```

'\n   ' Text.Whitespace
'('   Punctuation
'wPow'   Name
','   Operator
' '   Text.Whitespace
'e'   Name
')'   Punctuation
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'type'   Name.Builtin
','

          Operator
' '   Text.Whitespace
'e'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'`^`'   Name
'"'   Punctuation
'('   Punctuation
'"'   Punctuation
'freeof'   Name
'"'   Punctuation
'('   Punctuation
'var'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'anything' Name
'"'   Punctuation
'));'   Punctuation
'\n   ' Text.Whitespace
'('   Punctuation
'wExp'   Name
','   Operator
' '   Text.Whitespace
'e'   Name
')'   Punctuation
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'type'   Name.Builtin

```
','         Operator
' '         Text.Whitespace
'e'         Name
','         Operator
' '         Text.Whitespace
'"'         Punctuation
'exp'
            Name
'('         Punctuation
'anything'  Name
')'         Punctuation
'"'         Punctuation
');'        Punctuation
\n          ' Text.Whitespace
'wExp'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`+`'       Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'map2'      Name
'('         Punctuation
'op'        Name.Builtin
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
','         Operator
' '         Text.Whitespace
'wExp'      Name
')));'      Punctuation
\n          ' Text.Whitespace
'wExp'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'expand'    Name.Builtin
'('         Punctuation
'wExp'      Name
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'indets'    Name.Builtin
'('         Punctuation
'wExp'
```

```
          Name
','         Operator
' '         Text.Whitespace
'function'  Name
')));'      Punctuation
'\n     '   Text.Whitespace
'logmake'   Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
't'         Name
')'         Punctuation
'\n      '  Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
's'         Name
','         Operator
' '         Text.Whitespace
'r'         Name
';'         Punctuation
'\n      '  Text.Whitespace
's'         Name
','         Operator
' '         Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'depends'   Name
','         Operator
' '         Text.Whitespace
'convert'   Name.Builtin
'('         Punctuation
't'         Name
','         Operator
' '         Text.Whitespace
'"'
            Punctuation
'list'      Name
'"'         Punctuation
','         Operator
' '         Text.Whitespace
'`*`'       Name
')'         Punctuation
```

'},'   Operator
' '   Text.Whitespace
'var'   Name
');'   Punctuation
'\n   ' Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'`if`'   Name
'('   Punctuation
'make'   Name
'='   Operator
'eval'   Name.Builtin
','   Operator
'eval'   Name.Builtin
','   Operator
'Sum'   Name
')'   Punctuation
'\n   ' Text.Whitespace
'('   Punctuation
'piecewise_And' Name
'('   Punctuation
'dom_spec'   Name
','   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('

   Punctuation
's'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
')'   Punctuation
','   Operator
' '   Text.Whitespace
'var'   Name
'='   Operator
'new_rng'   Name
'));'   Punctuation
'\n   ' Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'w'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
' '   Text.Whitespace
'`if`'   Name
'('   Punctuation
'w'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'w'   Name
'
'   Text.Whitespace
'^'   Operator
' '   Text.Whitespace
'logmake'   Name
'('   Punctuation
'1'   Literal.Number.Integer
'))'   Punctuation
'\n   ' Text.Whitespace
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'map'   Name.Builtin
'(('   Punctuation
'f'   Name
' '   Text.Whitespace
'->'   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator

'f'   Name
')'   Punctuation
' '   Text.Whitespace
'^'   Operator
' '   Text.Whitespace
'logmake'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'f'   Name
')))'   Punctuation
','   Operator
' '   Text.Whitespace
'wPow'

    Name
'))'   Punctuation
'\n   ' Text.Whitespace
','   Operator
' '   Text.Whitespace
'`if`'   Name
'('   Punctuation
'wExp'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'exp'   Name
'('   Punctuation
'maptype'   Name
'('   Punctuation
'`+`'   Name
','   Operator
'logmake'   Name
','   Operator
'wExp'   Name
')))'   Punctuation
' '   Text.Whitespace
');'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace

'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'e'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'w'

    Name
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'make'   Name
'('   Punctuation
'piecewise_And' Name
'('   Punctuation
'dom_spec'   Name
','   Operator
' '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'e'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'mode'   Name
'())'   Punctuation
','   Operator
' '   Text.Whitespace
'var'   Name
'='   Operator
'new_rng'   Name
');'   Punctuation
'\n\n   ' Text.Whitespace
"# `rest' originally comes from `entry', and this reinserts it after some\n" Comment.Single

'   '   Text.Whitespace
'# processing. The original KB was valid, so this one should also be valid.\n' Comment.Single

'   '   Text.Whitespace
'kb'   Name
' '   Text.Whitespace
':='   Operator
' '

    Text.Whitespace
'foldr'   Name

'('   Punctuation
'assert'   Name
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'2'   Literal.Number.Integer
','   Operator
'entry'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'rest'   Name
'));'   Punctuation
'\n   ' Text.Whitespace
'ASSERT'   Name.Builtin
'('   Punctuation
'type'   Name.Builtin
'('   Punctuation
'kb'   Name
','   Operator
't_kb'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'"Loop/wrap{t_binder}: rebuilding kb produced contradiction"' Literal.String
');'   Punctuation
'\n\n   ' Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'entry'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
't_stmt'

    Name
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'# We evaluate arrrgs first, in case op(1,stmt) is an operation (such as\n' Comment.Single

'   ' Text.Whitespace
'# piecewise) that looks ahead at how many arguments it is passed before\n' Comment.Single

'   ' Text.Whitespace
'# they are evaluated.\n' Comment.Single

```
'    '    Text.Whitespace
'arrrgs'    Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'op'       Name.Builtin
'('        Punctuation
'op'       Name.Builtin
'('        Punctuation
'2'        Literal.Number.Integer
','        Operator
'entry'    Name
'))'       Punctuation
','        Operator
' '        Text.Whitespace
'e'        Name
','        Operator
' '        Text.Whitespace
'op'       Name.Builtin
'('        Punctuation
'op'       Name.Builtin
'('        Punctuation
'3'        Literal.Number.Integer
','
           Operator
'entry'    Name
'));'      Punctuation
'\n    '   Text.Whitespace
'e'        Name
'   '      Text.Whitespace
':='       Operator
' '        Text.Whitespace
'op'       Name.Builtin
'('        Punctuation
'1'        Literal.Number.Integer
','        Operator
'entry'    Name
')('       Punctuation
'arrrgs'   Name
');'       Punctuation
'\n    '   Text.Whitespace
'if'       Keyword
' '        Text.Whitespace
'entry'    Name
' '        Text.Whitespace
'::'       Operator
' '        Text.Whitespace
```

```
't_exp'      Name
' '          Text.Whitespace
'then'       Keyword
'\n     '    Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'mode'       Name
' '          Text.Whitespace
'<>'         Operator
' '          Text.Whitespace
'`+`'        Name
' '          Text.Whitespace
'then'       Keyword
'\n        ' Text.Whitespace
'print'      Name.Builtin
'('          Punctuation
'"Warning:
 heap mode inconsistency?"' Literal.String
','          Operator
' '          Text.Whitespace
'heap'       Name
','          Operator
' '          Text.Whitespace
'mode1'      Name
')'          Punctuation
'\n     '    Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
';'          Punctuation
'\n     '    Text.Whitespace
'mode'       Name
' '          Text.Whitespace
':='         Operator
' '          Text.Whitespace
'`*`'        Name
';'          Punctuation
'\n   '      Text.Whitespace
'end'        Keyword
' '          Text.Whitespace
'if'         Keyword
'\n   '      Text.Whitespace
'else'       Keyword
' '          Text.Whitespace
'error'      Keyword
' '          Text.Whitespace
'"Malformed heap entry %1"' Literal.String
','          Operator
```

''   Text.Whitespace
'entry'   Name
''   Text.Whitespace
'end'   Keyword
''   Text.Whitespace
'if'   Keyword
'\n
   '   Text.Whitespace
'end'   Keyword
''   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
''   Text.Whitespace
'mode'   Name
''   Text.Whitespace
'<>'   Operator
''   Text.Whitespace
'`*`'   Name
''   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'print'   Name.Builtin
'('   Punctuation
'"Warning: heap mode inconsistency??"' Literal.String
','   Operator
''   Text.Whitespace
'heap'   Name
','   Operator
''   Text.Whitespace
'mode1'   Name
')'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
''   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'e'   Name
','   Operator
''   Text.Whitespace
'kb'   Name
''   Text.Whitespace
':='   Operator
''
     Text.Whitespace
'enter_piecewise' Name

```
'('        Punctuation
'e'        Name
','        Operator
' '        Text.Whitespace
'kb'       Name
','        Operator
' '        Text.Whitespace
'mode'     Name
');'       Punctuation
'\n    '   Text.Whitespace
'rest'     Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'kb_subtract' Name
'('        Punctuation
'kb'       Name
','        Operator
' '        Text.Whitespace
'kb0'      Name
');'       Punctuation
'\n    '   Text.Whitespace
'rest'     Name
' '        Text.Whitespace
':='       Operator
' '        Text.Whitespace
'map'      Name.Builtin
'('        Punctuation
'proc'     Keyword
'('        Punctuation
'a'        Name
'::'       Operator
'['        Punctuation
'identical'  Name
'('        Punctuation
'assert'   Name
')'        Punctuation
','        Operator
'anything'   Name
']'
 Punctuation
','        Operator
'$'        Operator
')'        Punctuation
' '        Text.Whitespace
'op'       Name.Builtin
'('        Punctuation
'2'        Literal.Number.Integer
```

```
','         Operator
'a'         Name
')'         Punctuation
' '         Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
','         Operator
' '         Text.Whitespace
'rest'      Name
');'        Punctuation
'\n   '     Text.Whitespace
'('         Punctuation
'wExp'      Name
','         Operator
' '         Text.Whitespace
'e'         Name
')'         Punctuation
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'selectremove' Name.Builtin
'('         Punctuation
'type'      Name.Builtin
','         Operator
' '         Text.Whitespace
'convert'   Name.Builtin
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'"'

    Punctuation
'list'      Name
'"'         Punctuation
','         Operator
' '         Text.Whitespace
'`*`'       Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'"'         Punctuation
'exp'       Name
'('         Punctuation
'anything'  Name
')'         Punctuation
'"'         Punctuation
');'        Punctuation
```

'\n   '   Text.Whitespace
'wExp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'`+`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'map2'   Name
'('   Punctuation
'op'   Name.Builtin
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'wExp'   Name
')));'   Punctuation
'\n   '   Text.Whitespace
'wExp'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'expand'
    Name.Builtin
'('   Punctuation
'wExp'   Name
','   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'indets'   Name.Builtin
'('   Punctuation
'wExp'   Name
','   Operator
' '   Text.Whitespace
'function'   Name
')));'   Punctuation
'\n   '   Text.Whitespace
'logmake'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'('   Punctuation
't'   Name
' '   Text.Whitespace
'->'   Operator

```
' '         Text.Whitespace
't'         Name
' '         Text.Whitespace
'*'         Operator
' '         Text.Whitespace
'piecewise_And' Name
'('         Punctuation
'rest'      Name
','         Operator
'1'         Literal.Number.Integer
','         Operator
'0'         Literal.Number.Integer
'));'       Punctuation
\n   '      Text.Whitespace
`if`'       Name
'('         Punctuation
'wExp'
       Name
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'0'         Literal.Number.Integer
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
','         Operator
' '         Text.Whitespace
'exp'       Name
'('         Punctuation
'maptype'   Name
'('         Punctuation
`+`'        Name
','         Operator
'logmake'   Name
','         Operator
'wExp'      Name
')))'       Punctuation
\n    '     Text.Whitespace
'*'         Operator
' '         Text.Whitespace
'piecewise_And' Name
'('         Punctuation
'rest'      Name
','         Operator
`*`'        Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
```

'e'   Name
'))'   Punctuation
','   Operator
'1'   Literal.Number.Integer
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'
          Punctuation
'\n\n '   Text.Whitespace
'# Rewrite product(...piecewise(i+42=lo+42,th,el)...,i=lo..hi)\n' Comment.Single

' '   Text.Whitespace
'# to eval(...th...,i=lo)*product(...el...,i=lo+1..hi)\n' Comment.Single

' '   Text.Whitespace
't_peel'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'"'   Punctuation
'And'   Name
'('   Punctuation
'specfunc' Name
'({'   Punctuation
'sum'   Name
','   Operator
'Sum'   Name
','   Operator
'product' Name
','   Operator
'Product' Name
'})'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'anyfunc' Name
'('   Punctuation
'anything' Name
','   Operator
' '   Text.Whitespace
'name'   Name
'='   Operator
'range'   Name
'))'   Punctuation
'"'   Punctuation
';'   Punctuation

```
'\n '       Text.Whitespace
'peel'
        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n    '    Text.Whitespace
'subsindets'  Name.Builtin
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
't_peel'    Name
','         Operator
' '         Text.Whitespace
'do_peel'   Name
');'        Punctuation
'\n '       Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
'\n '       Text.Whitespace
'do_peel'   Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n    '
 Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'make'      Name
','         Operator
' '         Text.Whitespace
```

'body'	Name
','	Operator
' '	Text.Whitespace
'x'	Name
','	Operator
' '	Text.Whitespace
'r'	Name
','	Operator
' '	Text.Whitespace
'cond'	Name
','	Operator
' '	Text.Whitespace
'line'	Name
','	Operator
' '	Text.Whitespace
'test'	Name
','	Operator
' '	Text.Whitespace
'x0'	Name
','	Operator
' '	Text.Whitespace
'r0'	Name
','	Operator
' '	Text.Whitespace
'cond0'	Name
','	Operator
' '	Text.Whitespace
'here'	Name
','	Operator
' '	Text.Whitespace
'rest'	Name
';'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'not'	
Keyword	
' '	Text.Whitespace
'('	Punctuation
'e'	Name
' '	Text.Whitespace
'::'	Operator
' '	Text.Whitespace
't_peel'	Name
')'	Punctuation
' '	Text.Whitespace
'then'	Keyword
' '	Text.Whitespace

```
'return'    Keyword
' '         Text.Whitespace
'e'         Name
' '         Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n    '    Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'0'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
' '         Text.Whitespace
'in'        Keyword
' '         Text.Whitespace
'"""'       Punctuation
'{'         Punctuation
'sum'       Name
'   '       Text.Whitespace
','         Operator
'Sum'       Name
'   '       Text.Whitespace
'}'
      Punctuation
'"""'       Punctuation
' '         Text.Whitespace
'then'      Keyword
' '         Text.Whitespace
'make'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`+`'       Name
';'         Punctuation
'\n    '    Text.Whitespace
'elif'      Keyword
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'0'         Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
```

```
' '         Text.Whitespace
'in'        Keyword
' '         Text.Whitespace
'"'         Punctuation
'{'         Punctuation
'product'   Name
','         Operator
'Product'   Name
'}'         Punctuation
'"'         Punctuation
' '         Text.Whitespace
'then'      Keyword
' '         Text.Whitespace
'make'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`*`'       Name
';'         Punctuation
' '
  Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n '       Text.Whitespace
'body'      Name
','         Operator
' '         Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'e'         Name
');'        Punctuation
'\n '       Text.Whitespace
'x'         Name
','         Operator
' '         Text.Whitespace
'r'         Name
'  '        Text.Whitespace
':='        Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
'r'         Name
```

');'   Punctuation
'\n '   Text.Whitespace
'for'   Keyword
' '   Text.Whitespace
'cond'   Name
' '   Text.Whitespace
'in'   Keyword
' '   Text.Whitespace
'indets'   Name.Builtin
'('   Punctuation
'body'   Name
','   Operator
'
  '   Text.Whitespace
'"'   Punctuation
'{'   Punctuation
'`=`'   Name
'('   Punctuation
'algebraic' Name
')'   Punctuation
','   Operator
'`<`'   Name
','   Operator
'`<=`'   Name
'}'   Punctuation
'"'   Punctuation
')'   Punctuation
' '   Text.Whitespace
'do'   Keyword
'\n '   Text.Whitespace
'line'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'`-`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'cond'   Name
'));'   Punctuation
'\n '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'1'   Literal.Number.Integer
' '   Text.Whitespace
'<>'   Operator
' '   Text.Whitespace
'degree'   Name.Builtin

'('   Punctuation
'line'   Name
','   Operator
' '   Text.Whitespace
'x'
 Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'next'   Keyword
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'cond'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'`=`'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'cond0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'true'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'Testzero' Name
'('   Punctuation
'eval'   Name.Builtin
'('   Punctuation
'line'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator
'lhs'
     Name.Builtin
'('   Punctuation

'r'   Name
')))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'x0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'lhs'   Name.Builtin
'('   Punctuation
'r'   Name
');'   Punctuation
' '   Text.Whitespace
'r0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'applyop'   Name
'('   Punctuation
"`+`'   Name
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'r'   Name
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
');'   Punctuation
'\n   '   Text.Whitespace
'elif'   Keyword
' '   Text.Whitespace
'Testzero'   Name
'('   Punctuation
'eval'   Name.Builtin
'('
             Punctuation
'line'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator
'rhs'   Name.Builtin
'('   Punctuation
'r'   Name
')))'   Punctuation

' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'x0'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'rhs'	Name.Builtin
'('	Punctuation
'r'	Name
');'	Punctuation
' '	Text.Whitespace
'r0'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'applyop'	Name
'('	Punctuation
"`-`"	Name
','	Operator
' '	Text.Whitespace
'2'	Literal.Number.Integer
','	Operator
' '	Text.Whitespace
'r'	Name
','	Operator
' '	Text.Whitespace
'1'	Literal.Number.Integer
');'	Punctuation
'\n'	
' '	Text.Whitespace
'else'	Keyword
' '	Text.Whitespace
'next'	Keyword
' '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'else'	Keyword
'\n '	Text.Whitespace
'test'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'proc'	Keyword
'('	Punctuation

'x0'   Name
','   Operator
' '   Text.Whitespace
'x1'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   ' Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'res'   Name
';'   Punctuation
'\n   ' Text.Whitespace
'res'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'evalb'   Name.Builtin
'('   Punctuation
'not'   Keyword
' '

     Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'cond'   Name
')('   Punctuation
'eval'   Name.Builtin
'('   Punctuation
'line'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator
'x1'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
'));'   Punctuation
'\n   ' Text.Whitespace
'`if`'   Name
'('   Punctuation
'res'   Name
' '   Text.Whitespace
'in'   Keyword

' '   Text.Whitespace
'"""'   Punctuation
'{'   Punctuation
'true'   Name
','   Operator
'false'   Name
'}'   Punctuation
'"""'   Punctuation
'\n   ' Text.Whitespace
'and'   Keyword
' '   Text.Whitespace
'evalb'   Name.Builtin
'('   Punctuation
'op'
      Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'cond'   Name
')('   Punctuation
'eval'   Name.Builtin
'('   Punctuation
'line'   Name
','   Operator
' '   Text.Whitespace
'x'   Name
'='   Operator
'x0'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'0'   Literal.Number.Integer
'))'   Punctuation
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'res'   Name
','   Operator
'\n   ' Text.Whitespace
'res'   Name
','   Operator
'\n   ' Text.Whitespace
'FAIL'   Name
')'   Punctuation
'\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword

';'   Punctuation
'\n   ' Text.Whitespace
'cond0'   Name
' '   Text.Whitespace
':='   Operator
' '

        Text.Whitespace
'test'   Name
'('   Punctuation
'lhs'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'lhs'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
'+'   Operator
'1'   Literal.Number.Integer
');'   Punctuation
'\n   ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'cond0'   Name
' '   Text.Whitespace
'<>'   Operator
' '   Text.Whitespace
'FAIL'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'x0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'lhs'   Name.Builtin
'('   Punctuation
'r'   Name
');'   Punctuation
' '   Text.Whitespace
'r0'   Name
' '   Text.Whitespace
':='   Operator
' '

    Text.Whitespace
'applyop'   Name

'('   Punctuation
'`+`'   Name
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
','   Operator
' '   Text.Whitespace
'r'   Name
','   Operator
' '   Text.Whitespace
'1'   Literal.Number.Integer
');'   Punctuation
'\n   '   Text.Whitespace
'else'   Keyword
'\n   '   Text.Whitespace
'cond0'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'test'   Name
'('   Punctuation
'rhs'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'rhs'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
');'   Punctuation
'\n   '   Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'cond0'
    Name
' '   Text.Whitespace
'<>'   Operator
' '   Text.Whitespace
'FAIL'   Name
' '   Text.Whitespace
'then'   Keyword
'\n   '   Text.Whitespace
'x0'   Name
' '   Text.Whitespace

```
':='        Operator
' '         Text.Whitespace
'rhs'       Name.Builtin
'('         Punctuation
'r'         Name
');'        Punctuation
' '         Text.Whitespace
'r0'        Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'applyop'   Name
'('         Punctuation
'`-`'       Name
','         Operator
' '         Text.Whitespace
'2'         Literal.Number.Integer
','         Operator
' '         Text.Whitespace
'r'         Name
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
');'        Punctuation
'\n        ' Text.Whitespace
'else'      Keyword
' '         Text.Whitespace
'next'      Keyword
' '
            Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n      '  Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n    '    Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'if'        Keyword
';'         Punctuation
'\n    '    Text.Whitespace
'here'      Name
' '         Text.Whitespace
':='        Operator
```

```
' '         Text.Whitespace
'subs'      Name.Builtin
'('         Punctuation
'cond'      Name
' '         Text.Whitespace
'='         Operator
'     '     Text.Whitespace
'cond0'     Name
' '         Text.Whitespace
','         Operator
' '         Text.Whitespace
'body'      Name
');'        Punctuation
'\n    '    Text.Whitespace
'rest'      Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'subs'      Name.Builtin
'('         Punctuation
'cond'
      Name
' '         Text.Whitespace
'='         Operator
' '         Text.Whitespace
'evalb'     Name.Builtin
'('         Punctuation
'not'       Keyword
' '         Text.Whitespace
'cond0'     Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'body'      Name
');'        Punctuation
'\n    '    Text.Whitespace
'return'    Keyword
' '         Text.Whitespace
'make'      Name
'('         Punctuation
'eval'      Name.Builtin
'('         Punctuation
'here'      Name
','         Operator
' '         Text.Whitespace
'x'         Name
'='         Operator
'x0'        Name
```

')'   Punctuation
';'   Operator
' '   Text.Whitespace
'do_peel'   Name
'('   Punctuation
'eval'   Name.Builtin
'('   Punctuation
'subsop'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
'='   Operator
'rest'   Name
','   Operator
'
 '   Text.Whitespace
'['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
'='   Operator
'r0'   Name
','   Operator
' '   Text.Whitespace
'e'   Name
')))));'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'e'   Name
';'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'# Expand sum(a*(b-c),q) to sum(a*b,q)-sum(a*c,q)\n' Comment.Single

' '   Text.Whitespace
'split'   Name
' '   Text.Whitespace
':='   Operator

```
' '        Text.Whitespace
'proc'     Keyword
'('        Punctuation
'e'
 Name
','        Operator
' '        Text.Whitespace
'$'        Operator
')'        Punctuation
'\n   '    Text.Whitespace
'subsindets'  Name.Builtin
'('        Punctuation
'e'        Name
','        Operator
' '        Text.Whitespace
'"'        Punctuation
'And'      Name
'('        Punctuation
'specfunc'  Name
'({'       Punctuation
'sum'      Name
','        Operator
'Sum'      Name
'})'       Punctuation
','        Operator
'\n            ' Text.Whitespace
'anyfunc'  Name
'('        Punctuation
'And'      Name
'('        Punctuation
'`*`'      Name
','        Operator
'Not'      Name
'('        Punctuation
'`*`'      Name
'('        Punctuation
'Not'      Name
'('        Punctuation
'`+`'      Name
'))))'     Punctuation
','        Operator
'name'     Name
'='        Operator
'anything'  Name
'))'       Punctuation
'"'        Punctuation
','        Operator
'\n
```

```
              ' Text.Whitespace
'do_split'   Name
');'        Punctuation
'\n '       Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
'\n '       Text.Whitespace
'do_split'   Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n   '     Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'terms'     Name
','         Operator
' '         Text.Whitespace
'x'         Name
';'         Punctuation
'\n   '     Text.Whitespace
'terms'     Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'convert'    Name.Builtin
'('         Punctuation
'expand'     Name.Builtin
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
'1'
        Literal.Number.Integer
','         Operator
'e'         Name
')'         Punctuation
','         Operator
' '         Text.Whitespace
'op'        Name.Builtin
'('         Punctuation
```

'indets'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'e'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'function'   Name
')))'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'"'   Punctuation
'list'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'`+`'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'x'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'1'
        Literal.Number.Integer
']'   Punctuation
','   Operator
'e'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'`+`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'map'   Name.Builtin
'('   Punctuation
'proc'   Keyword
'('   Punctuation
'term'   Name
','   Operator
' '   Text.Whitespace

'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
's'   Name
','   Operator
' '   Text.Whitespace
'r'   Name
';'   Punctuation
'\n   '   Text.Whitespace
's'   Name
','   Operator
' '   Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'selectremove' Name.Builtin
'('   Punctuation
'depends'   Name
','   Operator
' '

   Text.Whitespace
'convert'   Name.Builtin
'('   Punctuation
'term'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'list'   Name
'"'   Punctuation
','   Operator
' '   Text.Whitespace
'`*`'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'x'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'`*`'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
','   Operator

```
' '         Text.Whitespace
'subsop'    Name.Builtin
'('         Punctuation
'1'         Literal.Number.Integer
'='         Operator
'`*`'       Name
'('         Punctuation
'op'        Name.Builtin
'('         Punctuation
's'         Name
'))'        Punctuation
','         Operator
'e'         Name
'))'        Punctuation
'\n  '      Text.Whitespace
'end'
    Keyword
' '         Text.Whitespace
'proc'      Keyword
','         Operator
' '         Text.Whitespace
'terms'     Name
')))'       Punctuation
'\n '       Text.Whitespace
'end'       Keyword
' '         Text.Whitespace
'proc'      Keyword
';'         Punctuation
'\n\n '     Text.Whitespace
'# Simplify f(lo-1)*product(f(i),i=lo..hi) to product(f(i),i=lo-1..hi)\n' Comment.Single

' '         Text.Whitespace
'graft'     Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n  '      Text.Whitespace
'subsindets' Name.Builtin
'('         Punctuation
'e'         Name
','         Operator
```

```
' '          Text.Whitespace
'"'          Punctuation
'Or'         Name
'('          Punctuation
'And'        Name
'('          Punctuation
'`*`'        Name
','
             Operator
'Not'        Name
'('          Punctuation
'`*`'        Name
'('          Punctuation
'Not'        Name
'('          Punctuation
'specfunc'   Name
'({'         Punctuation
'product'    Name
','          Operator
'Product'    Name
'})))))'     Punctuation
','          Operator
'\n                ' Text.Whitespace
'And'        Name
'('          Punctuation
'`+`'        Name
','          Operator
'Not'        Name
'('          Punctuation
'`+`'        Name
'('          Punctuation
'Not'        Name
'('          Punctuation
'specfunc'   Name
'({'         Punctuation
'sum'        Name
'   '        Text.Whitespace
','          Operator
'Sum'        Name
'   '        Text.Whitespace
'}))))))'    Punctuation
'"'          Punctuation
','          Operator
'\n          ' Text.Whitespace
'do_graft'   Name
');'         Punctuation
'\n '        Text.Whitespace
'end'        Keyword
```

```
' '         Text.Whitespace
'proc'
  Keyword
';'         Punctuation
'\n '       Text.Whitespace
'do_graft'  Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'         Punctuation
'\n   '     Text.Whitespace
'local'     Keyword
' '         Text.Whitespace
'produce'   Name
','         Operator
' '         Text.Whitespace
'factors'   Name
','         Operator
' '         Text.Whitespace
'i'         Name
','         Operator
' '         Text.Whitespace
'j'         Name
';'         Punctuation
'\n   '     Text.Whitespace
'produce'   Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'`if`'      Name
'('         Punctuation
'e'         Name
'::'        Operator
'`*`'       Name
','         Operator
' '         Text.Whitespace
'""'        Punctuation
'{'
        Punctuation
'product'   Name
','         Operator
'Product'   Name
```

'}'   Punctuation
'"'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'"'   Punctuation
'{'   Punctuation
'sum'   Name
' '   Text.Whitespace
','   Operator
'Sum'   Name
' '   Text.Whitespace
'}'   Punctuation
'"'   Punctuation
');'   Punctuation
'\n   '   Text.Whitespace
'factors'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'sort'   Name.Builtin
'('   Punctuation
'convert'   Name.Builtin
'('   Punctuation
'e'   Name
','   Operator
'"'   Punctuation
'list'   Name
'"'   Punctuation
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'key'   Name
' '   Text.Whitespace
'='   Operator
' '   Text.Whitespace
'('
            Punctuation
'factor'   Name
' '   Text.Whitespace
'->'   Operator
' '   Text.Whitespace
'-'   Operator
'numboccur' Name.Builtin
'('   Punctuation
'factor'   Name
','   Operator
'produce'   Name
')));'   Punctuation

```
'\n   '    Text.Whitespace
'for'       Keyword
' '         Text.Whitespace
'i'         Name
' '         Text.Whitespace
'from'      Keyword
' '         Text.Whitespace
'nops'      Name.Builtin
'('         Punctuation
'factors'   Name
')'         Punctuation
' '         Text.Whitespace
'to'        Keyword
' '         Text.Whitespace
'2'         Literal.Number.Integer
' '         Text.Whitespace
'by'        Keyword
' '         Text.Whitespace
'-'         Operator
'1'         Literal.Number.Integer
' '         Text.Whitespace
'do'        Keyword
'\n   '     Text.Whitespace
'for'       Keyword
' '         Text.Whitespace
'j'         Name
' '
  Text.Whitespace
'from'      Keyword
' '         Text.Whitespace
'i'         Name
'-'         Operator
'1'         Literal.Number.Integer
' '         Text.Whitespace
'to'        Keyword
' '         Text.Whitespace
'1'         Literal.Number.Integer
' '         Text.Whitespace
'by'        Keyword
' '         Text.Whitespace
'-'         Operator
'1'         Literal.Number.Integer
' '         Text.Whitespace
'do'        Keyword
'\n   '     Text.Whitespace
'if'        Keyword
' '         Text.Whitespace
'op'        Name.Builtin
```

```
'('          Punctuation
'j'          Name
','          Operator
'factors'    Name
')'          Punctuation
' '          Text.Whitespace
'::'         Operator
' '          Text.Whitespace
'"'          Punctuation
'And'        Name
'"'          Punctuation
'('          Punctuation
'"'          Punctuation
'specfunc'   Name
'"'          Punctuation
'('          Punctuation
'produce'    Name
')'          Punctuation
','
         Operator
'\n                  ' Text.Whitespace
'"'          Punctuation
'anyfunc'    Name
'('          Punctuation
'anything'   Name
','          Operator
'name'       Name
'='          Operator
'range'      Name
')'          Punctuation
'"'          Punctuation
')'          Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n       ' Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'Testzero'   Name
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'i'          Name
','          Operator
'factors'    Name
')'          Punctuation
' '          Text.Whitespace
'-'          Operator
' '          Text.Whitespace
```

'eval'   Name.Builtin
'('   Punctuation
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'
        Punctuation
','   Operator
'\n   ' Text.Whitespace
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'   Punctuation
'='   Operator
'op'   Name.Builtin
'(['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
')'   Punctuation
'-'   Operator
'1'   Literal.Number.Integer
'))'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'factors'   Name
' '   Text.Whitespace
':='   Operator

```
' '        Text.Whitespace
'subsop'
        Name.Builtin
'('        Punctuation
'i'        Name
'='        Operator
'NULL'      Name
','        Operator
'applyop'   Name
'('        Punctuation
'`-`'       Name
','        Operator
'['        Punctuation
'j'        Name
','        Operator
'2'        Literal.Number.Integer
','        Operator
'2'        Literal.Number.Integer
','        Operator
'1'        Literal.Number.Integer
']'        Punctuation
','        Operator
'factors'   Name
','        Operator
'1'        Literal.Number.Integer
'));'      Punctuation
'\n       ' Text.Whitespace
'break'    Keyword
'\n       ' Text.Whitespace
'elif'     Keyword
' '        Text.Whitespace
'Testzero'  Name
'('        Punctuation
'op'       Name.Builtin
'('        Punctuation
'i'        Name
','        Operator
'factors'   Name
')'        Punctuation
' '        Text.Whitespace
'-'        Operator
' '        Text.Whitespace
'eval'
        Name.Builtin
'('        Punctuation
'op'       Name.Builtin
'(['       Punctuation
'j'        Name
```

','	Operator
'1'	Literal.Number.Integer
']'	Punctuation
','	Operator
'factors'	Name
')'	Punctuation
','	Operator
'\n '	Text.Whitespace
'op'	Name.Builtin
'(['	Punctuation
'j'	Name
','	Operator
'2'	Literal.Number.Integer
','	Operator
'1'	Literal.Number.Integer
']'	Punctuation
','	Operator
'factors'	Name
')'	Punctuation
'='	Operator
'op'	Name.Builtin
'(['	Punctuation
'j'	Name
','	Operator
'2'	Literal.Number.Integer
','	Operator
'2'	Literal.Number.Integer
','	Operator
'2'	Literal.Number.Integer
']'	Punctuation
','	Operator
'factors'	Name
')'	Punctuation
'+'	
	Operator
'1'	Literal.Number.Integer
'))'	Punctuation
' '	Text.Whitespace
'then'	Keyword
'\n '	Text.Whitespace
'factors'	Name
' '	Text.Whitespace
':='	Operator
' '	Text.Whitespace
'subsop'	Name.Builtin
'('	Punctuation
'i'	Name
'='	Operator

'NULL'   Name
','   Operator
'applyop'   Name
'('   Punctuation
"`+`"   Name
','   Operator
'['   Punctuation
'j'   Name
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'factors'   Name
','   Operator
'1'   Literal.Number.Integer
'));'   Punctuation
\n   ' Text.Whitespace
'break'   Keyword
\n   ' Text.Whitespace
'end'   Keyword
' '
      Text.Whitespace
'if'   Keyword
\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'do'   Keyword
';'   Punctuation
\n   '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'0'   Literal.Number.Integer
','   Operator
'e'   Name
')('   Punctuation
'op'   Name.Builtin

'('   Punctuation
'factors'   Name
'))'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'# Normalize sum(f(i),i=2..hi) to sum(f(i+2),i=0..hi-2)\n' Comment.Single

' '   Text.Whitespace
'rebase_lower' Name
' '   Text.Whitespace
':='   Operator
'
 '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n '   Text.Whitespace
'subsindets' Name.Builtin
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'And'   Name
'('   Punctuation
'specfunc'   Name
'({'   Punctuation
'sum'   Name
','   Operator
'Sum'   Name
','   Operator
'product'   Name
','   Operator
'Product'   Name
'})'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'anyfunc'   Name
'('   Punctuation
'anything'   Name

',' Operator
'\n   ' Text.Whitespace
'name'   Name
'='   Operator
'Not'   Name
'({'   Punctuation
'0'   Literal.Number.Integer
','   Operator
'SymbolicInfinity'
 Name
','   Operator
'undefined'   Name
'})'   Punctuation
'..'   Operator
'anything'   Name
'))'   Punctuation
'""'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'do_rebase_lower' Name
');'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'do_rebase_lower' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'subsop'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
'='

```
          Operator
'0'        Literal.Number.Integer
','        Operator
'\n        ' Text.Whitespace
'applyop'  Name
'('        Punctuation
'`-`'      Name
','        Operator
'\n              ' Text.Whitespace
'['        Punctuation
'2'        Literal.Number.Integer
','        Operator
'2'        Literal.Number.Integer
','        Operator
'2'        Literal.Number.Integer
']'        Punctuation
','        Operator
'\n              ' Text.Whitespace
'applyop'  Name
'('        Punctuation
'eval'     Name.Builtin
','        Operator
' '        Text.Whitespace
'1'        Literal.Number.Integer
','        Operator
' '        Text.Whitespace
'e'        Name
','        Operator
' '        Text.Whitespace
'op'       Name.Builtin
'(['       Punctuation
'2'        Literal.Number.Integer
','        Operator
'1'        Literal.Number.Integer
']'        Punctuation
','        Operator
'e'
     Name
')'        Punctuation
'='        Operator
'op'       Name.Builtin
'(['       Punctuation
'2'        Literal.Number.Integer
','        Operator
'1'        Literal.Number.Integer
']'        Punctuation
','        Operator
'e'        Name
```

')'   Punctuation
'+'   Operator
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'e'   Name
'))'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'e'   Name
')))'   Punctuation
'\n
 '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'# Normalize sum(f(i),i=lo..2) to sum(f(i+2),i=lo-2..0)\n' Comment.Single

' '   Text.Whitespace
'rebase_upper' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'e'   Name
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace

```
'subsindets'  Name.Builtin
'('           Punctuation
'e'           Name
','           Operator
' '           Text.Whitespace
'"'           Punctuation
'And'         Name
'('           Punctuation
'specfunc'    Name
'({'          Punctuation
'sum'         Name
','           Operator
'Sum'         Name
','           Operator
'product'     Name
','           Operator
'Product'     Name
'})'          Punctuation
','           Operator
'\n
              ' Text.Whitespace
'anyfunc'     Name
'('           Punctuation
'anything'    Name
','           Operator
'\n                ' Text.Whitespace
'name'        Name
'='           Operator
'anything'    Name
'..'          Operator
'Not'         Name
'({'          Punctuation
'0'           Literal.Number.Integer
','           Operator
'SymbolicInfinity' Name
','           Operator
'undefined'   Name
'})))'        Punctuation
'"'           Punctuation
','           Operator
'\n           ' Text.Whitespace
'do_rebase_upper' Name
');'          Punctuation
'\n '         Text.Whitespace
'end'         Keyword
' '           Text.Whitespace
'proc'        Keyword
';'           Punctuation
```

```
'\n '       Text.Whitespace
'do_rebase_upper' Name
' '         Text.Whitespace
':='        Operator
' '         Text.Whitespace
'proc'      Keyword
'('         Punctuation
'e'         Name
','         Operator
' '         Text.Whitespace
'$'         Operator
')'
            Punctuation
'\n    '    Text.Whitespace
'subsop'    Name.Builtin
'(['        Punctuation
'2'         Literal.Number.Integer
','         Operator
'2'         Literal.Number.Integer
','         Operator
'2'         Literal.Number.Integer
']'         Punctuation
'='         Operator
'0'         Literal.Number.Integer
','         Operator
'\n        ' Text.Whitespace
'applyop'   Name
'('         Punctuation
'`-`'       Name
','         Operator
'\n            ' Text.Whitespace
'['         Punctuation
'2'         Literal.Number.Integer
','         Operator
'2'         Literal.Number.Integer
','         Operator
'1'         Literal.Number.Integer
']'         Punctuation
','         Operator
'\n            ' Text.Whitespace
'applyop'   Name
'('         Punctuation
'eval'      Name.Builtin
','         Operator
' '         Text.Whitespace
'1'         Literal.Number.Integer
','         Operator
' '
```

	Text.Whitespace
'e'	Name
','	Operator
' '	Text.Whitespace
'op'	Name.Builtin
'(['	Punctuation
'2'	Literal.Number.Integer
','	Operator
'1'	Literal.Number.Integer
']'	Punctuation
','	Operator
'e'	Name
')'	Punctuation
'='	Operator
'op'	Name.Builtin
'(['	Punctuation
'2'	Literal.Number.Integer
','	Operator
'1'	Literal.Number.Integer
']'	Punctuation
','	Operator
'e'	Name
')'	Punctuation
'+'	Operator
'op'	Name.Builtin
'(['	Punctuation
'2'	Literal.Number.Integer
','	Operator
'2'	Literal.Number.Integer
','	Operator
'2'	Literal.Number.Integer
']'	Punctuation
','	Operator
'e'	Name
'))'	Punctuation
','	Operator
'\n '	Text.Whitespace
'op'	Name.Builtin
'(['	Punctuation
'2'	Literal.Number.Integer
','	Operator
'2'	Literal.Number.Integer
','	Operator
'2'	Literal.Number.Integer
']'	Punctuation
','	Operator
'e'	Name

')))'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n\n '   Text.Whitespace
'ModuleLoad' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'proc'   Keyword
'($)'   Punctuation
'\n   '   Text.Whitespace
'# Override csgn to work a little bit harder on piecewise and sum\n' Comment.Single

'   '   Text.Whitespace
'# (to get rid of csgn(1/2+1/2*sum(piecewise(...,1,0),...))\n' Comment.Single

'   '   Text.Whitespace
'# produced by int on a Gaussian mixture model)\n' Comment.Single

'   '   Text.Whitespace
'unprotect' Name
'('   Punctuation
'csgn'
       Name
');'   Punctuation
'\n   '   Text.Whitespace
'csgn'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'overload'   Name
'(['   Punctuation
'\n   '   Text.Whitespace
"# Handle if the csgn of a piecewise doesn't depend on which branch\n" Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'a'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'specfunc'   Name
'('   Punctuation
'piecewise' Name.Builtin

')'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'option'   Keyword
' '   Text.Whitespace
'overload'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'r'   Name
','   Operator
' '   Text.Whitespace
'i'
             Name
';'   Punctuation
'\n   '   Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'{'   Punctuation
'seq'   Name.Builtin
'('   Punctuation
'`if`'   Name
'('   Punctuation
'i'   Name
'::'   Operator
'even'   Name
' '   Text.Whitespace
'or'   Keyword
' '   Text.Whitespace
'i'   Name
'='   Operator
'nops'   Name.Builtin
'('   Punctuation
'a'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'csgn'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name

','	Operator
'a'	Name
'))'	Punctuation
','	Operator
' '	Text.Whitespace
'NULL'	Name
')'	Punctuation
','	Operator
'\n '	Text.Whitespace
'i'	
	Name
'='	Operator
'1'	Literal.Number.Integer
'..'	Punctuation
'nops'	Name.Builtin
'('	Punctuation
'a'	Name
'))};'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'nops'	Name.Builtin
'('	Punctuation
'r'	Name
')'	Punctuation
'='	Operator
'1'	Literal.Number.Integer
' '	Text.Whitespace
'then'	Keyword
' '	Text.Whitespace
'return'	Keyword
' '	Text.Whitespace
'op'	Name.Builtin
'('	Punctuation
'r'	Name
')'	Punctuation
' '	Text.Whitespace
'end'	Keyword
' '	Text.Whitespace
'if'	Keyword
';'	Punctuation
'\n '	Text.Whitespace
'if'	Keyword
' '	Text.Whitespace
'not'	Keyword
' '	Text.Whitespace
'assigned'	Name.Builtin
'(_'	Punctuation

'Envsignum0' Name

')'

      Punctuation

' '   Text.Whitespace

'then'   Keyword

'\n   ' Text.Whitespace

'r'   Name

' '   Text.Whitespace

':='   Operator

' '   Text.Whitespace

'r'   Name

' '   Text.Whitespace

'minus'   Keyword

' '   Text.Whitespace

'{'   Punctuation

'0'   Literal.Number.Integer

'};'   Punctuation

'\n   ' Text.Whitespace

'if'   Keyword

' '   Text.Whitespace

'nops'   Name.Builtin

'('   Punctuation

'r'   Name

')'   Punctuation

'='   Operator

'1'   Literal.Number.Integer

' '   Text.Whitespace

'then'   Keyword

' '   Text.Whitespace

'return' Keyword

' '   Text.Whitespace

'op'   Name.Builtin

'('   Punctuation

'r'   Name

')'   Punctuation

' '   Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'if'   Keyword

';'   Punctuation

'\n

     ' Text.Whitespace

'end'   Keyword

' '   Text.Whitespace

'if'   Keyword

';'   Punctuation

'\n   ' Text.Whitespace

'error'   Keyword

' '   Text.Whitespace
'"invalid input: cannot csgn %1"' Literal.String
','   Operator
' '   Text.Whitespace
'a'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
'\n   '   Text.Whitespace
"# Handle if the csgn of a sum doesn't depend on the bound variable\n" Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'a'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'And'   Name
'('   Punctuation
'specfunc' Name
'({'   Punctuation
'sum'   Name
','   Operator
' '   Text.Whitespace
'Sum'   Name
'})'   Punctuation
','
           Operator
' '   Text.Whitespace
'anyfunc' Name
'('   Punctuation
'anything' Name
','   Operator
' '   Text.Whitespace
'name'   Name
'='   Operator
'range'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   ' Text.Whitespace
'option'   Keyword

```
' '         Text.Whitespace
'overload'   Name
';'          Punctuation
'\n    '  Text.Whitespace
'local'      Keyword
' '         Text.Whitespace
'r'         Name
';'          Punctuation
'\n    '  Text.Whitespace
'r'         Name
' '         Text.Whitespace
':='         Operator
' '         Text.Whitespace
'csgn'       Name
'('          Punctuation
'op'         Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'a'          Name
'));'        Punctuation
'\n    '  Text.Whitespace
'if'         Keyword
' '

         Text.Whitespace
'not'        Keyword
' '         Text.Whitespace
'depends'    Name
'('          Punctuation
'r'         Name
','          Operator
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'1'          Literal.Number.Integer
']'          Punctuation
','          Operator
'a'          Name
'))'         Punctuation
' '         Text.Whitespace
'then'       Keyword
'\n    ' Text.Whitespace
'return'     Keyword
' '         Text.Whitespace
'signum'     Name
'('          Punctuation
'op'         Name.Builtin
```

'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
']'   Punctuation
','   Operator
'a'   Name
')'   Punctuation
'+'   Operator
'1'   Literal.Number.Integer
'-'   Operator
'op'   Name.Builtin
'(['

            Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'a'   Name
'))'   Punctuation
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'r'   Name
'\n   '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n   '   Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"invalid input: cannot csgn %1"' Literal.String
','   Operator
' '   Text.Whitespace
'a'   Name
';'   Punctuation
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
'\n '   Text.Whitespace

'csgn'   Name
']);'   Punctuation
'\n   '   Text.Whitespace
'protect'   Name
'('
         Punctuation
'csgn'   Name
');'   Punctuation
'\n\n   '   Text.Whitespace
'# Do the same to signum.\n' Comment.Single

'   '   Text.Whitespace
'unprotect' Name
'('   Punctuation
'signum'   Name
');'   Punctuation
'\n   '   Text.Whitespace
'signum'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'overload'   Name
'(['   Punctuation
'\n   '   Text.Whitespace
"# Handle if the signum of a piecewise doesn't depend on which branch\n" Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'a'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'specfunc'   Name
'('   Punctuation
'piecewise' Name.Builtin
')'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   '   Text.Whitespace
'option'   Keyword
' '
         Text.Whitespace
'overload'   Name
';'   Punctuation
'\n   '   Text.Whitespace

'local'   Keyword
' '   Text.Whitespace
'r'   Name
','   Operator
' '   Text.Whitespace
'i'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'{'   Punctuation
'seq'   Name.Builtin
'('   Punctuation
'`if`'   Name
'('   Punctuation
'i'   Name
'::'   Operator
'even'   Name
' '   Text.Whitespace
'or'   Keyword
' '   Text.Whitespace
'i'   Name
'='   Operator
'nops'   Name.Builtin
'('   Punctuation
'a'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'signum'   Name
'('   Punctuation
'op'   Name.Builtin
'('   Punctuation
'i'   Name
','   Operator
'a'
    Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'NULL'   Name
')'   Punctuation
','   Operator
'\n   ' Text.Whitespace
'i'   Name
'='   Operator

'1'   Literal.Number.Integer
'..'   Punctuation
'nops'   Name.Builtin
'('   Punctuation
'a'   Name
'))};'   Punctuation
'\n   ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
'='   Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n
     ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'not'   Keyword
' '   Text.Whitespace
'assigned' Name.Builtin
'(_'   Punctuation
'Envsignum0' Name
')'   Punctuation
' '   Text.Whitespace
'then'   Keyword
'\n   ' Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'r'   Name
' '   Text.Whitespace

'minus'   Keyword
' '   Text.Whitespace
'{'   Punctuation
'0'   Literal.Number.Integer
'};'   Punctuation
\n   ' Text.Whitespace
'if'   Keyword
' '   Text.Whitespace
'nops'   Name.Builtin
'('   Punctuation
'r'   Name
')'   Punctuation
'='   Operator
'1'   Literal.Number.Integer
' '   Text.Whitespace
'then'   Keyword
' '   Text.Whitespace
'return'   Keyword
' '   Text.Whitespace
'op'   Name.Builtin
'('
          Punctuation
'r'   Name
')'   Punctuation
' '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
\n   ' Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"invalid input: cannot signum %1"' Literal.String
','   Operator
' '   Text.Whitespace
'a'   Name
';'   Punctuation
\n   ' Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
','   Operator
\n   ' Text.Whitespace

"# Handle if the signum of a sum doesn't depend on the bound variable\n" Comment.Single

'   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'a'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'And'
    Name
'('   Punctuation
'specfunc'   Name
'({'   Punctuation
'sum'   Name
','   Operator
' '   Text.Whitespace
'Sum'   Name
'})'   Punctuation
','   Operator
' '   Text.Whitespace
'anyfunc'   Name
'('   Punctuation
'anything'   Name
','   Operator
' '   Text.Whitespace
'name'   Name
'='   Operator
'range'   Name
'))'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator
')'   Punctuation
'\n   ' Text.Whitespace
'option'   Keyword
' '   Text.Whitespace
'overload'   Name
';'   Punctuation
'\n   ' Text.Whitespace
'local'   Keyword
' '   Text.Whitespace
'r'   Name
';'   Punctuation
'\n   ' Text.Whitespace
'r'   Name
' '   Text.Whitespace
':='   Operator

```
' '          Text.Whitespace
'signum'     Name
'('          Punctuation
'op'
          Name.Builtin
'('          Punctuation
'1'          Literal.Number.Integer
','          Operator
'a'          Name
'));'        Punctuation
'\n    '     Text.Whitespace
'if'         Keyword
' '          Text.Whitespace
'not'        Keyword
' '          Text.Whitespace
'depends'    Name
'('          Punctuation
'r'          Name
','          Operator
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'1'          Literal.Number.Integer
']'          Punctuation
','          Operator
'a'          Name
'))'         Punctuation
' '          Text.Whitespace
'then'       Keyword
'\n      '   Text.Whitespace
'return'     Keyword
' '          Text.Whitespace
'signum'     Name
'('          Punctuation
'op'         Name.Builtin
'(['         Punctuation
'2'          Literal.Number.Integer
','          Operator
'2'          Literal.Number.Integer
','          Operator
'2'          Literal.Number.Integer
']'
          Punctuation
','          Operator
'a'          Name
')'          Punctuation
'+'          Operator
```

'1'   Literal.Number.Integer
'-'   Operator
'op'   Name.Builtin
'(['   Punctuation
'2'   Literal.Number.Integer
','   Operator
'2'   Literal.Number.Integer
','   Operator
'1'   Literal.Number.Integer
']'   Punctuation
','   Operator
'a'   Name
'))'   Punctuation
' '   Text.Whitespace
'*'   Operator
' '   Text.Whitespace
'r'   Name
'\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'if'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'error'   Keyword
' '   Text.Whitespace
'"invalid input: cannot signum %1"' Literal.String
','   Operator
' '   Text.Whitespace
'a'   Name
';'   Punctuation
'\n   '   Text.Whitespace
'end'   Keyword
'
   '   Text.Whitespace
'proc'   Keyword
','   Operator
'\n   '   Text.Whitespace
'signum'   Name
']);'   Punctuation
'\n '   Text.Whitespace
'protect'   Name
'('   Punctuation
'signum'   Name
');'   Punctuation
'\n\n '   Text.Whitespace
'# Override sum to fail faster\n' Comment.Single

'   '   Text.Whitespace

'unprotect'   Name
'('   Punctuation
'sum'   Name
');'   Punctuation
\n   '   Text.Whitespace
'sum'   Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'overload'   Name
'(['   Punctuation
\n   '   Text.Whitespace
'proc'   Keyword
'('   Punctuation
'f'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'Not'   Name
'({'   Punctuation
"`+`"   Name
','   Operator
"`+`"   Name
'^'   Operator
'integer'   Name
'})'   Punctuation
','

              Operator
\n   '   Text.Whitespace
'k'   Name
' '   Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'name'   Name
'='   Operator
'And'   Name
'('   Punctuation
'range'   Name
','   Operator
'Not'   Name
'('   Punctuation
'range'   Name
'('   Punctuation
'rational'   Name
')))'   Punctuation
','   Operator
' '   Text.Whitespace
'$'   Operator

')'   Punctuation

'\n   ' Text.Whitespace

'option'   Keyword

' '   Text.Whitespace

'overload'   Name

';'   Punctuation

'\n   ' Text.Whitespace

'if'   Keyword

' '   Text.Whitespace

'not'   Keyword

' '   Text.Whitespace

'('   Punctuation

'`-`'   Name

'('   Punctuation

'op'   Name.Builtin

'('   Punctuation

'rhs'   Name.Builtin

'('   Punctuation

'k'   Name

')))'
             Punctuation

' '   Text.Whitespace

'::'   Operator

' '   Text.Whitespace

'"'   Punctuation

'rational'   Name

'"'   Punctuation

')'   Punctuation

'\n   ' Text.Whitespace

'and'   Keyword

' '   Text.Whitespace

'not'   Keyword

' '   Text.Whitespace

'('   Punctuation

'subsindets' Name.Builtin

'('   Punctuation

'f'   Name

','   Operator

' '   Text.Whitespace

'"'   Punctuation

'anything'   Name

'^'   Operator

'integer'   Name

'"'   Punctuation

','   Operator

' '   Text.Whitespace

'f'   Name

'->'   Operator

'op'   Name.Builtin
'('   Punctuation
'1'   Literal.Number.Integer
','   Operator
'f'   Name
'))'   Punctuation
\n   ' Text.Whitespace
'::'   Operator
' '   Text.Whitespace
'"'   Punctuation
'{'   Punctuation
"`+`"

    Name
','   Operator
'And'   Name
'('   Punctuation
"`*`"   Name
','   Operator
'Not'   Name
'('   Punctuation
"`*`"   Name
'('   Punctuation
'Not'   Name
'('   Punctuation
"`+`"   Name
')))))}'   Punctuation
'"'   Punctuation
')'   Punctuation
\n   ' Text.Whitespace
'and'   Keyword
' '   Text.Whitespace
'depends'   Name
'('   Punctuation
'indets'   Name.Builtin
'('   Punctuation
'f'   Name
','   Operator
' '   Text.Whitespace
'"'   Punctuation
'{'   Punctuation
'specfunc'   Name
'('   Punctuation
'idx'   Name
')'   Punctuation
','   Operator
' '   Text.Whitespace
'specindex' Name
'('   Punctuation

```
'idx'          Name
')}'           Punctuation
'"'            Punctuation
')'            Punctuation
','            Operator
' '            Text.Whitespace
'op'
          Name.Builtin
'('            Punctuation
'1'            Literal.Number.Integer
','            Operator
'k'            Name
'))'           Punctuation
\n      '  Text.Whitespace
'then'         Keyword
\n      '  Text.Whitespace
'"'            Punctuation
'procname'   Name
'(_'           Punctuation
'passed'       Name
')'            Punctuation
'"'            Punctuation
\n      '  Text.Whitespace
'else'         Keyword
\n      '  Text.Whitespace
'error'        Keyword
' '            Text.Whitespace
'"invalid input: cannot fast-fail sum(%1, %2)"' Literal.String
','            Operator
' '            Text.Whitespace
'_passed'    Name
\n      '  Text.Whitespace
'end'          Keyword
' '            Text.Whitespace
'if'           Keyword
\n    '    Text.Whitespace
'end'          Keyword
' '            Text.Whitespace
'proc'         Keyword
','            Operator
\n    '    Text.Whitespace
'sum'          Name
']);'          Punctuation
\n   '     Text.Whitespace
'protect'      Name
'('
          Punctuation
'sum'          Name
```

');'   Punctuation
'\n\n '   Text.Whitespace
':'   Operator
'-'   Operator
`` `print/Ints` `` Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'curry'   Name
'('   Punctuation
'thismodule' Name
':'   Operator
'-'   Operator
'Print'   Name
','   Operator
'Ints'   Name
');'   Punctuation
'\n '   Text.Whitespace
':'   Operator
'-'   Operator
`` `print/Sums` `` Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'curry'   Name
'('   Punctuation
'thismodule' Name
':'   Operator
'-'   Operator
'Print'   Name
','   Operator
'Sums'   Name
');'   Punctuation
'\n '   Text.Whitespace
':'   Operator
'-'   Operator
`` `print/ints` `` Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'curry'
       Name
'('   Punctuation
'thismodule' Name
':'   Operator
'-'   Operator
'Print'   Name
','   Operator

'ints'   Name
');'   Punctuation
'\n   '   Text.Whitespace
':'   Operator
'-'   Operator
'`print/sums`' Name
' '   Text.Whitespace
':='   Operator
' '   Text.Whitespace
'curry'   Name
'('   Punctuation
'thismodule' Name
':'   Operator
'-'   Operator
'Print'   Name
','   Operator
'sums'   Name
');'   Punctuation
'\n\n '   Text.Whitespace
'end'   Keyword
' '   Text.Whitespace
'proc'   Keyword
';'   Punctuation
'\n '   Text.Whitespace
'ModuleLoad' Name
'()'   Punctuation
':'   Operator
'\n'   Text.Whitespace

'end'   Keyword
' '   Text.Whitespace
'module'   Keyword
';'   Punctuation
' '   Text.Whitespace
'# Loop\n' Comment.Single

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1.350 @babel/core 7.28.0

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1.351 process 0.11.10

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1.352 typing-extensions 4.12.2

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see https://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see https://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations, which became
Zope Corporation. In 2001, the Python Software Foundation (PSF, see
https://www.python.org/psf/) was formed, a non-profit organization

created specifically to own Python-related Intellectual Property.
Zope Corporation was a sponsoring member of the PSF.

All
 Python releases are Open Source (see https://opensource.org for
the Open Source Definition). Historically, most, but not all, Python
releases have also been GPL-compatible; the table below summarizes
the various releases.

Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

Footnotes:

(1) GPL-compatible doesn't mean that we're distributing Python under
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(2) According to Richard Stallman, 1.6.1 is not GPL-compatible,
   because its license has a choice of law clause. According to
   CNRI, however, Stallman's lawyer has told CNRI's lawyer that 1.6.1
   is "not incompatible" with the GPL.

Thanks to the many outside volunteers who have worked under Guido's
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1.353 qs 6.13.0

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1.358 zeep 4.3.1

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Parts of the XSD handling are heavily inspired by soapfish, see:
https://github.com/soapteam/soapfish

--

The support for BinarySecurityToken is from py-wsse, see:
https://github.com/orcasgit/py-wsse

1.359 resize-observer-polyfill 1.5.1

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1.360 @splunk/ui-utils 1.10.0

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1.361 diff 8.0.2

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1.362 azure-mgmt-core 1.5.0

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1.363 @splunk/react-time-range 11.1.0

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Samuel Dion-Girardeau, 2017/05/29

Aydin Sen, 2017/06/14

Vinod Chandru, 2017/07/11

Preston Moore, 2017/06/18

Nicolas Mota, 2017/08/10

David Davis, 2017/08/11

Martial Pageau, 2017/08/16

Sammie S. Taunton, 2017/08/17

Kxrr,

 2017/08/18

Mads Jensen, 2017/08/20

Markus Kaiserswerth, 2017/08/30

Andrew Wong, 2017/09/07

Arpan Shah, 2017/09/12

Tobias 'rixx' Kunze, 2017/08/20

Mikhail Wolfson, 2017/12/11

Matt Davis, 2017/12/13

Alex Garel, 2018/01/04

Rgis Behmo 2018/01/20

Igor Kasianov, 2018/01/20

Derek Harland, 2018/02/15

Chris Mitchell, 2018/02/27

Josue Balandrano Coronel, 2018/05/24

Federico Bond, 2018/06/20

Tom Booth, 2018/07/06

Axel haustant, 2018/08/14

Bruno Alla, 2018/09/27

Artem Vasilyev, 2018/11/24

Victor Mireyev, 2018/12/13

Florian Chardin, 2018/10/23

Shady Rafehi, 2019/02/20

Fabio Todaro, 2019/06/13

Shashank Parekh, 2019/07/11

Arel Cordero, 2019/08/29

Kyle Johnson, 2019/09/23

Dipankar Achinta, 2019/10/24

Sardorbek Imomaliev, 2020/01/24

Maksym Shalenyi, 2020/07/30

Frazer McLean, 2020/09/29

Henrik Brusdal, 2020/11/29

Tom Wojcik, 2021/01/24

Ruaridh Williamson, 2021/03/09

Garry Lawrence, 2021/06/19

Patrick Zhang, 2017/08/19

Konstantin Kochin, 2021/07/11

kronion, 2021/08/26

Gabor Boros, 2021/11/09

Tizian Seehaus,

 2022/02/09

Oleh Romanovskyi, 2022/06/09

Tomer Nosrati, 2022/07/17

JoonHwan Kim, 2022/08/01

Kaustav Banerjee, 2022/11/10

Austin Snoeyink 2022/12/06

Jeremy Z. Othieno 2023/07/27

Tomer Nosrati, 2022/17/07

Andy Zickler, 2024/01/18

Johannes Faigle, 2024/06/18

Giovanni Giampauli, 2024/06/26

Shamil Abdulaev, 2024/08/05

Nikos Atlas, 2024/08/26

Marc Bresson, 2024/09/02

Narasux, 2024/09/09

Colin Watson, 2025/03/01

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