Cisco MDS 9000 Series Licensing Guide, Release 9.x

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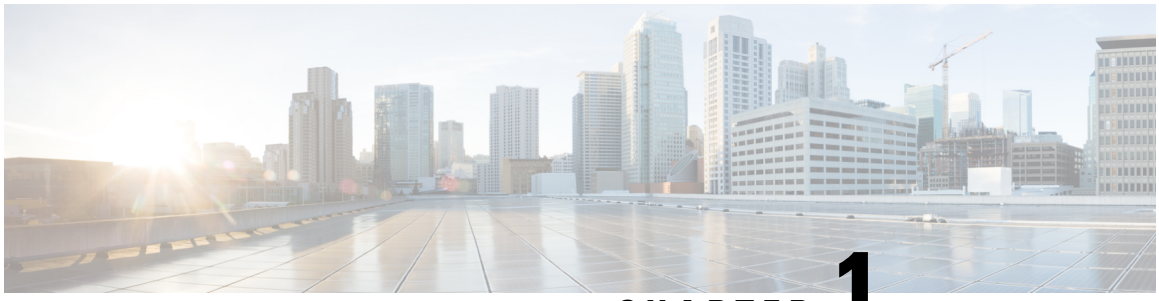
Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883



CHAPTER 1

Licensing Cisco MDS 9000 Series NX-OS Software Features

Licenses are available for all switches in the Cisco MDS 9000 Series. Licensing allows you to access specified premium features on the switch after you install the appropriate license for that feature.

Cisco MDS NX-OS Software Licenses

This section contains information related to licensing types, options, procedures, installation, and management for the Cisco MDS NX-OS software.

Licensing Terminology

The following terms are used in this document:

Licensed feature
: Permission to use a particular feature through a license file, a hardware object, or a legal contract. This permission is limited to the number of users, number of instances, time span, and the implemented device.

Licensed application
: A software feature that requires a license to be used.

License enforcement
: A mechanism that prevents a feature from being used without first obtaining a license.

Node-locked license
: A license that can only be used on a particular device using the device's unique host ID.

Host IDs
: A unique chassis serial number that is specific to each device.

Software license claim certificate
: A document entitling its rightful owner to use licensed features on one device as described in that document.

Product Authorization Key (PAK)
The PAK allows you to obtain a license key from one of the sites listed in the software license claim certificate document. After registering at the specified website, you will receive your license key file and installation instructions through e-mail.

License key file
A device-specific unique file that specifies the licensed features. Each file contains digital signatures to prevent tampering and modification. License keys are required to use a licensed feature. License keys are enforced within a specified time span.

Missing license
If the bootflash has been corrupted or a supervisor module replaced after you have installed a license, that license shows as missing. The feature still works. You should reinstall the license as soon as possible.

Evaluation license
A temporary license. Evaluation licenses are time bound (valid for a specified number of days) and are tied to a host ID (device serial number).

Permanent license
A license that is not time bound is called a permanent license.

Grace period
The amount of time the features in a license package can continue functioning without a license.

Support
If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco, contact Cisco Technical Support at this URL: http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html

Licensing Model

The licensing model defined for the Cisco MDS product line has two options:

Feature-based licenses allow features that are applicable to the entire switch.

Note
- A SAN extension license is included in the base license for the Cisco MDS 9000 24/10-Port SAN Extension Module (DS-X9334-K9).

This table describes feature-based licenses.

Table 1: Feature-Based Licenses

Feature License	Features
Enterprise package (ENTERPRISE_PKG)	• FC Port security • VSAN-based access control • Fibre Channel Security Protocol (FC-SP) authentication • Advanced traffic engineering—quality of service (QoS) • IPsec and IKE for IPv4 **Note** From Cisco MDS NX-OS Release 9.2(2), the IPsec feature is included in the default feature set and does not require an ENTERPRISE_PKG license on the Cisco MDS 9220i Fabric Switch. • IKE digital certificates • Enhanced VSAN routing inter-VSAN routing (IVR) over Fibre Channel • IVR Network Address Translation (NAT) over Fibre Channel • Zone-based traffic prioritizing • Zone-based FC QoS • Extended BB_Credits • Fibre Channel write acceleration • FCIP encryption • Fabric binding for Fibre Channel • SAN device virtualization • Cisco TrustSec Fibre Channel Link Encryption

Feature License	Features
SAN Telemetry package SAN_TELEMETRY_PKG	

Feature License	Features
	SAN Analytics The SAN Analytics feature is used to collect, store, and fetch the data of interest. This feature allows you to analyze data only on the switch. **Note** The SAN_TELEMETRY_PKG license is a switch based license only. The following provides information about the licenses that are supported on Cisco switches and the release from which it supports these licenses: • Cisco MDS 9700 Series Multilayer Directors: Supports the SAN_ANALYTICS_PKG and SAN_TELEMETRY_PKG licenses from Cisco MDS NX-OS Release 8.2(1). • Cisco MDS 9396T 32-Gbps 96-Port Fibre Channel Fabric Switch: Supports only the SAN_ANALYTICS_PKG license from Cisco MDS NX-OS Release 8.4(1). • Cisco MDS 9148T 32-Gbps 48-Port Fibre Channel Fabric Switch: Supports only the SAN_ANALYTICS_PKG license from Cisco MDS NX-OS Release 8.4(1). • Cisco MDS 9132T 32-Gbps 32-Port Fibre Channel Fabric Switch: Supports only the SAN_ANALYTICS_PKG license from Cisco MDS NX-OS Release 8.3(1). If you have purchased the SAN_TELEMETRY_PKG license, you can continue to use it only to analyze data on your switch in Cisco MDS NX-OS Release 8.3(1) or later releases. However, we recommend that you upgrade to the SAN_ANALYTICS_PKG license that is available from Cisco MDS NX-OS Release 8.3(1) to analyze data not only on the switch but also on the Cisco Data Center Network Manager (DCNM) or supported third party devices or apps. To upgrade from SAN_TELEMETRY_PKG used in Cisco MDS NX-OS Release 8.2(1) to SAN_ANALYTICS_PKG that is available in Cisco MDS NX-OS Release 8.3(1), perform these steps: **1.** Use the **no feature analytics** command to disable the SAN analytics feature. **2.** Use the **clear license** *filename* to uninstall the SAN_TELEMETRY_PKG license. **Note** You can uninstall a license before or after upgrading the software as long as the license package is not in use. **3.** Upgrade to Cisco MDS NX-OS Release 8.3(1).

Feature License	Features
	4. Use the **install license** *filename* to install the SAN_ANALYTICS_PKG license. **Note** If you have already purchased the SAN_TELEMETRY_PKG license, you can upgrade to the SAN_ANALYTICS_PKG license for free. **5.** Use the **feature analytics** command to enable the SAN analytics feature. This feature supports the following license models: • Grace-period license—If you do not have a license and enable the analytic feature using the **feature analytics** command, the feature functions for 120 days. **Note** After 120 days of using the analytics feature, this feature will be disabled. • Term-based license—Term-based license for the SAN Analytics and Telemetry feature is a traditional license that is valid for a minimum of three years. A message will be displayed 90 days before the license expiry date as a reminder to renew the license. The message will continue to display on the 89th, 60th, 30th day, once every day for the last 28 days, and once every hour for the last 7 days of the license expiry date. **Note** After the license expiry, the SAN Analytics feature will be disabled after you reload the switch, using the **reload** command.

Feature License	Features
SAN Analytics package SAN_ANALYTICS_PKG	SAN Analytics and SAN Telemetry Streaming The SAN Analytics and SAN Telemetry Streaming provides insights into your fabric by allowing you to monitor, analyze, identify, and troubleshoot performance issues. This solution allows you to analyze data not only on the switch but also on the Cisco Data Center Network Manager (DCNM) or supported third party devices or apps. **Note** • The SAN_ANALYTICS_PKG license is a switch based license only. • For the SAN Analytics and SAN Telemetry Streaming feature to work on DCNM, you need to purchase the DCNM Advanced SAN Feature License and SAN Analytics license. For more information on the licensing information on DCNM, see the "Advanced SAN Feature Licenses" topic in the Cisco DCNM Licensing Guide. This solution is supported from Cisco MDS Release 8.3(1) and later releases and supports the following license models: • Grace-period license—If you do not have a license and enable the analytic feature using the **feature analytics** command, the feature functions for 120 days. **Note** After 120 days of using the analytics feature, this feature will be disabled. • Term-based license—Term-based license for the SAN Analytics and Telemetry feature is a traditional license that is valid for a minimum of three years. A message will be displayed 90 days before the license expiry date as a reminder to renew the license. The message will continue to display on the 89th, 60th, 30th day, once every day for the last 28 days, and once every hour for the last 7 days of the license expiry date. **Note** After the license expiry, the SAN Analytics feature will be disabled after you reload the switch, using the **reload** command.
Mainframe package (MAINFRAME_PKG)	• Switch cascading • IBM TotalStorage Virtual Tape Server (VTS) • IBM TotalStorage XRC application • Port swap, block, prohibit

Feature License	Features
DCNM-SAN License packages	For DCNM related licensing information, see the Cisco DCNM Licensing Guide.
NDFC License packages	For NDFC related licensing information, see the License Management chapter in Cisco NDFC Fabric Controller Configuration Guide.

On-demand Port Activation Licensing package
(PORT_ACTIVATION_PKG)
(M9220I-UPGK9=)
(M9250IP20-16G=)
(M9148T-PL8)
(M9396T-PL16)
(M9132T-PL8)
(M9124V-PL8)
(M9148V-PL8)
Note The license manager does not prevent installing more port licenses than the available physical ports on the switch. The extra licenses if installed, will not affect the normal behavior of the licensed ports.
	• On the Cisco MDS 9220i Switch:
	  • Fibre Channel ports: Only the first 4 Fibre Channel ports out of the 12 ports are active by default. The FC_PORT_ACTIV_9220I_PKG enables additional 8 Fibre Channel ports.
	  IPS ports: Only the first 2 IPS ports operating in 1-Gbps speed mode are active by default (IP Storage 1/1 and IP Storage 1/2). The IPS_PORT_ACTIV_9220I_PKG enables other speed modes.
	• Cisco MDS 9148V with 48 x 8/16/32/64-Gbps multispeed ports and 1-rack unit (1RU) SAN fabric switch. 24 ports are enabled by default and the other ports are enabled in increments of 8.
	• Cisco MDS 9124Vx with 24 x 8/16/32/64-Gbps multispeed ports and 1-rack unit (1RU) SAN fabric switch. 8 ports are enabled by default and the other ports are enabled in increments of 8.
	• Cisco MDS 9132T 32-Gbps 32-Port Fibre Channel Switches have 16 32-Gbps FC ports (FC1/1-16) in the base chassis and 16 32-Gbps FC ports on the LEM module (FC1/17-32). Port licenses are not movable between the base chassis and the LEM module.

Data Mobility Manager (DMM) (DMM_FOR_SSM_PKG) (M9250IDMMT6M)	• Online migration of heterogenous arrays • Simultaneous migration of multiple LUNs • Unequal size LUN migration • Rate adjusted migration • Verification of migrated data • Secure erasure of migrated data • Dual fabric support

Note License packages for Cisco DMM (Cisco Data Mobility Manager) and Cisco SME (Cisco Storage Media Encryption) are documented in the Cisco MDS 9000 Series Data Mobility Manager Configuration Guide.

Licensing High Availability

As with other Cisco NX-OS features, the licensing feature also maintains the following high-availability standards:

- Installing any license in the device is a nondisruptive process.
- Installing a license automatically saves a copy of permanent licenses to the chassis.
- If you have enabled the grace period feature, enabling a licensed feature that does not have a license key starts a counter on the grace period. You then have 120 days to install the appropriate license keys, disable the use of that feature, or disable the grace period feature. If at the end of the 120-day grace period the device does not have a valid license key for the feature, the Cisco NX-OS software automatically disables the feature and removes the configuration from the device.

Devices with dual supervisors have the following additional high-availability features:

- The license software runs on both supervisor modules and provides failover protection.
- The license key file is mirrored on both supervisor modules. Even if both supervisor modules fail, the license file continues to function from the version that is available on the chassis.

License Transfers Between Devices

A license is specific to the physical device for which it is issued and is not valid on any other physical device. The license cannot be transferred.

Note

- Cisco ONE Software license can be transferred from one device to another as a replacement.
- Return Material Authorization (RMA) certified devices need new license file and can be obtained from Technical Assistance Center (TAC) license team.
- If you have a single supervisor module on your Cisco NX-OS device and you replace the supervisor module, you must reinstall the license key file.

  If you are evaluating a license when you replace the supervisor module, the grace period of the license is usually set to 120 days. On a dual supervisor system, the grace period of the license will be overwritten from the existing active supervisor module to the new stand-by supervisor module.
- If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco, contact Cisco Technical Support at this URL: http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html
- If the supervisor modules are interchanged between two different Cisco MDS chassis, `license missing` message is displayed under the **show license usage** command. Use the **clear license***filename* command to uninstall the license package and re-install the license files. However, the licensed features will continue to work.

On-Demand Port Activation Licensing

This section describes how to use the on-demand port activation licensing feature on the Cisco MDS 9132T, Cisco MDS 9148T, Cisco MDS 9148V, Cisco MDS 9124V Cisco MDS 9148S, Cisco MDS 9250i, and Cisco MDS 9396S switches.

About On-Demand Port Activation Licensing

You can expand your SAN connectivity as needed by enabling users to purchase and install additional port licenses. By default, all ports are eligible for license activation.

Port-Naming Conventions

This table describes the port-naming conventions for the Cisco Fabric switches.

Table 2: Port-Naming Conventions for Cisco Fabric Switches

Cisco MDS 9124V Switch	fc1/1 through fc1/8
Cisco MDS 9132T Switch	Cisco MDS 9132T Switch
Cisco MDS 9148S Switch	fc1/1 through fc1/48
Cisco MDS 9148T Switch	fc1/1 through fc1/48
Cisco MDS 9148V Switch	fc1/1 through fc1/24
Cisco MDS 9220i Switch	fc1/1 through fc1/12 and IPS 1/1 through 1/6

Cisco MDS 9250i Switch	fc1/1 through fc1/40 and IPS 1/1-2 ETH 1/1-8
Cisco MDS 9396S Switch	fc1/1 through fc1/96
Cisco MDS 9396T Switch	fc1/1 through fc1/96

Port Licensing

Cisco MDS 9250i Switch

On Cisco MDS 9250i Switch, 20 16-Gbps Fibre Channel ports are active by default. To enable the other 20 16-Gbps Fibre Channel ports, you must obtain a license. The 8 10-Gbps FCoE ports are active by default. The two fixed 10-Gbps IP storage services ports do not require additional license.

Cisco MDS 9220i Switch

- Fibre Channel ports: Only the first 4 ports out of the 12 ports are active by default. However, you can move the default license from the first 4 ports to any of the other 8 ports. To enable the other 8 ports, you must obtain a license. The additional license will enable the extra 8 ports.
- IP Storage (IPS) ports: Only the first two ports that are operating in 1-Gbps speed mode are active by default (IPStorage 1/1 and IPStorage 1/2). You cannot move the default license from these ports to the other IPS ports such as IPStorage 1/3 through 1/6.

  Default license for IPS ports is available only in the 1-Gbps speed mode. In any other speed mode (10 Gbps or 40 Gbps), ports need additional port activation license.

The port licenses for Fibre Channel and IPS ports are bundled into a single license. You need to install this license for enabling additional ports for both Fibre Channel and IPS ports.

The following example displays the license status on a Cisco MDS 9220i switch:

```
switch# show lic usage
Feature                      Ins  Lic   Status Expiry Date Comments
                                Count
--------------------------------------------------------------------------------
FM_SERVER_PKG                 No    -   Unused             -
ENTERPRISE_PKG                No    -   In use             Grace 49D 13H
FC_PORT_ACTIV_9220I_PKG       Yes  12   In use never       -
IPS_PORT_ACTIV_9220I_PKG      Yes   4   In use never       -
IPS_1G_PORT_ACTIV_9220I_PKG   No    2   In use never       -
--------------------------------------------------------------------------------

switch# show lic default
Feature                              Default License Count
--------------------------------------------------------------------------------
FM_SERVER_PKG                        -
ENTERPRISE_PKG                       -
FC_PORT_ACTIV_9220I_PKG              4
IPS_PORT_ACTIV_9220I_PKG             0
IPS_1G_PORT_ACTIV_9220I_PKG          2
--------------------------------------------------------------------------------

switch# show port-license
Available FC port activation licenses are 0
Available IPS port activation licenses are 2
------------------------------------------------
```

```
  Interface       Cookie    Port Activation License
-------------------------------------------------
  fc1/1           16777216        acquired
  fc1/2           16781312        acquired
  fc1/3           16785408        acquired
  fc1/4           16789504        acquired
  fc1/5           16793600        acquired
  fc1/6           16797696        acquired
  fc1/7           16801792        acquired
  fc1/8           16805888        acquired
  fc1/9           16809984        acquired
  fc1/10          16814080        acquired
  fc1/11          16818176        acquired
  fc1/12          16822272        acquired
  fcip1           167772160       eligible
  fcip3           167772162       eligible
  IPStorage1/1    33554432        acquired
  IPStorage1/2    33558528        acquired
  IPStorage1/3    33562624        acquired
  IPStorage1/4    33566720        acquired
  IPStorage1/5    33570816        eligible
  IPStorage1/6    33574912        ineligible
```

Default Configuration

The following example shows the default port license configuration for the Cisco MDS 9132T Switch:

```
switch# show port-license
Available port activation licenses are 8
-----------------------------------------------
Interface Cookie    Port Activation License
-----------------------------------------------
fc1/1     16777216   acquired
fc1/2     16781312   acquired
fc1/3     16785408   acquired
fc1/4     16789504   acquired
fc1/5     16793600   acquired
fc1/6     16797696   acquired
fc1/7     16801792   acquired
fc1/8     16805888   acquired
fc1/9     16809984   eligible
fc1/10    16814080   eligible
fc1/11    16818176   eligible
fc1/12    16822272   eligible
fc1/13    16826368   eligible
fc1/14    16830464   eligible
fc1/15    16834560   eligible
fc1/16    16838656   eligible
fc1/17    16842752   acquired
fc1/18    16846848   acquired
fc1/19    16850944   acquired
fc1/20    16855040   acquired
fc1/21    16859136   acquired
fc1/22    16863232   acquired
fc1/23    16867328   acquired
fc1/24    16871424   acquired
fc1/25    16875520   acquired
fc1/26    16879616   acquired
fc1/27    16883712   acquired
fc1/28    16887808   acquired
fc1/29    16891904   acquired
```

```
fc1/30    16896000   acquired
fc1/31    16900096   acquired
fc1/32    16904192   acquired
```

Note The cookie is used to acquire a license. Use the **show license usage PORT_ACTIV_8132U_PKG** command to show the cookies for acquired licenses.

```
switch# show license usage poRT_ACTIV_9132U_PKG
Application
--------------------------------------------------------------------------------
Port Manager (fc1/1)
Port Manager (fc1/2)
Port Manager (fc1/3)
Port Manager (fc1/4)
Port Manager (fc1/5)
Port Manager (fc1/6)
Port Manager (fc1/7)
Port Manager (fc1/8)
--------------------------------------------------------------------------------
```

The following example shows the default port license configuration for the Cisco MDS 9250i Switch:

```
switch# show port-license
Available port activation licenses are 20
-----------------------------------------------
  Interface   Cookie    Port Activation License
-----------------------------------------------
  fc1/1       16777216        acquired
  fc1/2       16781312        acquired
  fc1/3       16785408        acquired
  fc1/4       16789504        acquired
  fc1/5       16793600        acquired
  fc1/6       16797696        acquired
  fc1/7       16801792        acquired
  fc1/8       16805888        acquired
  fc1/9       16809984        acquired
  fc1/10      16814080        acquired
  fc1/11      16818176        acquired
  fc1/12      16822272        acquired
  fc1/13      16826368        acquired
  fc1/14      16830464        acquired
  fc1/15      16834560        acquired
  fc1/16      16838656        acquired
  fc1/17      16842752        acquired
  fc1/18      16846848        acquired
  fc1/19      16850944        acquired
  fc1/20      16855040        acquired
  fc1/21      16859136        eligible
  fc1/22      16863232        eligible
  fc1/23      16867328        eligible
  fc1/24      16871424        eligible
  fc1/25      16875520        eligible
  fc1/26      16879616        eligible
  fc1/27      16883712        eligible
  fc1/28      16887808        eligible
  fc1/29      16891904        eligible
  fc1/30      16896000        eligible
```

```
  fc1/31      16900096        eligible
  fc1/32      16904192        eligible
  fc1/33      16908288        eligible
  fc1/34      16912384        eligible
  fc1/35      16916480        eligible
  fc1/36      16920576        eligible
  fc1/37      16924672        eligible
  fc1/38      16928768        eligible
  fc1/39      16932864        eligible
  fc1/40      16936960        eligible
```

Note The cookie is used to acquire a license. Use the **show license usage PORT_ACTIV_20P** command to show the cookies for acquired licenses.

```
switch# show license usage PORT_ACTIV_20P
Application
--------------------------------------------------------------------------------
Port Manager (fc1/1)
Port Manager (fc1/2)
Port Manager (fc1/3)
Port Manager (fc1/4)
Port Manager (fc1/5)
Port Manager (fc1/6)
Port Manager (fc1/7)
Port Manager (fc1/8)
Port Manager (fc1/9)
Port Manager (fc1/10)
Port Manager (fc1/11)
Port Manager (fc1/12)
Port Manager (fc1/13)
Port Manager (fc1/14)
Port Manager (fc1/15)
Port Manager (fc1/16)
Port Manager (fc1/17)
Port Manager (fc1/18)
Port Manager (fc1/19)
Port Manager (fc1/20)
```

The following example shows the default port license configuration for the Cisco MDS 9396S Switch:

```
switch# show port-license
 Available port activation licenses are 0
-----------------------------------------------
  Interface   Cookie    Port Activation License
-----------------------------------------------
  fc1/1       16777216        acquired
  fc1/2       16781312        acquired
  fc1/3       16785408        acquired
  fc1/4       16789504        acquired
  fc1/5       16793600        acquired
  fc1/6       16797696        acquired
  fc1/7       16801792        acquired
  fc1/8       16805888        acquired
  fc1/9       16809984        acquired
  fc1/10      16814080        acquired
  fc1/11      16818176        acquired
  fc1/12      16822272        acquired
  fc1/13      16826368        acquired
  fc1/14      16830464        acquired
```

```
fc1/15      16834560        acquired
fc1/16      16838656        acquired
fc1/17      16842752        acquired
fc1/18      16846848        acquired
fc1/19      16850944        acquired
fc1/20      16855040        acquired
fc1/21      16859136        acquired
fc1/22      16863232        acquired
fc1/23      16867328        acquired
fc1/24      16871424        acquired
fc1/25      16875520        acquired
fc1/26      16879616        acquired
fc1/27      16883712        acquired
fc1/28      16887808        acquired
fc1/29      16891904        acquired
fc1/30      16896000        acquired
fc1/31      16900096        acquired
fc1/32      16904192        acquired
fc1/33      16908288        acquired
fc1/34      16912384        acquired
fc1/35      16916480        acquired
fc1/36      16920576        acquired
fc1/37      16924672        acquired
fc1/38      16928768        acquired
fc1/39      16932864        acquired
fc1/40      16936960        acquired
fc1/41      16941056        acquired
fc1/42      16945152        acquired
fc1/43      16949248        acquired
fc1/44      16953344        acquired
fc1/45      16957440        acquired
fc1/46      16961536        acquired
fc1/47      16965632        acquired
fc1/48      16969728        acquired
fc1/49      16973824        eligible
fc1/50      16977920        eligible
fc1/51      16982016        eligible
fc1/52      16986112        eligible
fc1/53      16990208        eligible
fc1/54      16994304        eligible
fc1/55      16998400        eligible
fc1/56      17002496        eligible
fc1/57      17006592        eligible
fc1/58      17010688        eligible
fc1/59      17014784        eligible
fc1/60      17018880        eligible
fc1/61      17022976        eligible
fc1/62      17027072        eligible
fc1/63      17031168        eligible
fc1/64      17035264        eligible
fc1/65      17039360        eligible
fc1/66      17043456        eligible
fc1/67      17047552        eligible
fc1/68      17051648        eligible
fc1/69      17055744        eligible
fc1/70      17059840        eligible
fc1/71      17063936        eligible
fc1/72      17068032        eligible
fc1/73      17072128        eligible
fc1/74      17076224        eligible
fc1/75      17080320        eligible
fc1/76      17084416        eligible
fc1/77      17088512        eligible
```

```
  fc1/78      17092608        eligible
  fc1/79      17096704        eligible
  fc1/80      17100800        eligible
  fc1/81      17104896        eligible
  fc1/82      17108992        eligible
  fc1/83      17113088        eligible
  fc1/84      17117184        eligible
  fc1/85      17121280        eligible
  fc1/86      17125376        eligible
  fc1/87      17129472        eligible
  fc1/88      17133568        eligible
  fc1/89      17137664        eligible
  fc1/90      17141760        eligible
  fc1/91      17145856        eligible
  fc1/92      17149952        eligible
  fc1/93      17154048        eligible
  fc1/94      17158144        eligible
  fc1/95      17162240        eligible
  fc1/96      17166336        eligible
```

Note The cookie is used to acquire a license. Use the **show license usage PORT_ACTIV_9396S_PKG** command to show the cookies for acquired licenses.

```
switch# show license usage PORT_ACTIV_9396S_PKG
Application
--------------------------------------------------------------------------------
Port Manager (fc1/1)
Port Manager (fc1/2)
Port Manager (fc1/3)
Port Manager (fc1/4)
Port Manager (fc1/5)
Port Manager (fc1/6)
Port Manager (fc1/7)
Port Manager (fc1/8)
Port Manager (fc1/9)
Port Manager (fc1/10)
Port Manager (fc1/11)
Port Manager (fc1/12)
Port Manager (fc1/13)
Port Manager (fc1/14)
Port Manager (fc1/15)
Port Manager (fc1/16)
Port Manager (fc1/17)
Port Manager (fc1/18)
Port Manager (fc1/19)
Port Manager (fc1/20)
Port Manager (fc1/21)
Port Manager (fc1/22)
Port Manager (fc1/23)
Port Manager (fc1/24)
Port Manager (fc1/25)
Port Manager (fc1/26)
Port Manager (fc1/27)
Port Manager (fc1/28)
Port Manager (fc1/29)
Port Manager (fc1/30)
Port Manager (fc1/31)
Port Manager (fc1/32)
Port Manager (fc1/33)
Port Manager (fc1/34)
```

```
Port Manager (fc1/35)
Port Manager (fc1/36)
Port Manager (fc1/37)
Port Manager (fc1/38)
Port Manager (fc1/39)
Port Manager (fc1/40)
Port Manager (fc1/41)
Port Manager (fc1/42)
Port Manager (fc1/43)
Port Manager (fc1/44)
Port Manager (fc1/45)
Port Manager (fc1/46)
Port Manager (fc1/47)
Port Manager (fc1/48)
--------------------------------------------------------------------------------
```

License Status Definitions

This table defines the port activation license status terms.

Table 3: Port Activation License Status Definitions

Port Activation License Status	Definition
acquired	The port is licensed and active.
eligible	The port is eligible to receive a license but does not yet have one.
ineligible	The port is not allowed to receive a license.

By default, when you install additional port license activation packages, the activation status of ports changes from "eligible" to "acquired." If you prefer to accept the default behavior, no further action is required.

Note You can uninstall licenses for ports not in use; however, you cannot uninstall default licenses.

This table describes the port license assignments for the Cisco MDS 9148S Switch.

Table 4: Default Port License Assignments for Cisco MDS 9148S Switch

License Package (PORT_ACTIV_9148S_PKG)	Assigned to Ports on the Cisco MDS 9148S Switch
Default	1–12
PORT_ACTIV_9148S_PKG	13–48

You can use the **show license usage** command to view any licenses assigned to a switch. If a license is in use, the status displayed is In use. If a license is installed but features or ports have acquired the license, then the status displayed is Unused.

The default license package for the Cisco MDS 9148S Switch is as follows:

```
switch# show license usage
```

```
Feature                      Ins  Lic   Status Expiry Date Comments
                                Count
--------------------------------------------------------------------------------
FM_SERVER_PKG                 Yes   -   Unused never       -
ENTERPRISE_PKG                No    -   Unused             Grace expired
PORT_ACTIV_9148S_PKG          No   12   In use never       -
--------------------------------------------------------------------------------
```

This example displays the output when you do not have port licenses and try to active a port license:

```
switch# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config)# interface fc1/50
switch(config-if)# shutdown
switch(config-if)# port-license acquire
fc1/50: (error) port activation license not available
switch(config-if)# no shutdown
switch(config-if)# end
switch# show interface fc1/50
fc1/50 is down (SFP not present)
    Hardware is Fibre Channel
    Port WWN is 20:32:8c:60:4f:0d:27:70
    Admin port mode is F, trunk mode is off
    snmp link state traps are enabled
    Port vsan is 1
    Receive data field Size is 2112
    Beacon is turned off
    Logical type is Unknown(0)
    5 minutes input rate 0 bits/sec,0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec,0 bytes/sec, 0 frames/sec
      0 frames input,0 bytes
        0 discards,0 errors
        0 invalid CRC/FCS,0 unknown class
        0 too long,0 too short
      0 frames output,0 bytes
        0 discards,0 errors
      0 input OLS,0  LRR,0 NOS,0 loop inits
      0 output OLS,0 LRR, 0 NOS, 0 loop inits
    Last clearing of "show interface" counters :  never

switch# show running-config interface fc1/50

!Command: show running-config interface fc1/50
!Time: Mon Apr 17 11:47:08 2017

version 8.1(1)

interface fc1/50
  switchport mode F
  no shutdown

switch# show port-license | i 1/50
  fc1/50      16977920        eligible
```

This table describes the port license assignments for the Cisco MDS 9250i Switch.

Table 5: Default Port License Assignments for Cisco MDS 9250i Switch

License Package (PORT_ACTIV_20P)	Assigned to Ports on the Cisco MDS 9250i Switch
Default	1–20

License Package (PORT_ACTIV_20P)	Assigned to Ports on the Cisco MDS 9250i Switch
PORT_ACTIV_20P	21–40

You can use the **show license usage** command to view any licenses assigned to a switch. If a license is in use, the status displayed is In use. If a license is installed but no ports have acquired a license, then the status displayed is Unused.

The default license package for the Cisco MDS 9250i Switch is as follows:

```
switch# show license usage
Feature                      Ins  Lic   Status Expiry Date Comments
                                Count
--------------------------------------------------------------------------------
DMM_9250                      No    0   Unused             -
IOA_9250                      No    0   Unused             -
XRC_ACCL                      No    -   Unused             -
FM_SERVER_PKG                 Yes   -   Unused never       -
MAINFRAME_PKG                 No    -   Unused             -
ENTERPRISE_PKG                No    -   Unused             -
PORT_ACTIV_20P                No   20   In use never       -
--------------------------------------------------------------------------------
```

This table describes the port license assignments for the Cisco MDS 9396S Switch.

Table 6: Default Port License Assignments for Cisco MDS 9396S Switch

License Package (PORT_ACTIV_9396S_PKG)	Assigned to Ports on the Cisco MDS 9396S Switch
Default	1–48
First PORT_ACTIV_9396S_PKG	49-60
Second PORT_ACTIV_9396S_PKG	61-72
Third PORT_ACTIV_9396S_PKG	73-84
Fourth PORT_ACTIV_9396S_PKG	85-96

You can use the **show license usage** command to view any licenses assigned to a switch. If a license is in use, the status displayed is In use. If a license is installed but features or ports have acquired the license, then the status displayed is Unused.

The default license package for the Cisco MDS 9396S Switch is as follows:

```
switch# show license usage

Feature                      Ins  Lic   Status Expiry Date Comments
                                Count
--------------------------------------------------------------------------------
FM_SERVER_PKG                 No    -   Unused             -
ENTERPRISE_PKG                No    -   In use             Grace 24D 0H
PORT_ACTIV_9396S_PKG          No   48   In use never       -
--------------------------------------------------------------------------------
```

Related Documentation

The documentation set for the Cisco MDS 9000 Series includes the following documents. To find a document online, use the Cisco MDS NX-OS Documentation Locator at:

http://www.cisco.com/en/US/docs/storage/san_switches/mds9000/roadmaps/doclocater.htm

Cisco DCNM documentation is available at the following URL:

http://www.cisco.com/en/US/products/ps9369/tsd_products_support_series_home.html

Release Notes

- *Cisco MDS 9000 Series Release Notes for Cisco MDS NX-OS Releases*
- *Cisco MDS 9000 Series Release Notes for MDS SAN-OS Releases*
- *Cisco MDS 9000 Series Release Notes for Storage Services Interface Images*
- *Cisco MDS 9000 Series Release Notes for Cisco MDS 9000 EPLD Images*
- *Cisco Data Center Network Manager Release Notes*

Regulatory Compliance and Safety Information

Regulatory Compliance and Safety Information for the Cisco MDS 9000 Series

Compatibility Information

- *Cisco Data Center Interoperability Support Matrix*
- *Cisco MDS 9000 NX-OS Hardware and Software Compatibility Information and Feature Lists*
- *Cisco MDS NX-OS Release Compatibility Matrix for Storage Service Interface Images*
- *Cisco MDS 9000 Series Switch-to-Switch Interoperability Configuration Guide*
- *Cisco MDS NX-OS Release Compatibility Matrix for IBM SAN Volume Controller Software for Cisco MDS 9000*

Hardware Installation

- *Cisco MDS 9700 Director Hardware Installation Guide*
- *Cisco MDS 9500 Series Hardware Installation Guide*
- *Cisco MDS 9250i Multiservice Switch Hardware Installation Guide*
- *Cisco MDS 9200 Series Hardware Installation Guide*

Software Installation and Upgrade

- *Cisco MDS 9000 Series Storage Services Interface Image Install and Upgrade Guide*
- *Cisco MDS 9000 Series Storage Services Module Software Installation and Upgrade Guide*

- *Cisco MDS 9000 NX-OS Release 4.1(x) and SAN-OS 3(x) Software Upgrade and Downgrade Guide*

Cisco NX-OS

- *Cisco MDS 9000 Series NX-OS Fundamentals Configuration Guide*
- *Cisco MDS 9000 Series NX-OS Licensing Guide*
- *Cisco MDS 9000 Series NX-OS System Management Configuration Guide*
- *Cisco MDS 9000 Series NX-OS Interfaces Configuration Guide*
- *Cisco MDS 9000 Series NX-OS Fabric Configuration Guide*
- *Cisco MDS 9000 Series NX-OS Quality of Service Configuration Guide*
- *Cisco MDS 9000 Series NX-OS Security Configuration Guide*
- *Cisco MDS 9000 Series NX-OS IP Services Configuration Guide*
- *Cisco MDS 9000 Series NX-OS Intelligent Storage Services Configuration Guide*
- *Cisco MDS 9000 Series NX-OS High Availability and Redundancy Configuration Guide*
- *Cisco MDS 9000 Series NX-OS Inter-VSAN Routing Configuration Guide*

Command-Line Interface

Cisco MDS 9000 Series Command Reference

Intelligent Storage Networking Services Configuration Guides

- *Cisco MDS 9000 I/O Acceleration Configuration Guide*
- *Cisco MDS 9000 Series SANTap Deployment Guide*
- *Cisco MDS 9000 Series Data Mobility Manager Configuration Guide*
- *Cisco MDS 9000 Series Storage Media Encryption Configuration Guide*
- *Cisco MDS 9000 Series Secure Erase Configuration Guide*
- *Cisco MDS 9000 Series Cookbook for Cisco MDS SAN-OS*

Troubleshooting and Reference

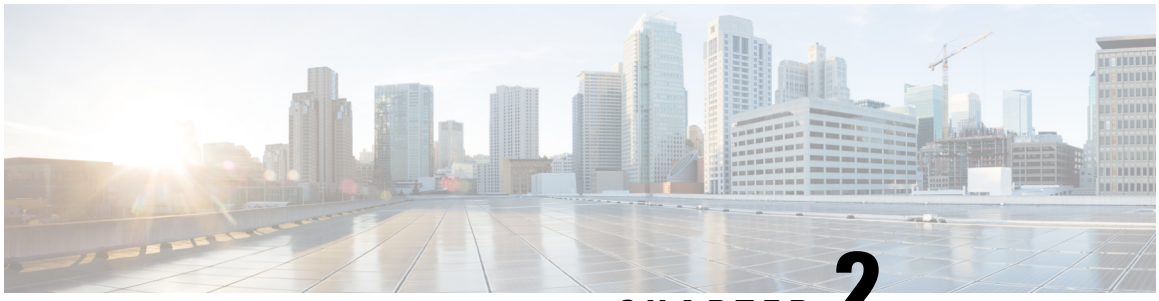
- *Cisco NX-OS System Messages Reference*
- *Cisco MDS 9000 Series NX-OS Troubleshooting Guide*
- *Cisco MDS 9000 Series NX-OS MIB Quick Reference*
- *Cisco MDS 9000 Series NX-OS SMI-S Programming Reference*
- *Cisco DCNM for SAN Database Schema Reference*

Communications, Services, and Additional Information

- To receive timely, relevant information from Cisco, sign up at Cisco Profile Manager.
- To get the business impact you're looking for with the technologies that matter, visit Cisco Services.
- To submit a service request, visit Cisco Support.
- To discover and browse secure, validated enterprise-class apps, products, solutions and services, visit Cisco Marketplace.
- To obtain general networking, training, and certification titles, visit Cisco Press.
- To find warranty information for a specific product or product family, access Cisco Warranty Finder.

Cisco Bug Search Tool

Cisco Bug Search Tool (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.



CHAPTER 2

Smart Software Licensing

This chapter provides an overview of Smart Software Licensing and describes the tools and processes required to complete the registration and authorization for Cisco MDS 9000 Series Switches.

Finding Feature Information

Your software release might not support all the features documented in this module. For the latest caveats and feature information, see the Bug Search Tool at https://tools.cisco.com/bugsearch/ and the release notes for your software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature History for Smart Software Licensing table.

Information About Smart Software Licensing

Introduction to Smart Licensing

Cisco Smart Licensing is a flexible licensing model that provides you with an easier, faster, and more consistent way to purchase and manage software across the Cisco portfolio and across your organization. And it's secure – you control what users can access. With Smart Licensing you get:

- **Easy Activation**: Smart Licensing establishes a pool of software licenses that can be used across the entire organization—no more PAKs (Product Activation Keys).
- **Unified Management**: My Cisco Entitlements (MCE) provides a complete view into all of your Cisco products and services in an easy-to-use portal, so you always know what you have and what you are using.
- **License Flexibility**: Your software is not node-locked to your hardware, so you can easily use and transfer licenses as needed.

To use Smart Licensing, you must first set up a Smart Account on Cisco Software Central (https://software.cisco.com/software/csws/ws/platform/home).

For a more detailed overview on Cisco Licensing, go to https://www.cisco.com/c/en/us/buy/licensing/licensing-guide.html.

Smart Software Licensing Overview

Smart Software Licensing is a cloud-based licensing model that consists of tools and processes to authorize you the usage and reporting of your Cisco products. This feature captures your order and communicates with the Cisco Cloud License Service through the Smart Call Home transport media to complete product registration and authorization at the corresponding performance and technology levels.

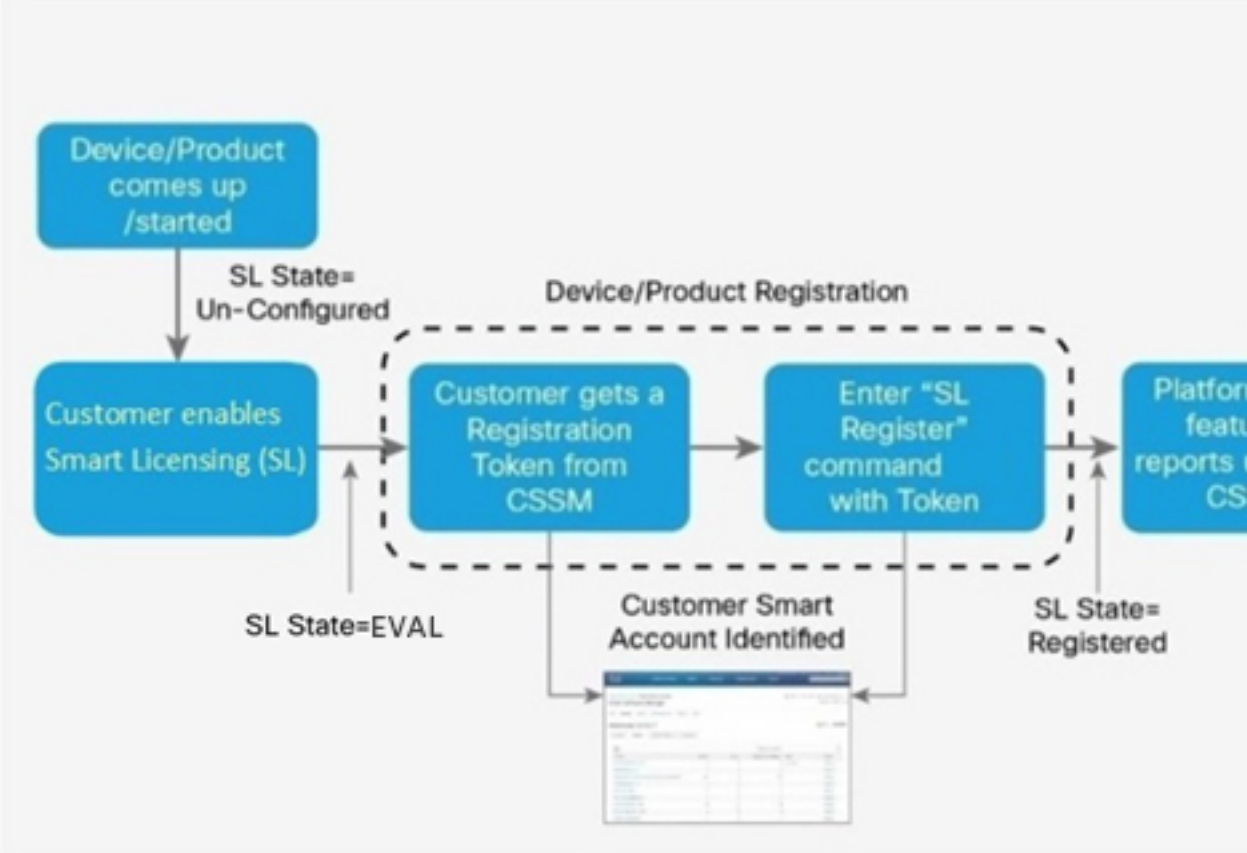
In the Smart Software Licensing model, you can activate licensed products without the use of a special software key or upgrade license file. You can activate the new functionalities using the appropriate product commands or configurations. Note that a software reboot may or may not be required depending on the product capabilities and requirements.

Similarly, downgrading or removing an advanced feature, performance, or functionality requires the removal of configurations or commands. After either of these actions is taken, the change in license state is noted by the Smart Software Manager during the next synchronization and an appropriate action is taken.

Starting from Cisco NX-OS 8.4(2), subscription-based licensing is available on Cisco MDS 9000 Series switches. This enables the customer to purchase licenses for a period of time.

Smart Software Licensing provides a single, standardized licensing solution for your Cisco products.

Figure 1: Smart Licensing Workflow



Traditional Licensing Overview

Traditional licensing at Cisco is a legacy licensing model based on Product Activation Keys (PAK) and Unique Device Identifiers (UDI). On most devices, capacity needs are assessed prior to obtaining and installing a *.tar* file on switches to retrieve the UDI. Customers place an order for a PAK, and the PAK is emailed to the user. A combination of them. UDI and PAK is used to receive a license file that is installed in the boot directory of the switch to complete the installation of the Cisco NX-OS software.

The License Registration Portal (LRP) is available to help migrate traditional licenses to smart licenses. To access the LRP, obtain training, and manage licenses, go to http://tools.cisco.com/SWIFT/LicensingUI/Home.

You can convert the traditional license to a smart license in the following ways:

- Converting a Traditional License to a Smart License Through GUI, on page 32
- Converting a Traditional License to a Smart License Through CLI, on page 33

Comparing Licensing Models

Two types of licensing models are used for the Cisco MDS 9000 Series Switches—traditional licensing and Smart Software Licensing.

Table 7: Comparison Between Traditional Licensing and Smart Software Licensing

Description	Traditional Licensing	Smart Software Licensing
License instance node locked to the product instance	Yes	No
Product registration upon configuration	No	Yes
Offers tools to report, monitor, own, and consume	No	Yes
Requires Smart Call Home	No	Yes

Smart Software Licensing Model

The Smart Software licensing model that is defined for the Cisco MDS product line has the following options:

- Subscription-based licenses
  - Advantage (A)

    License contains Cisco Nexus Dashboard Fabric Controller (formerly DCNM) and Enterprise license of Cisco MDS 9000 series.
  - Premier (P)

    License contains Cisco Nexus Dashboard Fabric Controller (formerly DCNM), SAN Analytics, and Enterprise license of Cisco MDS 9000 series.
- Enterprise Agreement (EA) licenses

The license naming convention is as follows: M91XK9-A-1Y

- M91XK9 - Cisco MDS 9000 series
- A or P - License type
- NY - License Duration in years.

This table provides PIDs for subscription-based licenses.

Table 8: PIDs for Subscription-Based Licenses

PIDs	License Type	Duration (years)
M91XK9-DCNM-1Y	Subscription	1
M92XK9-DCNM-1Y	Subscription	1
M93XK9-DCNM-1Y	Subscription	1

PIDs	License Type	Duration (years)
M97XK9-DCNM-1Y	Subscription	1
M91XK9-DCNM-3Y	Subscription	3
M92XK9-DCNM-3Y	Subscription	3
M93XK9-DCNM-3Y	Subscription	3
M97XK9-DCNM-3Y	Subscription	3
M91XK9-DCNM-5Y	Subscription	5
M92XK9-DCNM-5Y	Subscription	5
M93XK9-DCNM-5Y	Subscription	5
M97XK9-DCNM-5Y	Subscription	5
M91XK9-ENT-1Y	Subscription	1
M92XK9-ENT-1Y	Subscription	1
M93XK9-ENT-1Y	Subscription	1
M97XK9-ENT-1Y	Subscription	1
M91XK9-ENT-3Y	Subscription	3
M92XK9-ENT-3Y	Subscription	3
M93XK9-ENT-3Y	Subscription	3
M97XK9-ENT-3Y	Subscription	3
M91XK9-ENT-5Y	Subscription	5
M92XK9-ENT-5Y	Subscription	5
M93XK9-ENT-5Y	Subscription	5
M97XK9-ENT-5Y	Subscription	5
L1-D-M91S-AXK9	Time Based	1
L-D-M91S-AXK9	Time Based	3
L5-D-M91S-AXK9	Time Based	5
L1-D-M93S-AXK9	Time Based	1
L-D-M93S-AXK9	Time Based	3
L5-D-M93S-AXK9	Time Based	5
L1-D-M97S-AXK9	Time Based	1
L-D-M97S-AXK9	Time Based	3
L5-D-M97S-AXK9	Time Based	5
M91XK9-A-1Y	Subscription	1
M91XK9-A-3Y	Subscription	3

PIDs	License Type	Duration (years)
M91XK9-A-5Y	Subscription	5
M93XK9-A-1Y	Subscription	1
M93XK9-A-3Y	Subscription	3
M93XK9-A-5Y	Subscription	5
M97XK9-A-1Y	Subscription	1
M97XK9-A-3Y	Subscription	3
M97XK9-A-5Y	Subscription	5
M91XK9-P-1Y	Subscription	1
M91XK9-P-3Y	Subscription	3
M91XK9-P-5Y	Subscription	5
M93XK9-P-1Y	Subscription	1
M93XK9-P-3Y	Subscription	3
M93XK9-P-5Y	Subscription	5
M97XK9-P-1Y	Subscription	1
M97XK9-P-3Y	Subscription	3
M97XK9-P-5Y	Subscription	5
M91XK9-SD-1Y	Subscription	1
M91XK9-SD-3Y	Subscription	3
M91XK9-SD-5Y	Subscription	5
M93XK9-SD-1Y	Subscription	1
M93XK9-SD-3Y	Subscription	3
M93XK9-SD-5Y	Subscription	5
M97XK9-SD-1Y	Subscription	1
M97XK9-SD-3Y	Subscription	3
M97XK9-SD-5Y	Subscription	5

This table provides PIDs for EA licenses.

Table 9: PIDs for EA Licenses

PIDs	Term
E2N-MDS9100-G-A	3 or 5 Year
E2N-MDS9100-B-A	3 or 5 Year
E2N-MDS9100-G-P	3 or 5 Year

PIDs	Term
E2N-MDS9100-B-P	3 or 5 Year
E2N-MDS9300-G-A	3 or 5 Year
E2N-MDS9300-B-A	3 or 5 Year
E2N-MDS9300-G-P	3 or 5 Year
E2N-MDS9300-B-P	3 or 5 Year
E2N-MDS9700-G-A	3 or 5 Year
E2N-MDS9700-B-A	3 or 5 Year
E2N-MDS9700-G-P	3 or 5 Year
E2N-MDS9700-B-P	3 or 5 Year

Guidelines and Limitations for Smart Software Licensing

- You cannot use both traditional licensing and Smart Software Licensing at the same time on the Cisco MDS 9000 Series Switches.
- From Cisco MDS NX-OS Release 9.2(2), Smart Software Licensing is supported on Cisco N-Port Virtualizer (Cisco NPV) devices. Smart Software Licensing is not supported on Cisco NPV devices in Cisco MDS NX-OS Release 9.2(1) or earlier.

Smart Accounts and Virtual Accounts

- A Smart account provides you with a single location for all smart-account enabled products and licenses. It assists you in speedy procurement, deployment, and maintenance of your Cisco software.

  If you are requesting a Smart account on behalf of an organization, you must have the authority to represent the requesting organization when creating a Smart account. After submitting the request, the request goes through an approval process before you are provided with access to your Smart account.

  Go to http://software.cisco.com to learn about, set up, and manage a Smart account.
- A virtual account is a subaccount within a Smart account. You can define the virtual account's structure based on organizational layout, business function, geography, or any defined hierarchy. Virtual accounts can be created and maintained only by Smart account administrators.

Smart Software Manager Overview

Smart Software Manager enables the management of software licenses and Smart accounts from a single portal. The interface allows you to activate your product, manage entitlements, renew, and upgrade software.

An active Smart account is required to complete the registration process. To access the Smart Software Manager, go to http://www.cisco.com/web/ordering/smart-software-manager/index.html.

You must add the following information in the Smart Software Manager:

- Trusted Unique Identifier—This is the device ID (Secure Unique Device Identifier (SUDI)).
- Organizational Identifier—This is a numerical format to associate a product with a Smart account or Virtual account.
- Licenses consumed—Allows the Smart Software Manager to understand the license type and the level of consumption.

Smart Call Home Overview

Use the Smart Call Home feature to communicate with the Smart Software Manager. Smart Call Home is enabled automatically when you configure Smart Software Licensing. On Cisco MDS 9000 Series Switches, Smart Software Licensing is not enabled by default.

The Smart Call Home (SCH) server runs on the Cisco Smart Software Manager (CSSM) satellite by default. You can access this service using the following URL:

https://<CSSM satllite IP:443>/Transportgateway/services/DeviceRequestHandler

Provide this URL as part of Smart Call Home configuration so that the device registration works with the CSSM satellite. For a sample configuration, see Configuration Examples for Smart Software Licensing.

The associated Smart Call Home messages are sent to the Smart Software Manager only after enabling Smart Call Home. For switches in which Smart Software Licensing is enabled by default, Smart Call Home is also enabled by default, along with the associated messages.

To disable Smart Software Licensing, see Disabling Smart Software Licensing.

Smart Software Manager Satellite

Smart Software Manager satellite is a component of Smart Software Licensing and works in conjunction with the Smart Software Manager to manage software licenses. You can intelligently manage product licenses and get near real-time visibility and reports pertaining to the Cisco licenses you purchased and consumed.

If you do not want to manage your installed base using a direct Internet connection, the Smart Software Manager satellite will be installed on your premises to provide a subset of the Smart Software Manager functionality. You can download the satellite application, deploy it, and register it with the Smart Software Manager.

You can perform the following functions using the satellite application on your premises:

- Activate or register a license
- Get visibility to your company's licenses
- Transfer licenses between company entities

To learn more about the Smart Software Manager satellite, go to http://www.cisco.com/go/smartsatellite.

Requesting a Smart Account

Requesting a Smart account is a one-time process. Subsequent management of users is a capability provided through the tool.

Before you begin

Ensure that you have a Cisco Employee Connection (CEC) ID.

Procedure

Step 1 Go to http://software.cisco.com, and log in to your account.

Step 2 Click the **Request a Smart Account** link in the **Administration** section.

Step 3 Perform one of the following tasks to select the Account Approver:

- To select yourself as the approver, click **Yes, I will be the Approver for the account** option.
- To select a different person as the approver, click **No, the person specified below will be the Approver for the account** option and specify the person's email ID.

Note The specified approver must have the authority to enter legal agreements. The approver serves as the primary owner and nominates account administrators.

Step 4 Depending on the approver type, perform one of the following procedures:

- If you are the approver, perform the following tasks:
  1. **a.** Enter **Account Name**, **Company/Organization Name**, **Country**, and **State/Province/Region** information.
  2. **b.** (Optional) Click **Edit**.
  3. **c.** In the **Edit Account Identifier** window, enter a valid **Proposed Domain Identifier** and **Contact Phone Number**, and click **OK**.

     Note The default domain identifier is the approver's email domain. If you edit the domain identifier, the change goes through a manual approval process.
  4. **d.** Click **Continue** to select the legal address to be linked to your Smart account.

- If you are not the approver, perform the following procedure:
  1. **a.** Enter the **Account Name** and an optional **Message** to the approver.
  2. **b.** (Optional) Click **Edit**.
  3. **c.** In the **Edit Account Identifier** window, enter a valid **Proposed Domain Identifier**, and click **OK**.

     Note The default domain identifier is the approver's email domain. If you edit the domain identifier, the change goes through a manual approval process.
  4. **d.** Click **Continue**.

e. Follow the instructions in the email that is sent to you to complete the request.

Adding a User to a Smart Account

Smart account user management is available in the **Administration** section of Cisco Software Central.

Procedure

Step 1 Go to http://software.cisco.com, and log in to your account.

Step 2 Click the **Manage Smart Account** link in the **Administration** section.

Step 3 Click the **Users** tab.

Step 4 Click **New User**.

Step 5 Provide the required information in the **New User** section.

(Define roles to manage the entire Smart account or specific virtual accounts.)

Step 6 Click **Continue**.

Converting a Traditional License to a Smart License Through GUI

Traditional licenses associated with Product Activation Keys (PAK) can be converted to Smart Licenses. Access Traditional licenses through the License Registration Portal by clicking the **PAKs/Tokens** tab, and then use the information provided in this section to convert PAKs to smart licenses.

Procedure

Step 1 Go to http://software.cisco.com, and log in to your account.

Step 2 Click the **Traditional Licensing** link in the **License** section.
You will be redirected to the **LRP** window.

Step 3 Click the **PAKs/Tokens** tab under **Manage**, if it is not already selected.

Step 4 Check the **PAK/Token ID** check box.

Step 5 Select **Convert to Smart Entitlements** from the **Actions** drop-down menu.

Step 6 Select a smart account from the **Smart Account** drop-down list.

Note You can view only the smart accounts that are assigned to you.

Step 7 Select a virtual account from the **Virtual Account** drop-down list.

Note You can view only the virtual accounts that are assigned to you.

Step 8 Click **Assign**.
The selected PAK will be converted to a smart license.

Converting a Traditional License to a Smart License Through CLI

Traditional licenses associated with Product Activation Keys (PAK) can be converted to smart licenses using CLI.

Before you begin

- Ensure that Smart Software Licensing is enabled.
- Ensure that you have a valid smart account.
- Ensure that you have valid user rights for the smart account.

Procedure

Step 1 switch# **license smart conversion start**

Starts a manual conversion of a traditional license to a smart license. The conversion takes place in the background. After the conversion succeeds or fails, a system log message is displayed on the switch console.

Step 2 (Optional) switch# **license smart conversion stop**

Stops the manual conversion.

Step 3 (Optional) switch# **show license status**

Displays the license conversion status. If you run this command from an active device in an high availability (HA) configuration, this will display the status of all the devices in the HA configuration.

Converting a Traditional License to a Smart License Through CLI

The following example shows how to convert a traditional license to a smart license using the CLI:

```
switch# license smart conversion start

Smart License Conversion process is in progress. Use the 'show license status' command to
check the progress and result.
```

The following example shows how to stop the process of converting a traditional license to smart license using the CLI:

The following example shows the status of the license conversion for a standalone device:

```
switch# license smart conversion stop
stop manual conversion failed:
Some Smart Licensing Conversion jobs stopped successfully.
```

The following example shows the status of line conversion for a standalone device:

```
switch# show license status

Smart Licensing is ENABLED.
Registration:
Status: REGISTERED
Smart Account: Big-U University
Virtual Account: Physics
Export-Controlled Functionality: Not Allowed
Initial Registration: SUCCEEDED on Feb 24 23:30:12 2014 PST
Last Renewal Attempt: SUCCEEDED on Feb 24 23:30:12 2014 PST
Next Renewal Attempt: Aug 24 23:30:12 2014 PST
Registration Expires: Feb 24 23:30:12 2015 PST

!The following show output is applicable from Cisco NX-OS Release 8.2(1) onwards!
Smart License Conversion:
Automatic Conversion Enabled: False
Status: SUCCEEDED on Jan 1 00:00:00 1970 UTC

License Authorization:
Status: AUTHORIZED on Aug 31 17:04:56 2017 UTC
Last Communication Attempt: SUCCEEDED on Aug 31 17:04:56 2017 UTC
Next Communication Attempt: Sep 30 17:04:56 2017 UTC
Communication Deadline: Nov 29 16:58:31 2017 UTC
```

Configuring Smart Software Licensing

Configuring a DNS Client

Note To avoid any issues during configuring a DNS client, ensure to check if the name server is reachable before you configure a DNS client.

Procedure

Step 1 switch# **configure terminal**

Enters global configuration mode.

Step 2 switch(config)# **ip domain-lookup**

Enables DNS-based address translation.

Step 3 switch(config)# **ip domain-name** *name*

Defines the default domain name that Cisco NX-OS uses to resolve unqualified host names.

Cisco NX-OS appends the default domain name to any hostname that does not contain a complete domain name before starting a domain-name lookup.

Step 4 switch(config)# **ip name-server** *address1* [*address2... address6*]

Defines up to six name servers. The address can be either an IPv4 address or an IPv6 address.

Enabling Smart Software Licensing

Note From Cisco MDS NX-OS Release 9.2(2), Smart Software Licensing is enabled by default and cannot be disabled.

Procedure

Step 1 switch# **configure terminal**.

Enters global configuration mode.

Step 2 Use one of the following commands to enable Smart Software Licensing:

- switch(config)# **license smart enable**
- switch(config)# **feature license smart**

Enables Smart Software Licensing.

Disabling Smart Software Licensing

Procedure

Step 1 switch# **configure terminal**.

Enters global configuration mode.

Step 2 Use one of the following commands to disable Smart Software Licensing:

- switch(config)# **no license smart enable**
- switch(config)# **no feature license smart**

Disables Smart Software Licensing.

Registering a Device

Before you begin

- Ensure that Smart Software Licensing is enabled.
- Ensure that you have the token to be used to register your device to the smart account.

Procedure

switch# **license smart register idtoken** *token* [**force**]

Registers your device to the smart account using the token.

Renewing Device Registration

Procedure

switch# **license smart renew ID**

Renews the device registration.

Renewing Device Authorization

Procedure

switch# **license smart renew auth**

Renews the device authorization.

Unregistering a Device

Procedure

switch# **license smart deregister**

Unregisters a device.

Configuring Smart Call Home for Smart Software Licensing

Viewing a Smart Call Home Profile

Procedure

switch# **show callhome smart-licensing**

Displays the Smart Call Home profile.

Enabling Smart Call Home Data Privacy

Procedure

Step 1 switch# **configure terminal**

Enters global configuration mode.

Step 2 switch(config)# **callhome**
Enters Call Home configuration mode.

Step 3 switch(config-callhome)# **data-privacy hostname**
Enables Call Home data privacy.

Verifying Smart Software Licensing

Verify Smart Software Licensing using the following commands:

Commands	Purpose
show license	Displays the contents of all the license files.
show license all	Displays all smart license agent information.
show license brief	Displays a list of license files.
show license status	Displays the smart license agent status.

show license summary	Displays a summary of the smart license agent status.
show license tech support	Gathers information for troubleshooting.
show license udi	Displays device UDI information.
show license usage	Displays show license usage table information.
show tech-support license	Displays licensing technical support information.

Configuration Examples for Smart Software Licensing

This example shows how to register your device with the Cisco portal and enable Smart Software Licensing:

Note To avoid any issues during registering your device, ensure to check if the name server is reachable before registering your device.

```
switch# configure terminal
switch(config)# ip domain-lookup
switch(config)# ip domain-name cisco.com
switch(config)# ip name-server 171.70.168.183
switch(config)# callhome
switch(config-callhome)# dest xml trans http
switch(config-callhome)# dest xml email sl-sch-test@cisco.com
switch(config-callhome)# dest xml http
https://tools.cisco.com/its/service/oddce/services/DDCEService
switch(config-callhome)# enable
switch(config-callhome)# commit*
switch(config-callhome)# exit
switch(config)# feature license smart
```

Note * Ensure that callhome distribute is enabled. If not the commit fails.

This example shows how to disable Smart Software Licensing:

```
switch# configure terminal
switch(config)# no feature license smart
```

This example shows how to register a device:

```
switch# configure terminal
switch(config)# license smart register idtoken sampletokenID
register status: Registration process is in progress. Use the 'show license status' command
 to check the progress and result
```

This example shows how to unregister a device:

```
switch# license smart deregister
```

This example shows how to provide the URL for CSSM satellite as part of smart call home configuration:

```
switch(config-callhome)# destination-profile xml email-addr example@cisco.com
alert-group Add alert group
email-addr Add email addr
http Add http or https url
transport-method Callhome message sending transport-method
destination-profile xml http https://tools.cisco.com/its/service/oddce/services/DDCEService
services/DeviceRequestHandler*
```

Note * The IP address should have the format: https://<CSSM satellite IP:443>/Transportgateway/services/DeviceRequestHandler

Verification Examples for Smart Software Licensing

These examples show how to verify Smart Software Licensing:

```
switch# show license status

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: MDS-9148S
  Virtual Account: Default
  Export-Controlled Functionality: Allowed
  Initial Registration: SUCCEEDED on Apr 18 08:20:47 2017 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Oct 15 08:20:46 2017 UTC
  Registration Expires: Apr 18 08:17:43 2018 UTC

License Authorization:
  Status: AUTHORIZED on Apr 18 08:25:08 2017 UTC

  Last Communication Attempt: SUCCEEDED on Apr 18 08:25:08 2017 UTC
  Next Communication Attempt: May 18 08:25:08 2017 UTC
  Communication Deadline: Jul 17 08:22:07 2017 UTC


switch# show callhome smart-licensing

Current smart-licensing transport settings:
 Smart-license messages: enabled
 Profile: CiscoTAC-1 (status: ACTIVE)


switch# show license summary

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: Cisco Systems, Inc.
  Virtual Account: NexusSmartLicensing_Test
  Export-Controlled Functionality: Allowed

License Authorization:
  Status: AUTHORIZED on Dec 14 10:43:48 2016 UTC

  Last Communication Attempt: SUCCEEDED
  Next Communication Attempt: Jan 13 10:43:47 2017 UTC
```

```
  Communication Deadline: Dec 14 08:07:20 2017 UTC


switch# show license brief

Status Legend:
  u - unenforced, e - enforced
  d - platform default, f - factory installed SLP license,
  p - converted from PAK, s - migrated from Smart Licensing,
  a - installed using SLP, h - honored (pending SLP authorization)
General Legend:
  NA - not applicable
-----------------------------------------------------------------------------------------
                                                                License  Port
License Name                                                    Count    Count  Used  Status
-----------------------------------------------------------------------------------------
MDS 9700 series Modular Enterprise package                          1     NA     1  pu
MDS 9700 series Modular Mainframe package                           1     NA     1  u
SAN Analytics                                                       1     NA     0  pu
MDS 9300V Series Enterprise                                         1     NA     1  u
MDS 9396V 64G FC 16 Port Activation License                        NA     48    48  d
MDS 9396V 64G FC 16 Port Activation License                         3     48    48  ae
switch# show license all

Smart Licensing Status
======================
Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: Cisco Systems, Inc.
  Virtual Account: NexusSmartLicensing_Test
  Export-Controlled Functionality: Allowed
  Initial Registration: SUCCEEDED on Dec 14 10:43:33 2016 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Jun 12 10:43:32 2017 UTC
  Registration Expires: Dec 14 08:07:20 2017 UTC

License Authorization:
  Status: AUTHORIZED
  Last Communication Attempt: SUCCEEDED on Dec 14 10:43:48 2016 UTC
  Next Communication Attempt: Jan 13 10:43:48 2017 UTC
  Communication Deadline: Dec 14 08:07:21 2017 UTC

License Usage
=============

Product Information
===================
UDI: SN:JAF1428DTAH

Agent Version
=============
Smart Agent for Licensing: 1.6.6_rel/88
```

The **show license tech support** command displays the smart licensing status along with the smart agent logs.

```
switch# show license tech support

Smart Licensing Tech Support info

Smart Licensing Status
```

```
======================

Smart Licensing is ENABLED

License Conversion:
  Automatic Conversion Enabled: True
  Status: Not started

Export Authorization Key:
  Features Authorized:
    <none>

Utility:
  Status: DISABLED

Smart Licensing Using Policy:
  Status: ENABLED

Data Privacy:
  Sending Hostname: yes
    Callhome hostname privacy: DISABLED
    Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED

Transport:
  Type: cslu
  Cslu address: <empty>
  Proxy:
    Address: <empty>
    Port: <empty>
    Username: <empty>
    Password: <empty>
  Server Identity Check: False

Miscellaneous:
  Custom Id: <empty>

Policy:
  Policy in use: Merged from multiple sources.
  Reporting ACK required: yes (CISCO default)
  Unenforced/Non-Export Attributes:
    First report requirement (days): 90 (CISCO default)
    Reporting frequency (days): 365 (CISCO default)
    Report on change (days): 90 (CISCO default)
  Enforced (Perpetual/Subscription) License Attributes:
    First report requirement (days): 0 (CISCO default)
    Reporting frequency (days): 0 (CISCO default)
    Report on change (days): 0 (CISCO default)
  Export (Perpetual/Subscription) License Attributes:
    First report requirement (days): 0 (CISCO default)
    Reporting frequency (days): 0 (CISCO default)
    Report on change (days): 0 (CISCO default)

Usage Reporting:
  Last ACK received: <none>
  Next ACK deadline: May 10 2022 10:06:40 UTC
  Reporting push interval: 30  days State(2) InPolicy(90)
  Next ACK push check: <none>
  Next report push: Apr 12 2022 08:53:29 UTC
  Last report push: <none>
  Last report file write: <none>

License Usage
=============
```

```
Handle: 1
  License: LAN_ENTERPRISE_SERVICES_PKG
  Entitlement Tag:
regid.2019-06.com.cisco.LAN_Nexus9300_XF,1.0_76a87ea7-465b-40fd-b403-1bf9d845aa1b
  Description: LAN license for Nexus 9300-XF
  Count: 1
  Version: 1.0
  Status: IN USE(15)
  Status time: Apr 12 2022 08:52:59 UTC
  Request Time: Apr 12 2022 08:52:59 UTC
  Export status: NOT RESTRICTED
  Feature Name: LAN_ENTERPRISE_SERVICES_PKG
  Feature Description: LAN license for Nexus 9300-XF
  Enforcement type: NOT ENFORCED
  License type: Generic
  Measurements:
    ENTITLEMENT:
      Interval: 00:15:00
      Current Value: 1

Product Information
===================
UDI: PID:N9K-C93240YC-FX2,SN:FDO24450MBL

Agent Version
=============
Smart Agent for Licensing: 5.2.4_rel/79

Upcoming Scheduled Jobs
=======================
Current time: Apr 12 2022 10:35:37 UTC
Daily: Apr 13 2022 08:51:24 UTC (22 hours, 15 minutes, 47 seconds remaining)
Init Flag Check: Expired Not Rescheduled
Reservation configuration mismatch between nodes in HA mode: Expired Not Rescheduled
Start Utility Measurements: Apr 12 2022 10:38:09 UTC (2 minutes, 32 seconds remaining)
Send Utility RUM reports: Apr 13 2022 08:53:29 UTC (22 hours, 17 minutes, 52 seconds
remaining)
Save unreported RUM Reports: Apr 12 2022 11:23:19 UTC (47 minutes, 42 seconds remaining)
Process Utility RUM reports: Apr 13 2022 08:51:25 UTC (22 hours, 15 minutes, 48 seconds
remaining)
External Event: May 10 2022 10:06:40 UTC (27 days, 23 hours, 31 minutes, 3 seconds remaining)
Operational Model: Expired Not Rescheduled

Communication Statistics:
=========================
Communication Level Allowed: INDIRECT
Overall State: <empty>
Trust Establishment:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: <none>
Trust Acknowledgement:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: <none>
Usage Reporting:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
```

```
  Last Failure Time: <none>
Result Polling:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: <none>
Authorization Request:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: <none>
Authorization Confirmation:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: <none>
Authorization Return:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: <none>
Trust Sync:
  Attempts: Total=0, Success=0, Fail=0  Ongoing Failure: Overall=0 Communication=0
  Last Response: <none>
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: <none>
Hello Message:
  Attempts: Total=2, Success=0, Fail=2  Ongoing Failure: Overall=2 Communication=2
  Last Response: NO REPLY on Apr 12 2022 08:53:29 UTC
    Failure Reason: <none>
  Last Success Time: <none>
  Last Failure Time: Apr 12 2022 08:53:29 UTC

License Certificates
====================
Production Cert: True
Not registered. No certificates installed

HA Info
==========
RP Role: Active
Chassis Role: Active
Behavior Role: Active
RMF: True
CF: True
CF State: Stateless
Message Flow Allowed: True

Reservation Info
================
License reservation: DISABLED

Overall status:
  Active: PID:N9K-C93240YC-FX2,SN:FDO24450MBL
      Reservation status: NOT INSTALLED
      Request code: <none>
      Last return code: <none>
      Last Confirmation code: <none>
      Reservation authorization code: <none>
```

```
      Status:PAK

Specified license reservations:

Purchased Licenses:
  No Purchase Information Available


Other Info
==========
Software ID: regid.2017-11.com.cisco.Nexus_9300,1.0_ac6d6e6b-8ca9-4de7-8699-4ee1cb8f422d
Agent State: authorized
TS enable: True
Transport: cslu
Locale: en_US.UTF-8
Debug flags: 0x7
Privacy Send Hostname: True
Privacy Send IP: True
Build type:: Production
sizeof(char)  : 1
sizeof(int)   : 4
sizeof(long)  : 8
sizeof(char *): 8
sizeof(time_t): 8
sizeof(size_t): 8
Endian: Little
Write Erase Occurred: False
XOS version: 0.12.0.0
Config Persist Received: True
Message Version: 1.3
connect_info.name: <empty>
connect_info.version: <empty>
connect_info.additional: <empty>
connect_info.prod: False
connect_info.capabilities: <empty>
agent.capabilities: UTILITY, DLC, AppHA, MULTITIER, EXPORT_2, OK_TRY_AGAIN
Check Point Interface: False
Config Management Interface: False
License Map Interface: True
HA Interface: True
Trusted Store Interface: True
Platform Data Interface: True
Crypto Version 2 Interface: False
SAPluginMgmtInterfaceMutex: False
SAPluginMgmtIPDomainName: False
SmartAgentClientWaitForServer: 2000
SmartAgentCmReTrySend: False
SmartAgentClientIsUnified: True
SmartAgentCmClient: True
SmartAgentClientName: UnifiedClient
builtInEncryption: True
SmartAgentXMLEntriesAreUnique: True
enableOnInit: true
chassisRole: Active
SmartTransportServerIdCheck: False
SmartTransportProxySupport: True
SmartAgentPolicyDisplayFormat: 2
SmartAgentReportOnUpgrade: true
SmartAgentIndividualRUMEncrypt: 2
SmartAgentUsageStatisticsEnable: False
SmartAgentMaxRumMemory: 4
SmartAgentConcurrentThreadMax: 10
SmartAgentPolicyControllerModel: False
SmartAgentPolicyModel: true
```

```
SmartAgentFederalLicense: False
SmartAgentMultiTenant: False
attr365DayEvalSyslog: False
checkPointWriteOnly: False
SmartAgentDelayCertValidation: False
enableByDefault: False
conversionAutomatic: True
conversionAllowed: true
storageEncryptDisable: False
storageLoadUnencryptedDisable: False
TSPluginDisable: False
bypassUDICheck: False
loggingAddTStamp: False
loggingAddTid: true
HighAvailabilityOverrideEvent: UnknownPlatformEvent
platformIndependentOverrideEvent: UnknownPlatformEvent
platformOverrideEvent: UnknownPlatformEvent
WaitForHaRole: False
standbyIsHot: True
chkPtType: 2
delayCommInit: False
roleByEvent: true
maxTraceLength: 100
traceAlwaysOn: False
debugFlags: 7
Event log max size: 512 KB
Event log current size: 68 KB
Local Device: No Trust Data
Overall Trust: No ID
Clock sync-ed with NTP: False

Platform Provided Mapping Table
===============================
  regid.2017-11.com.cisco.Nexus_9300,1.0_ac6d6e6b-8ca9-4de7-8699-4ee1cb8f422d: Total licenses
 found: 17
Enforced Licenses:
  P:N9K-C93240YC-FX2,S:FDO24450MBL:
    No PD enforced licenses
```

The **show tech-support license** command displays information about the license installed on the device.

```
switch# show tech-support license
`show license host-id`
License hostid: VDH=JPG2551000X
`show license usage`

License Authorization:
  Status: Not Applicable

(ENTERPRISE_PKG):
  Description: MDS 9100V Series Enterprise
  Count: 1
  Version: 1.0
  Status: IN USE
  Enforcement Type: NOT ENFORCED
  License Type: Generic

(PORT_ACTIV_9148V_PKG):
  Description: MDS 9148V FC 8 port-activation
  Count: 24
  Version: 1.0
  Status: IN USE
  Enforcement Type: ENFORCED
  License Type: Enforced
```

```
`show license status`
Utility:
    Status: DISABLED

Smart Licensing using Policy:
    Status: ENABLED

Data Privacy:
    Sending Hostname: yes
    Callhome Hostname Privacy: DISABLED
        Smart Licensing Hostname Privacy: DISABLED
    Version Privacy: DISABLED

Transport:
    Type: Smart
    URL: https://smartreceiver.cisco.com/licservice/license
    Proxy:
        Not configured

Policy:
    Policy in use: Merged from multiple sources
    Reporting ACK required: Yes
    Unenforced/Non-Export:
        First report requirement (days): 90 (CISCO default)
        Ongoing reporting frequency (days): 365 (CISCO default)
        On change reporting (days): 90 (CISCO default)
    Enforced (Pepertual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)
    Export (Perpetual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)

Miscellaneous:
    Custom Id: <empty>

Usage reporting:
    Last ACK received: <none>
    Next ACK deadline: Jun 29 13:27:54 2022  UTC
    Reporting push interval: 30 days
    Next ACK push check: <none>
    Next report push: Jul 14 12:09:43 2022  UTC
    Last report push: <none>
    Last report file write: <none>

Trust Code installed: Mar 31 11:17:43 2022  UTC
    Active: PID: DS-C9148V-K9, SN: JPG2551000X
        Mar 31 11:17:43 2022  UTC


`show license summary`


License Usage:
License                     Entitlement tag                 Count   Status
-----------------------------------------------------------------------------
MDS 9100V Series Enterp... (ENTERPRISE_PKG)                  1       IN USE
MDS 9148V FC 8 port-act... (PORT_ACTIV_9148V_PKG)            24      IN USE
`show running-config license all`
```

```
!Command: show running-config license all
!Running configuration last done at: Thu Jul 21 06:52:51 2022
!Time: Wed Jul 27 06:26:21 2022

version 9.3(1)
license grace-period
license smart transport smart
license smart url smart https://smartreceiver.cisco.com/licservice/license
license smart url cslu cslu-local
license smart usage interval 30


`test license platformInfo`
SL Status        : Enabled
Chassis ID       : 43
Trad spec file   : mds_nellis
SL spec file     : smartpd_spec_m9148V
SLP spec file    : sle_spec_m9148V
IPS bootup ports : 0
Bootup ports     : 0
Hport Status     : Disabled
SL(Prev) Status  : Disabled
`show system internal license event-history error`
```

```
switch# show license udi

UDI: SN:JAF1428DTAH
```

```
switch# show license usage
License Authorization:
  Status: AUTHORIZED on Apr 18 08:25:08 2017 UTC

(ENTERPRISE_PKG):
  Description: This entitlement tag was created via Alpha Extension application
  Count: 1
  Version: 1.0
  Status: AUTHORIZED

(PORT_ACTIV_9148S_PKG):
  Description: This entitlement tag was created via Alpha Extension application
  Count: 48
  Version: 1.0
  Status: AUTHORIZED
```

```
switch# show running-config callhome

!Time: Thu Dec 15 08:55:26 2016

version 8.0(1)
callhome
  email-contact sch-smart-licensing@cisco.com
  destination-profile xml transport-method http
  destination-profile xml http https://tools.cisco.com/its/service/oddce/
services/DDCEService
  transport http use-vrf management
  enable
```

Use Cases for Smart Software Licensing

Scenario 1

1. Configure and order a with licenses and select the release that will be preinstalled on the hardware prior to shipment.

Note To convert the preinstalled licenses on the hardware to smart licenses, you must have a Smart Account set up, and then convert the licenses by going to the License Registration Portal.

2. Click the **Devices** tab under the **Manage** section. Click the corresponding Device ID, and choose **Convert to Smart Entitlements** from the Device ID drop-down list. This will convert all the licenses that are preinstalled on the switch to smart licenses. Note that this task must be performed for each switch that you want to convert to smart license.
3. The service will validate if license Stock Keeping Units (SKUs) on the switch have been mapped to smart licenses before proceeding with the conversion.
4. Enable smart mode on the switch and start using the smart licenses.

Scenario 2

1. Configure and order a with licenses and select the release that will be preinstalled in the hardware prior to shipment.
2. Upgrade the switch to .

Note To convert the preinstalled licenses on the hardware to smart licenses, you must have a Smart account set up and then perform the conversion by going to the License Registration Portal.

3. Click the **Devices** tab under the **Manage** section. Click the corresponding Device ID, and choose **Convert to Smart Entitlements** from the Device ID drop-down list. This will convert all the licenses that are preinstalled on the switch to smart licenses. Note that this task must be performed for each switch that you want to convert to smart license.
4. The service will validate if license SKUs on the switch are mapped to smart licenses before proceeding with the conversion.
5. You enable smart mode on the switch and start using the smart licenses.

Scenario 3

1. Order a spare license SKU and do not associate a Smart account to the order in Cisco Commerce Workspace (CCW).

Note You must have a Smart account set up before using Smart Software Licensing.

2. Get a PAK delivered to yourself and load it to your Smart account.
3. License Registration Portal service will validate if a spare license SKU is mapped to a smart license.
4. The Smart Software Manager (SSM) will notify you via email that your Smart Account has licenses that can be fulfilled as traditional licenses or smart licenses.
5. Specify the PAKs as smart licenses in SSM.
6. Ensure that is installed on the switch, enable smart mode, and start using the smart entitlements.

Scenario 4

1. Order a spare license SKU and assign a Smart account to the order in CCW.
2. The existing License Registration Portal service will auto deposit the PAK to the LRP Smart account.
3. License Registration Portal service will validate if the spare license SKU has been mapped to smart entitlements. If the spare license SKU are mapped to smart entitlements, the service sends out a confirmation notification to CSSM.
4. The Smart Software Manager will notify you via email that your Smart Account has licenses that can be fulfilled as traditional licenses or smart licenses.
5. Specify the PAKs as Smart Software Licenses in SSM.
6. Ensure that is installed on the switch, enable smart mode, and start using the smart licenses.

Additional References for Smart Software Licensing

Table 10: Technical Assistance

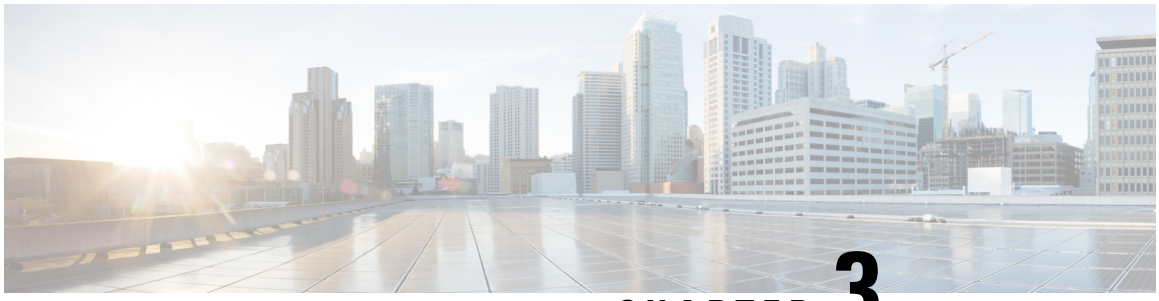
Description	Link

Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html
License Registration Port (LRP) documentation	https://www.cisco.com/web/fw/tools/swift/xui/html/help.html

Feature History for Smart Software Licensing

Feature Name	Release	Feature Information
Smart agent log display	9.3(1)	The **show license tech support** command is enhanced to display only the smart agent logs.

Feature Name	Release	Feature Information
Smart Software Licensing	8.4(2)	Smart Software Licensing is a standardized licensing platform that simplifies the Cisco software experience and helps you understand how Cisco software is used across your network. Smart Software Licensing is the next generation licensing platform for Cisco MDS 9000 Series Switches. The following commands were introduced in this feature: • **feature license smart** • **license smart deregister** • **license smart enable** • **license smart register** • **license smart renew** • **show license all** • **show license status** • **show license summary** • **show license tech support** • **show license udi** • **show license usage**



CHAPTER 3

Smart Licensing Using Policy

Feature History for Smart Licensing Using Policy

This table provides release and related information for features that are explained in this module.

These features are available on all releases after the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco MDS NX-OS Release 9.2(2)	Smart Licensing Using Policy (SLP)	This feature was introduced.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.

Overview

Introduction to Smart Licensing Using Policy

Note If you are purchasing licenses via third-party vendors or partners, check with your vendors or partners for instructions on implementing SLP.

Smart Licensing using Policy (SLP) is an enhanced version of Smart Licensing, the objective of which is to provide a cloud-based licensing solution that does not interrupt the operations of your network, rather enables a compliance relationship to account for the hardware and software licenses purchased and used.

SLP is supported starting with Cisco MDS NX-OS Release 9.2(2) and is the only licensing mechanism available.

The primary benefits of this enhanced licensing model are:

- Seamless day-0 operations

  After a license is ordered, no preliminary steps, such as registration or generation of keys, are required unless an enforced license is used.

- Visibility and manageability of licenses

  View and manage all your switch licenses at one place.

- Flexible, time series reporting of licenses to remain compliant

  Easy reporting options are available, whether you are directly or indirectly connected to Cisco Smart Software Manager (CSSM) or are using an air-gapped approach.

This document provides conceptual, configuration, and troubleshooting information for SLP on Cisco MDS switches. For a more detailed overview on Cisco Licensing, go to cisco.com/go/licensingguide.

The conceptual information includes an overview of SLP, supported products, supported topologies, and explains how SLP interacts with other features. SLP is a software license management solution that provides a seamless experience for customers:

- Purchase: Purchase licenses through the existing channels and use the Cisco Smart Software Manager (CSSM) portal to view switches and licenses.

  To simplify the implementation of SLP, we recommend that you provide your Smart Account and Virtual Account information when placing an order for new hardware or software. This allows Cisco to install applicable licenses on switches (terms explained in the Concepts, on page 55 section) and deposit entitlements to SA/VA at the time of manufacturing. Also, purchase information will be populated under the **show license authorizations** command.

- License Types: Licenses on Cisco MDS switches are of two categories — enforced and unenforced.

  Enforced licensing prevents a feature from being used without first obtaining a license.

  Unenforced licensing does not need to complete any licensing-specific operations before using the feature. License usage is recorded on your switch with timestamps and the required workflows to report usage to Cisco can be completed later.

- Report: License usage should be reported to CSSM. Multiple options are available for license usage reporting. You can use the Cisco Smart Licensing Utility (CSLU) or SSM On-Prem , or report usage information directly to CSSM. For air-gapped networks, a provision for offline reporting where usage information can be downloaded from switches and uploaded to CSSM is also available. The usage report is in plain text XML format.

Guidelines and Limitations

The SLP feature has the following guidelines and limitations:

- CSLU-initiated pull mode is not supported in Cisco MDS NX-OS Release 9.2(2).
- When upgrading to Cisco MDS NX-OS Release 9.2(2) for SL registered switches, the transport mode may go to CSLU instead of Call Home. We recommend configuring the transport mode to Call Home manually and establish the trust with CSSM.
- During upgrade from earlier release with traditional licensing (PAK) to Cisco MDS NX-OS Release 9.2(2), reflection of RUM sync in the **show** command may take up to 24 hours after migration.
- While using the transport mode as CSLU, if licenses do not get released from the SA/VA after write-erase and reload of a switch, it is recommended to delete the switch from SA/VA.
- For SL registered switches with CSSM, when upgrading from pre-SLP releases to Cisco NX-OS MDS Release 9.2(2), duplicate entry may occur for the same switch on CSSM or SSM On-Prem. The duplicate entry will be deleted automatically within a day from CSSM, but needs to be deleted manually by users from SSM On-Prem.
- Ports enabled in SL mode in pre-SLP releases will not be enabled if boot variables are used for migration instead of ISSU.
- Syslogs will be printed on a weekly basis for port licenses that are not authorized. This scenario is specific to SL based migration.
- For CSLU, single SA/VA is supported, but multitenant is not supported.
- For autodiscovery (when only one IP is configured in CSLU local), only one CSLU can be used in the network.
- SLP MIB is not supported.
- Only CSLU mode of transport is supported with SSM On-Prem.
- Authorization code cannot be returned to the SA/VA pool for enforced port licenses.

About Smart Licensing using Policy

Concepts

This section explains the key concepts of SLP.

License Enforcement Types

Cisco MDS 9000 Series switches support enforced and unenforced license types. Port licenses are enforced license and all other licenses are unenforced and do not require authorization before being used in air-gapped networks or in connected air-gapped deployment approach. The terms of use for such licenses are as per the end user license agreement (EULA).

License Duration

This refers to the duration or term for which a purchased license is valid. A given license may be enforced or unenforced and be valid for the following durations:

- Perpetual: There is no expiration date for such a license.

  Port and Enterprise licenses are examples of perpetual licenses that are available on Cisco MDS switches.

- Subscription: The license is valid only until a certain date.

  SAN Analytics is an example of subscription license and it is an unenforced license.

Policy

A policy provides the switch with these reporting instructions:

- License usage report acknowledgment requirement (Reporting ACK required): The license usage report is known as a RUM Report and the acknowledgment is referred to as an ACK (See RUM Report and Report Acknowledgment). This is a yes or no value that specifies if the report for this switch requires CSSM acknowledgment. The default value is set to **Yes**.
- First report requirement (days): The first report must be sent within the timeframe that is specified here. Cisco default value is 0 days.
- Reporting frequency (days): The subsequent report must be sent within the timeframe that is specified here. Cisco default value is 0 days.
- Report on change (days): If there is a change in license usage, a report must be sent within the timeframe that is specified here. Cisco default value is 0 days.

Understanding the Policy Selection

CSSM determines the policy that is applied to a switch. Only one policy is in use at a given point in time. The policy and its values are based on several factors, including the licenses being used.

`CISCO default` is the default policy that is always available in the switch. If no other policy is applied, the switch applies this default policy. Table 11: Cisco Default Policy, on page 58 shows the `CISCO default` policy values.

While a new policy cannot be configured, user can request for a customized one by contacting the Cisco Global Licensing Operations team. Go to Support Case Manager. Click **OPEN NEW CASE** > Select **Software Licensing**. The licensing team will contact you to start the process or for any additional information. Customized policies will be made available through your Smart account in CSSM.

Note To know which policy is applied (the policy in-use) and its reporting requirements, enter the **show license status** command in EXEC mode.

```
switch# show license status
Utility:
    Status: DISABLED

Smart Licensing using Policy:
    Status: ENABLED

Data Privacy:
    Sending Hostname: yes
    Callhome Hostname Privacy: DISABLED
        Smart Licensing Hostname Privacy: DISABLED
    Version Privacy: DISABLED

Transport:
    Type: CSLU
    Cslu address: cslu-local

Policy:
    Policy in use: Merged from multiple sources
    Reporting ACK required: Yes
    Unenforced/Non-Export:
        First report requirement (days): 90 (CISCO default)
        Ongoing reporting frequency (days): 365 (CISCO default)
        On change reporting (days): 90 (CISCO default)
    Enforced (Pepertual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)
    Export (Perpetual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)

Miscellaneous:
    Custom Id: <empty>

Usage reporting:
    Last ACK received: <none>
    Next ACK deadline: Jan 12 08:39:14 2022 UTC
    Reporting push interval: 30 days
    Next ACK push check: <none>
    Next report push: Oct 14 10:20:48 2021 UTC
    Last report push: <none>
    Last report file write: <none>

Trust Code installed: <none>
```

Table 11: Cisco Default Policy

Policy: `CISCO default`	**Default Policy Values**
Unenforced	Reporting ACK required: Yes Unenforced/Non-Export: First report requirement (days): 90 (CISCO default) Ongoing reporting frequency (days): 365 (CISCO default) On change reporting (days): 90 (CISCO default)
Enforced	Reporting ACK required: Yes Enforced (Pepertual/Subscription): First report requirement (days): 0 (CISCO default) Ongoing reporting frequency (days): 0 (CISCO default) On change reporting (days): 0 (CISCO default)

RUM Report and Report Acknowledgment

A Resource Utilization Measurement report (RUM report) is a license usage report, which the switch generates automatically at a periodic interval or can be generated manually before the interval expiry, to fulfill reporting requirements as specified by the policy.

An acknowledgment (ACK) is a response from CSSM and provides information about the status of a RUM report.

The policy that is applied to a switch determines the following reporting requirements:

- Whether a RUM report should be sent to CSSM and the maximum number of days provided to meet this requirement.
- Whether the RUM report requires an acknowledgment from CSSM or not.
- The maximum number of days provided to report a change in license consumption.

A RUM report may be accompanied by other requests, such as a trust code request. In addition to the RUM report ID for the received report, an acknowledgment from CSSM may include trust codes and policy files as well.

Trust Code

Trust code is a UDI-tied public key with which the switch signs a RUM report. This prevents tampering and ensures data authenticity.

Architecture

This section explains the various components that can be part of your implementation of SLP.

Product Instance or Switch

A product instance or switch is a single instance of a Cisco product, identified by a Unique Device Identifier (UDI).

A switch records and reports license usage (Resource Utilization Measurement reports) and provides alerts and system messages about issues such as overdue reports and communication failures toward CSSM. Resource Utilization Measurement (RUM) reports and usage data are securely stored on the switch.

Throughout this document, the term *product instance* refers to all supported swtiches, unless noted otherwise.

CSSM

Cisco Smart Software Manager (CSSM) is a web portal that enables to manage all your Cisco software licenses from a centralized location. CSSM helps manage current requirements and review usage trends to plan for future license requirements.

Access the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts.

CSSM supports the following features:

- Create, manage, or view virtual accounts.
- Create and manage switch registration tokens.
- Transfer licenses between virtual accounts or view licenses.
- Transfer, remove, or view switches.
- Run reports against your virtual accounts.
- Modify your email notification settings.
- View overall account information.

CSLU

Cisco Smart License Utility (CSLU) is a reporting utility that is to be deployed on premises that provides aggregate licensing workflows. This utility performs the following key functions:

- Provides options relating to how workflows are triggered. The workflows can be triggered by CSLU (**Product Instance Initiated Only**) or by the switch.
- Collects usage reports from the switch and uploads these usage reports to the corresponding Smart Account or Virtual Account, online or offline, using files. Similarly, the RUM report ackowledge is collected online or offline and sent back to the switch.
- Sends authorization code requests to CSSM and receives authorization codes from CSSM, if applicable.

CSLU can be part of your implementation in the following ways:

- Install the Windows or Linux application to use CSLU as a standalone tool that is connected to CSSM.
- Install the Windows or Linux application to use CSLU as a standalone tool that is disconnected from CSSM. With this option, the required usage information is downloaded to a file and then uploaded to CSSM. This is suited for an air-gapped deployment approach.

For more information, see New Deployment Method for Smart Licensing.

SSM On-Prem

Smart Software Manager On-Prem (SSM On-Prem) is an asset manager, which works in conjunction with CSSM. It enables administering products and licenses on your premises instead of having to directly connect to CSSM. It incorporates functionalities from CSLU.

Information about the required software versions to implement SLP with SSM On-Prem, is provided below:

Minimum Required SSM On-Prem Version for SLP	Minimum Required Cisco MDS NX-OS Version
Version 8, Release 202108	Cisco MDS NX-OS Release 9.2(2)

For more information about SSM On-Prem, see Smart Software Manager On-Prem on the Software Download page. Hover over the *.iso* image to display the documentation links to the following guides:

- Installation Guide: SSM On-Prem Installation Guide
- Release Notes: Cisco Smart Software Manager On-Prem Release Notes
- User Guide: Smart Software Manager On-Prem User Guide
- Console Guide: Smart Software Manager On-Prem Console Reference Guide
- Quick Start Guide: Smart Software Manager On-Prem Quick Start Installation Guide

Supported Topologies

This section describes the various ways in which SLP can be implemented. For each topology, refer to the accompanying overview to know how the setup is designed to work and refer to the considerations and recommendations, if any.

After Topology Selection

After a topology is selected, you can configure the SLP as per the listed procedure. These workflows are only for new deployments. They provide the simplest and fastest way to implement a topology.

For migrating from an existing licensing model, see Migrating to Smart Licensing Using Policy, on page 101.

To perform any additional configuration tasks, for instance, to configure a different license, use an add-on license, or to configure a narrower reporting interval, see the Common Tasks for Configuring Smart Licensing Using Policy, on page 87.

Choosing a Topology

Table 12: Choosing a Topology, on page 61 allows you to choose a topoplogy depending on your network deployment.

Table 12: Choosing a Topology

Topology	Recommendations
Topology 1: Connected to CSSM Through CSLU, on page 61	Use this topology when you do not want the switches to be directly connected to CSSM. This topology will support only one SA/VA combination. You cannot view license consumption locally.
Topology 2: Connected Directly to CSSM, on page 64	Use this topology when you have switches that are already registered to CSSM and need to continue in the same mode. If you need to continue using this topology after upgrading to SLP, then Smart Transport is the preferred transport method.
Topology 3: Connected to CSSM Through SSM On-Prem, on page 66	Use this topology when you need to manage or view license consumption locally. You can also use multiple VA.
Topology 4: CSLU Disconnected from CSSM, on page 69	Use this topology when you want to collect licensing information from a single source and when there is no connectivity to CSSM. You cannot view license consumption locally. Also, only a single VA can be used.
Topology 5: No Connectivity to CSSM and No CSLU, on page 72	Use this topology when you want to collect licensing information from each switch in the network and when there is no connectivity to CSSM.
Topology 6: SSM On-Prem Disconnected from CSSM, on page 73	Use this topology when you want to manage or view licenses from a single source. You can view license consumption locally. You can also use multiple VA combinations.

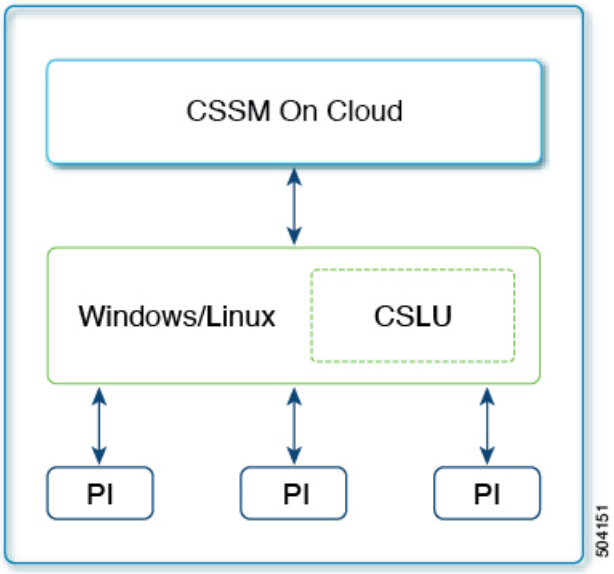
Topology 1: Connected to CSSM Through CSLU

Here, switches in the network are connected to CSLU, and CSLU becomes the single point of interface with CSSM. A switch can be configured to push the required information to CSLU.

Switch-initiated communication (push): A switch initiates communication with CSLU by connecting to a REST endpoint in CSLU. Data that is sent is unsecure and includes RUM reports.

Configure the switch to automatically send RUM reports to CSLU at required intervals. CSLU is the default method for a switch.

Figure 2: Topology: Connected to CSSM Through CSLU



SLP Configuration - Connected to CSSM Through CSLU Topology

Procedure

Step 1 CSLU Installation

Where task is performed: ISO image that you would download and deploy it as a VM as per your orchestration environment.

Download the file from Smart Software Manager > **Smart Licensing Utility**.

Refer to the Cisco Smart License Utility Quick Start Setup Guide for help with installation and setup.

Step 2 CSLU Preference Settings

Where tasks are performed: CSLU Interface

a. Logging into Cisco

b. Configuring a Smart Account and a Virtual Account

c. Adding a Product Instances in CSLU

Step 3 Switch Configuration

Where tasks are performed: MDS Switch

a. Ensuring Network Reachability for Product Instance Initiated Communication.

b. Ensure that transport type is set to **cslu**.

CSLU is the default transport type. If a different option is configured, enter the **license smart transport cslu** command in global configuration mode. Save any changes to the configuration file.

```
switch(config)# license smart transport cslu
switch(config)# exit
switch# copy running-config startup-config
```

c. No action is required beyond basic configuration. Name server does not need to be configured in the network. Enter the **ip host cslu-local***cslu_ip* command in global configuration mode. For *cslu_ip* enter the IP address of Windows or Linux host where CSLU is installed.

d. Specify how CSLU is to be discovered (choose one):

- Option1:

  No action required beyond basic configuration. Name server configured for zero-touch DNS discovery of `cslu-local`.

  The assumption here is that the name server (DNS) IP address is configured on the switch and the DNS server has an entry where hostname `cslu-local` is mapped to the CSLU IP address, then no further action is required. The switch automatically discovers hostname `cslu-local`.

- Option2:

  No action required beyond basic configuration. Name server and domain configured for zero-touch DNS discovery of `cslu-local.<domain>`.

  The assumption here is that the name server (DNS) IP address is configured on the switch and the DNS server has an entry where `cslu-local.<domain>` is mapped to the CSLU IP address, then no further action is required. The switch automatically discovers hostname `cslu-local`.

- Option3:

  Configure a specific URL for CSLU.

  Enter the **license smart url cslu** *http://<cslu_ip_or_host>:8182/cslu/v1/pi* command in global configuration mode. For `<cslu_ip_or_host>`, enter the hostname or the IP address of the Windows or Linux host where CSLU is installed. 8182 is the TCP port number and it is the only port number that CSLU uses.

  ```
  switch(config)# license smart url cslu http://192.168.0.1:8182/cslu/v1/pi
  switch(config)# exit
  switch# copy running-config startup-config
  ```

As the switch initiates communication, it automatically sends out the first RUM report at the scheduled time as per the policy. To know when the switch will be sending this information, enter the **show license status** command in privileged EXEC mode and check the date in the `Next report push:` field in the output.

```
switch# show license status
Utility:
    Status: DISABLED

Smart Licensing using Policy:
    Status: ENABLED

Data Privacy:
    Sending Hostname: yes
    Callhome Hostname Privacy: DISABLED
        Smart Licensing Hostname Privacy: DISABLED
```

```
    Version Privacy: DISABLED

Transport:
    Type: CSLU
    Cslu address: cslu-local

Policy:
    Policy in use: Merged from multiple sources
    Reporting ACK required: Yes
    Unenforced/Non-Export:
        First report requirement (days): 90 (CISCO default)
        Ongoing reporting frequency (days): 365 (CISCO default)
        On change reporting (days): 90 (CISCO default)
    Enforced (Pepertual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)
    Export (Perpetual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)

Miscellaneous:
    Custom Id: <empty>

Usage reporting:
    Last ACK received: <none>
    Next ACK deadline: Jan 12 08:39:14 2022 UTC
    Reporting push interval: 30 days
    Next ACK push check: <none>
    Next report push: Oct 14 10:20:48 2021 UTC
    Last report push: <none>
    Last report file write: <none>

Trust Code installed: <none>
```

CSLU forwards the information to CSSM and returns the acknowledgment from CSSM to the switch.

Topology 2: Connected Directly to CSSM

This method was available in the earlier version of Smart Licensing and remains supported with SLP.

Here, establish a direct and trusted connection from a switch to CSSM. The direct connection requires network reachability to CSSM. For the switch to then exchange messages and communicate with CSSM, configure one of the transport options available with this topology. Lastly, the establishment of trust requires the generation of a token from the corresponding Smart Account and Virtual Account in CSSM and installation on the switch.

You can configure a switch to communicate with CSSM in the following ways:

- Use smart transport to communicate with CSSM (recommended)

  Smart transport is a transport method where a Smart Licensing (JSON) message is contained within an HTTPs message and exchanged between a switch and CSSM to communicate.

  The following smart transport configuration options are available:

  - Smart transport: In this method, a switch uses a specific smart transport licensing server URL. This must be configured exactly as shown in the workflow section.
  - Smart transport through an HTTPs proxy: In this method, a switch uses a proxy server to communicate with the licensing server and CSSM.

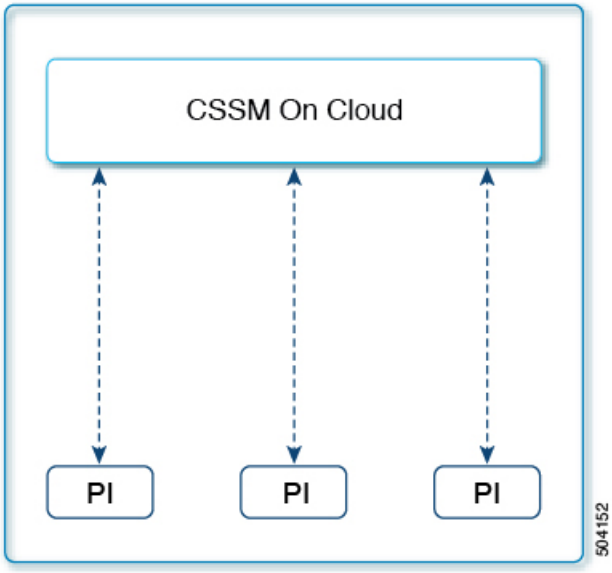
- Use Call Home to communicate with CSSM.

  Call Home provides email-based and web-based notification of critical system events. This method of connecting to CSSM was available in the earlier Smart Licensing environment and remains available with SLP.

  The following Call Home configuration options are available:

  - Direct cloud access: In this method, a switch sends usage information directly over the Internet to CSSM; no additional components are needed for the connection.
  - Cloud access through an HTTPs proxy: In this method, a switch sends usage information over the Internet through a proxy server — either a Call Home Transport Gateway or an off-the-shelf proxy (such as Apache) to CSSM.

Figure 3: Topology: Connected Directly to CSSM



SLP Configuration - Connected Directly to CSSM Topology

Procedure

Step 1 Switch Configuration

Where tasks are performed: MDS Switch

a. Set up switch connection to CSSM: Setting Up a Connection to CSSM.

b. Configure a connection method and transport type (choose one):

- Option1:

  Smart transport: Set the transport type to **smart** using the **license smart transport smart** command. Save any changes to the configuration file.

```
switch(config)# license smart transport smart
switch(config)# license smart url smart
https://smartreceiver.cisco.com/licservice/license
switch(config)# copy running-config startup-config
```

- Option2:

  Configure smart transport through an HTTPs proxy. See Configuring Smart Transport Through an HTTPs Proxy.

- Option3:

  Configure Call Home service for direct cloud access. See Configuring the Call Home Service for Direct Cloud Access.

Step 2 Establishment of Trust with CSSM

Where task is performed: CSSM Web UI and then switch

a. Generate one token for each *Virtual Account*. Use the same token for all the switches that are part of one Virtual Account: Generating a New Token for a Trust Code from CSSM.

b. Having downloaded the token, install the trust code on the switch: Installing a Trust Code.

After establishing trust, CSSM returns a policy. The policy is automatically installed on all switches of that Virtual Account. The policy specifies if and how often the switch reports usage.

To change the reporting interval to report more frequently: on the switch, configure the **license smart usage interval** command.

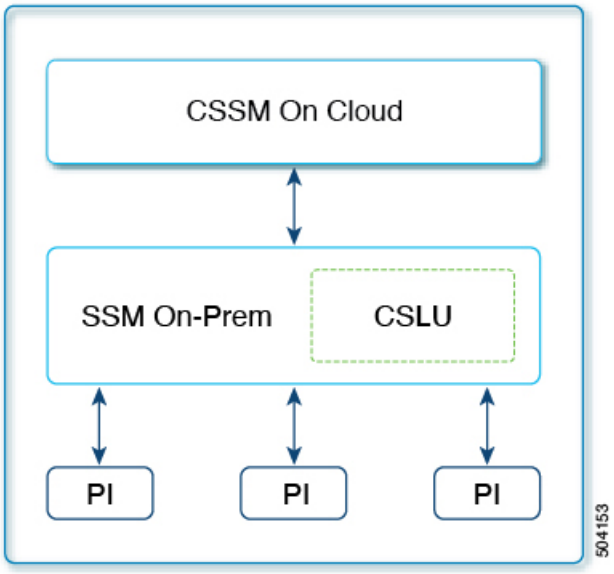
Topology 3: Connected to CSSM Through SSM On-Prem

Note When the SSM On-Prem server is associated with virtual account in CSSM, it will be required that all product instance registration tokens to be generated from their Smart Software On-Prem management interface.

Here, switches in the network are connected to SSM On-Prem and SSM On-Prem becomes the single point of interface with CSSM. You can also configure the switch to *push* the required information to SSM On-Prem.

Switch-initiated communication (push): A switch initiates communication with CSSM by connecting to a REST endpoint in SSM On-Prem. Data that is sent includes RUM reports. Configure the switch to automatically send RUM reports to SSM On-Prem at required intervals.

Figure 4: Topology: Connected to SSM On-Prem Through CSSM



SLP Configuration - Connected to CSSM Through SSM On-Prem Topology

Note If the switch is registered On-Prem with pre-SLP release, the transport mode will change to CSLU after the migration. Also, the CSLU URL will be populated on the switch from **OnPrem CSLU tenant ID**. Ensure that the configuration is saved using the **copy running-config startup-config** command.

Procedure

Step 1 SSM On-Prem Installation

Where task is performed: ISO image that you would download and deploy it as a VM as per your orchestration environment.

Download the file from Smart Software Manager > **Smart Licensing Utility**.

Refer to the Cisco Smart License Utility Quick Start Setup Guide for help with installation and setup.

Step 2 SSM On-Prem Preference Settings

Where tasks are performed: SSM On-Prem

a. Logging into Cisco (SSM On-Prem Interface), on page 87

b. Configuring a Smart Account and a Virtual Account, on page 88

c. Adding a Product Instances in CSLU, on page 88

Step 3 Switch Configuration

Where tasks are performed: MDS Switch

a. Ensure that transport type is set to **cslu**.

CSLU is the default transport type. If a different option is configured, enter the **license smart transport cslu** command in global configuration mode. Save any changes to the configuration file.

```
switch(config)# license smart transport cslu
switch(config)# exit
switch# copy running-config startup-config
```

b. Specify how SSM On-Prem is to be discovered (choose one):

Configure a specific URL for SSM On-Prem. If SSM On-Prem was previously configured, then the URL is automatically configured. Otherwise, copy the URL from SSM On-Prem and configure the URL.

Enter the **license smart url cslu** *http://<ssm_on_prem_ip_or_host>/cslu/v1/pi/<Tenant_ID>*, command in global configuration mode. This command can be obtained by the following:

- Log into SSM On-prem web interface.
- Select the correct Account Name.
- Go to Smart Licensing >> Inventory
- Under the General tab, click on "CSLU Transport URL" and copy the URL

For `<ssm_on_prem_ip_or_host>`, enter the hostname or the IP address of the Windows or Linux host where SSM On-Prem is installed.

```
switch(config)# license smart url cslu http://192.168.0.1/cslu/v1/pi/<Virtual Account>
switch(config)# exit
switch# copy running-config startup-config
```

Since the switch initiates communication, it automatically sends out the first RUM report at the scheduled time, as per the policy. To know when the switch will be sending this information, enter the **show license all** command in privileged EXEC mode and check the date in the `Next report push:` field in the output.

SSM On-Prem forwards the information to CSSM and returns acknowledgment from CSSM to the switch .

```
switch# show license status
Utility:
    Status: DISABLED

Smart Licensing using Policy:
    Status: ENABLED

Data Privacy:
    Sending Hostname: yes
    Callhome Hostname Privacy: DISABLED
        Smart Licensing Hostname Privacy: DISABLED
    Version Privacy: DISABLED

Transport:
    Type: CSLU
    Cslu address: https://Cisco_SSM_OnPrem/cslu/v1/pi/SSM-On-Prem-92-1

Policy:
    Policy in use: Merged from multiple sources
```

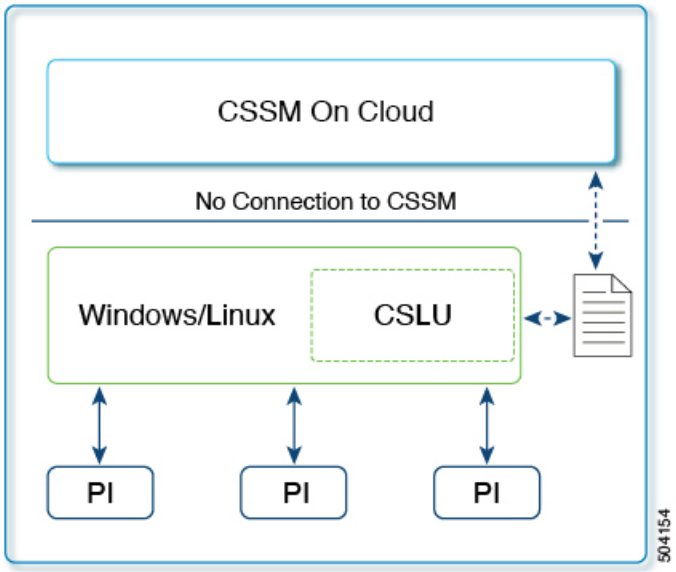
```
    Reporting ACK required: Yes
    Unenforced/Non-Export:
        First report requirement (days): 90 (CISCO default)
        Ongoing reporting frequency (days): 365 (CISCO default)
        On change reporting (days): 90 (CISCO default)
    Enforced (Pepertual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)
    Export (Perpetual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)

Miscellaneous:
    Custom Id: <empty>

Usage reporting:
    Last ACK received: <none>
    Next ACK deadline: Jul 5 13:17:21 2022 UTC
    Reporting push interval: 30 days
    Next ACK push check: <none>
    Next report push: May 6 13:24:44 2022 UTC
    Last report push: Apr 6 13:24:44 2022 UTC
    Last report file write: <none>

Trust Code installed: <none>
```

Topology 4: CSLU Disconnected from CSSM

The CSLU utility is installed on-premises and the switches communicate with it. The other side of the communication, between CSLU and CSSM, is offline. In fact, CSLU provides the option of working in a mode that is disconnected from CSSM.

Communication between CSLU and CSSM is sent and received in the form of signed files (xml) that are saved offline and then uploaded to or downloaded from CSLU or CSSM.

Figure 5: Topology: CSLU Disconnected from CSSM



SLP Configuration - CSLU Disconnected from CSSM Topology

Procedure

Step 1 CSLU Installation

Where task is performed: ISO image that you would download and deploy it as a VM as per your orchestration environment.

Download the file from Smart Software Manager > **Smart Licensing Utility**.

Refer to the Cisco Smart License Utility Quick Start Setup Guide for help with installation and setup.

Step 2 CSLU Preference Settings

Where tasks are performed: CSLU Interface

a. In the CSLU Preferences tab, click the **Cisco Connectivity** toggle switch to **off**. The field switches to *Cisco Is Not Available*.

b. Configuring a Smart Account and a Virtual Account, on page 88

c. Adding a Product Instances in CSLU, on page 88

Step 3 Switch Configuration

Where tasks are performed: MDS Switch

a. Ensuring Network Reachability for Product Instance Initiated Communication, on page 90.

b. Ensure that transport type is set to **cslu**.

CSLU is the default transport type. If a different option is configured, enter the **license smart transport cslu** command in global configuration mode. Save any changes to the configuration file.

```
switch(config)# license smart transport cslu
switch(config)# exit
switch# copy running-config startup-config
```

c. Specify how CSLU is to be discovered (choose one):

Configure a specific URL for CSLU.

Enter the **license smart url cslu** *http://<cslu_ip_or_host>:8182/cslu/v1/pi* command in global configuration mode. For `<cslu_ip_or_host>`, enter the hostname or the IP address of the Windows or Linux host where CSLU is installed. 8182 is the port number and it is the only port number that CSLU uses.

```
switch(config)# license smart url cslu http://192.168.0.1:8182/cslu/v1/pi
switch(config)# exit
switch# copy running-config startup-config
```

Step 4 Download and upload PIs from a file. You can also choose a single or multiple PIs.

Where tasks are performed: CSLU and CSSM

a. Export CSV (CSLU Interface), on page 89

b. Uploading Usage Data to CSSM and Downloading an ACK, on page 95

c. Import CSV (CSLU Interface), on page 89

As the switch initiates communication, it automatically sends out the first RUM report at the scheduled time, as per the policy. To know when the switch will be sending this information, enter the **show license status** command in EXEC mode and check the date in the `Next report push:` field in the output.

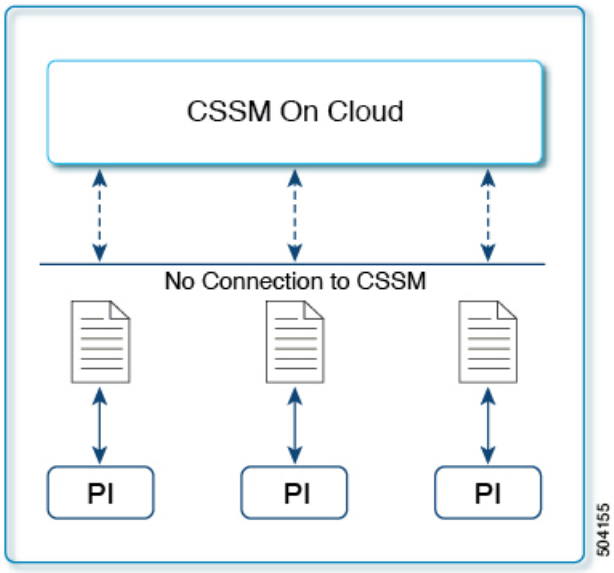
```
switch# show license status
Utility:
    Status: DISABLED

Smart Licensing using Policy:
    Status: ENABLED

Data Privacy:
    Sending Hostname: yes
    Callhome Hostname Privacy: DISABLED
        Smart Licensing Hostname Privacy: DISABLED
    Version Privacy: DISABLED

Transport:
    Type: CSLU
    Cslu address: cslu-local

Policy:
    Policy in use: Merged from multiple sources
    Reporting ACK required: Yes
    Unenforced/Non-Export:
        First report requirement (days): 90 (CISCO default)
        Ongoing reporting frequency (days): 365 (CISCO default)
        On change reporting (days): 90 (CISCO default)
    Enforced (Pepertual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)
    Export (Perpetual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)

Miscellaneous:
    Custom Id: <empty>

Usage reporting:
    Last ACK received: <none>
    Next ACK deadline: Jan 12 08:39:14 2022 UTC
    Reporting push interval: 30 days
    Next ACK push check: <none>
    Next report push: Oct 14 10:20:48 2021 UTC
    Last report push: <none>
    Last report file write: <none>

Trust Code installed: <none>
```

As the CSLU is disconnected from CSSM, save usage data which CSLU has collected from the switch to a file. Then, from a workstation that is connected to Cisco, upload it to CSSM. After this, download the acknowledgment from CSSM. In the workstation where CSLU is installed and connected to the switch, upload the file to CSLU which will then push the acknowledgment to all the switches.

Topology 5: No Connectivity to CSSM and No CSLU

Here we have a switch and CSSM disconnected from each other without any other intermediary CSLU or components. All communication is in the form of uploaded and downloaded files.

Figure 6: Topology: No Connectivity to CSSM and No CSLU



SLP Configuration - No Connectivity to CSSM and No CSLU Topology

Procedure

Switch Configuration

Where task is performed: MDS Switch. Set transport type to **off**.

Enter the **license smart transport off** command in global configuration mode. Save any changes to the configuration file.

```
switch(config)# license smart transport off
switch(config)# exit
switch# copy running-config startup-config
```

All communication to and from the switch is disabled. To report license usage, save RUM reports to a file (on your switch) and upload it to CSSM (from a workstation that has connectivity to the internet and Cisco):

1. Generate and save RUM reports

   Enter the **license smart save usage** command in privileged EXEC mode if you have any features enabled. In the following example, all RUM reports are saved to the flash memory of the switch , in the `all_rum.txt` file. In the example, the file is first saved to the bootflash and then copied to a TFTP location:

```
switch# license smart save usage all bootflash:all_rum.txt
switch# copy bootflash:all_rum.txt tftp://10.8.0.6/all_rum.txt
```

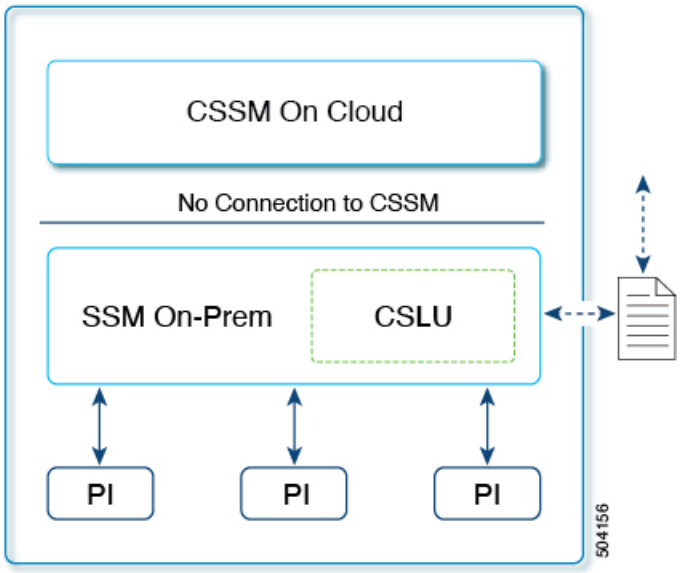
2. Upload usage data to CSSM: Uploading Usage Data to CSSM and Downloading an ACK, on page 95.
3. Install the acknowledgment on the switch: Installing a File on the Switch, on page 95.

Topology 6: SSM On-Prem Disconnected from CSSM

Here, a switch communicates with SSM On-Prem and the switch-initiated communication must be implemented. The other side of the communication, between SSM On-Prem and CSSM, is offline. SSM On-Prem provides the option of working in a mode that is disconnected from CSSM.

Communication between SSM On-Prem and CSSM is sent and received in the form of signed files (xml) that are saved offline and then uploaded to or downloaded from SSM On-Prem or CSSM.

Figure 7: Topology: SSM On-Prem Disconnected from CSSM



SLP Configuration - SSM On-Prem Disconnected from CSSM Topology

Note If the switch is registered On-Prem with pre-SLP release, the transport mode will change to CSLU after migration. Ensure to save the configuration using the **copy running-config startup-config** command.

Procedure

Step 1 SSM On-Prem Installation

Where task is performed: ISO image that you would download and deploy it as a VM as per your orchestration environment.

Download the file from Smart Software Manager > **Smart Software Manager On-Prem**.

Refer to the Smart Software Manager On-Prem Installation Guide for help with installation and setup.

Step 2 Switch Configuration

Where tasks are performed: MDS Switch

a. Ensuring Network Reachability for Product Instance Initiated Communication, on page 90.

b. Ensure that transport type is set to **cslu**.

CSLU is the default transport type. If a different option is configured, enter the **license smart transport cslu** command in global configuration mode. Save any changes to the configuration file.

```
switch(config)# license smart transport cslu
switch(config)# exit
switch# copy running-config startup-config
```

c. Configure the SSM On-Prem URL. Login to the SSM On-Prem. Click **Inventory** > **General**. Then, click **CSLU Transport URL** to copy the URL.

Enter the **license smart url cslu** *http://<ssm_on_prem_ip_or_host>/cslu/v1/pi/<Tenant_ID>* command in global configuration mode. This command can be obtained by the following:

- Log into SSM On-prem web interface.
- Select the correct Account Name.
- Go to Smart Licensing >> Inventory
- Under the General tab, click on "CSLU Transport URL" and copy the URL

For `<ssm_on_prem_ip_or_host>`, enter the hostname or the IP address of the Windows or Linux host where SSM On-Prem is installed.

```
switch(config)# license smart url cslu http://192.168.0.1:8182/cslu/v1/pi
switch(config)# exit
switch# copy running-config startup-config
```

Step 3 Download and upload PIs from a file. Login to the SSM On-Prem. Click **Inventory** > **Product Instances** > **Export Usage to Cisco** or **Import From Cisco**.

Where tasks are performed: CSLU and CSSM

a. Export CSV (CSLU Interface), on page 89

b. Uploading Usage Data to CSSM and Downloading an ACK, on page 95

Since the switch initiates communication, it automatically sends out the first RUM report at the scheduled time, as per the policy. To know when the switch will be sending this information, enter the **show license all** command in privileged EXEC mode check the date in the `Next report push:` field in the output.

Since SSM On-Prem is disconnected from CSSM, save usage data which SSM On-Prem has collected from the switch to a file. Then, from a workstation that is connected to Cisco, upload it to CSSM. After this,

download the acknowledgment from CSSM. In the workstation where SSM On-Prem is installed and connected to the switch, upload the file to SSM On-Prem.

Enforced Licensing (Port Licensing)

Enforced licensing prevents a feature from being used without first obtaining a license. Ports on Cisco MDS 9000 Series switches use enforced licensing and will require authorization before using them in SLP. Use the instructions in this section to migrate existing licenses to SLP. For more information about enforced licenses, see the "Licensing Cisco MDS 9000 Series NX-OS Software Features" chapter in Cisco MDS 9000 Series Licensing Guide, Release 9.x.

Port Licensing Verification

Port licensing is available for the ports used in Cisco MDS 9000 switches. The following table describes the default port licenses for the ports.

Table 13: Default Port License

Platform	Default Port license
9396V	48
9124V	8
9148V	24
9148S	12
9250i	20
9220i	FC Port 4, IPS Port 2
9396S	48
9132T	8
9148T	24
9396T	48

Port licensing is verified using the following commands:

- show license default
- show license usage
- show port-license
- show license version
- show license brief

Command	Output
`switch# show license default`	Feature Default License Count PORT_ACTIV_9396T_PKG 48
`switch# show license usage`	License Authorization: Status: Not Applicable (PORT_ACTIV_9396T_PKG): Description: MDS 9396T 32G 16 port-activation Count: 48 Version: 1.0 Status: IN USE Enforcement Type: ENFORCED License Type: Enforced

Command	Output
`switch# show port-license`	

Command	Output
	Available port activation licenses are 0 --- Interface Cookie Port Activation License --- fc1/1 16777216 acquired fc1/2 16781312 acquired fc1/3 16785408 acquired fc1/4 16789504 acquired fc1/5 16793600 acquired fc1/6 16797696 acquired fc1/7 16801792 acquired fc1/8 16805888 acquired fc1/9 16809984 acquired fc1/10 16814080 acquired fc1/11 16818176 acquired fc1/12 16822272 acquired fc1/13 16826368 acquired fc1/14 16830464 acquired fc1/15 16834560 acquired fc1/16 16838656 acquired fc1/17 16842752 acquired fc1/18 16846848 acquired fc1/19 16850944 acquired fc1/20 16855040 acquired fc1/21 16859136 acquired fc1/22 16863232 acquired fc1/23 16867328 acquired fc1/24 16871424 acquired fc1/25 16875520 acquired fc1/26 16879616 acquired fc1/27 16883712 acquired fc1/28 16887808 acquired fc1/29 16891904 acquired fc1/30 16896000 acquired fc1/31 16900096 acquired fc1/32 16904192 acquired fc1/33 16908288 acquired fc1/34 16912384 acquired fc1/35 16916480 acquired fc1/36 16920576 acquired fc1/37 16924672 acquired fc1/38 16928768 acquired fc1/39 16932864 acquired fc1/40 16936960 acquired fc1/41 16941056 acquired fc1/42 16945152 acquired fc1/43 16949248 acquired fc1/44 16953344 acquired fc1/45 16957440 acquired fc1/46 16961536 acquired fc1/47 16965632 acquired fc1/48 16969728 acquired fc1/49 16973824 acquired fc1/50 16977920 acquired fc1/51 16982016 acquired fc1/52 16986112 acquired fc1/53 16990208 acquired fc1/54 16994304 acquired fc1/55 16998400 acquired

Command	Output
	fc1/56 17002496 acquired fc1/57 17006592 acquired fc1/58 17010688 acquired fc1/59 17014784 acquired fc1/60 17018880 acquired fc1/61 17022976 acquired fc1/62 17027072 acquired fc1/63 17031168 acquired fc1/64 17035264 acquired fc1/65 17039360 acquired fc1/66 17043456 acquired fc1/67 17047552 acquired fc1/68 17051648 acquired fc1/69 17055744 acquired fc1/70 17059840 acquired fc1/71 17063936 acquired fc1/72 17068032 acquired fc1/73 17072128 acquired fc1/74 17076224 acquired fc1/75 17080320 acquired fc1/76 17084416 acquired fc1/77 17088512 acquired fc1/78 17092608 acquired fc1/79 17096704 acquired fc1/80 17100800 acquired fc1/81 17104896 acquired fc1/82 17108992 acquired fc1/83 17113088 acquired fc1/84 17117184 acquired fc1/85 17121280 acquired fc1/86 17125376 acquired fc1/87 17129472 acquired fc1/88 17133568 acquired fc1/89 17137664 acquired fc1/90 17141760 acquired fc1/91 17145856 acquired fc1/92 17149952 acquired fc1/93 17154048 acquired fc1/94 17158144 acquired fc1/95 17162240 acquired fc1/96 17166336 acquired
`switch# show license version`	Smart Agent for Licensing: 5.5.19_rel/83

Command	Output

`switch# show license brief`	`Status Legend:`
	`u - unenforced,`
	`e - enforced`
	`d - platform default,`
	`f - factory installed SLP license,`
	`p - converted from PAK,`
	`s - migrated from Smart Licensing,`
	`a - installed using SLP,`
	`h - honored (pending SLP authorization)`
	`General Legend:`
	`NA - not applicable`
	`----------`
	`License Port`
	`License Name Count Count Used Status`
	`----------`
	`DCNM SAN Adv. Features for MDS 9300 Switch based (FM-SERVER) 1 NA 0 pu`
	`DCNM for SAN Adv License for MDS9300 (DCNM-SAN) 1 NA 1 u`
	`MDS 9300 series Enterprise package 1 NA 1 pu`
	`MDS 9396T 32G 16 port activation NA 48 48 d`
	`MDS 9396T 32G 16 port activation 2 32 5 ae`
	`SAN Analytics 1 NA 1 pu`

Generating Authorization Code in Online Mode- CSLU/Smart Transport/Callhome

Authorization code for your license is generated in online mode and installed on your switch for use. You will need to request for the authorization code from a switch for a specific port license of a specific port-block size depending on the type of switch. Then, CSSM will receive the authorization request, generate the authorization code, and install the returned code on the switch automatically. You can use the **show license authorizations** command to verify the installation of the requested licenses and view the authorization code under the *Last Confirmation code:* field in the output.

Use the **license smart authorization request** {**add** | **replace**} *port-feature* {**local** | **all**} **count** *port-range* command to enable ports or replace the existing authorization code.

Note

- Use the **add** option to install authorization code for the first time.
- Use the **replace** option to increase authorization code to enable new ports.

The **count** *port-range* value will depend on the type of deployment:

- Greenfield deployment: This value is the sum of installed authorization code and new ports that needs to be enabled.
- PAK license: This value is the sum of PAK license count and new ports that needs to be enabled.
- SL 1.0 license: This value is the sum of ports that are enabled without the authorization code and new ports that needs to be enabled.

Port count can only be in multiples of block size. Table 14: Port Count for Switches, on page 81 provide the block size for different MDS switches.

Table 14: Port Count for Switches

Switch	Block Size Count
Cisco MDS 9148V	8
Cisco MDS 9124V	8
Cisco MDS 9148S	12
Cisco MDS 9250i	20
Cisco MDS 9220i	12
Cisco MDS 9132T	8
Cisco MDS 9148T	8
Cisco MDS 9396S	12
Cisco MDS 9396T	16

Greenfield Deployment

Authorization code will be generated, and licenses will be factory-installed. Your switch will be shipped with the required licenses installed.

The following example displays how to request authorization code to activate 16 ports in greenfield deployment:

```
switch# configure t
Enter configuration commands, one per line.  End with CNTL/Z.
switch(config)# license smart authorization  request add PORT_ACTIV_9148T_PKG all count 9
Request is being sent for 16 ports(in multiples of 8)
Initiated authorization request with backend. run 'show license authorizations', for request
 status
switch(config)# show license authorizations
Overall status:
  Active: PID:DS-C9148T-K9,SN:JPG220700PY
       Status: SMART AUTHORIZATION INSTALLED on Jan 11 2022 10:15:31 UTC
       Last Confirmation code: 9d60e04c

Authorizations:
  MDS 9148T 32G FC switch 8-port upgrade license (MDS_9148T_8P):
    Description: MDS 9148T 32G FC switch 8-port upgrade license
    Total available count: 16
    Enforcement type: ENFORCED
    Term information:
      Active: PID:DS-C9148T-K9,SN:JPG220700PY
        Authorization type: SMART AUTHORIZATION INSTALLED
        License type: PERPETUAL
          Term Count: 16

Purchased Licenses:
  No Purchase Information Available
```

Note In this example, the port count is 9 but the request is sent for 16 ports. This is because the port count can only be in multiples of the block size.

Brownfield Deployment

Migrating from PAK Licenses

Previously installed license will continue to be usable. The PAK licenses will be automatically converted to Smart Licensing entitlement tags and will be added to your SA/VA. To enable more ports than the PAK based license, authorization code needs to be installed.

The following example displays how to request authorization code to activate 12 ports after migrating from PAK license:

```
switch# show license authorizations

Overall status:
  Active: PID:DS-C9148T-K9,SN:XXX22020071
      Status: NOT INSTALLED
      Status:PAK

Legacy License Info:
  regid.2018-04.com.cisco.MDS_9148T_8P,1.0_c2a52df2-b5a0-49eb-896f-36a46c203d89:
    DisplayName: PORT_ACTIV_9148T_PKG
    Description: MDS 9148T 32G FC switch 8-port upgrade license
    Total available count: 8
    Term information:
      Active: PID:DS-C9148T-K9,SN:XXX22020071
        License type: PERPETUAL
          Term Count: 8

Purchased Licenses:
  No Purchase Information Available

switch# configure t
switch(config)# license smart authorization request replace PORT_ACTIV_9148T_PKG all count
 16
Request is being sent for 16 ports(in multiples of 8)
Initiated authorization request with backend. run 'show license authorizations', for request
 status
switch(config)# show license authorizations

Overall status:
  Active: PID:DS-C9148T-K9,SN:XXX22020071
      Status: SMART AUTHORIZATION INSTALLED on Jan 11 2022 13:40:18 UTC
      Last Confirmation code: 13ff57a7
      Status:PAK

Authorizations:
  MDS 9148T 32G FC switch 8-port upgrade license (MDS_9148T_8P):
    Description: MDS 9148T 32G FC switch 8-port upgrade license
    Total available count: 16
    Enforcement type: ENFORCED
    Term information:
      Active: PID:DS-C9148T-K9,SN:XXX22020071
        Authorization type: SMART AUTHORIZATION INSTALLED
        License type: PERPETUAL
```

```
          Term Count: 16

Legacy License Info:
  regid.2018-04.com.cisco.MDS_9148T_8P,1.0_c2a52df2-b5a0-49eb-896f-36a46c203d89:
    DisplayName: PORT_ACTIV_9148T_PKG
    Description: MDS 9148T 32G FC switch 8-port upgrade license
    Total available count: 8
    Term information:
      Active: PID:DS-C9148T-K9,SN:XXX22020071
        License type: PERPETUAL
          Term Count: 8

Purchased Licenses:
  No Purchase Information Available
```

Migration from SL 1.0 License

The ports that were enabled in prior to the migration will continue to work. The request for authorization code will be sent for the existing enabled ports after 10 minutes of migration. If the authorization code is not installed for the existing enabled ports, a weekly syslog will be generated to alert the same.

The following example displays how to request authorization code to activate 16 ports after migrating from SL 1.0 license:

```
switch# show license authorizations

Overall status:
  Active: PID:DS-C9148T-K9,SN:XXX22020071
      Status: SMART AUTHORIZATION INSTALLED on Jan 11 2022 15:13:27 UTC
      Last Confirmation code: 6b60deef

Authorizations:
  MDS 9148T 32G FC switch 8-port upgrade license (MDS_9148T_8P):
    Description: MDS 9148T 32G FC switch 8-port upgrade license
    Total available count: 8
    Enforcement type: ENFORCED
    Term information:
      Active: PID:DS-C9148T-K9,SN:XXX22020071
        Authorization type: SMART AUTHORIZATION INSTALLED
        License type: PERPETUAL
          Term Count: 8

Purchased Licenses:
  No Purchase Information Available

switch# configure t
switch(config)# license smart authorization request replace PORT_ACTIV_9148T_PKG all count
 16
Request is being sent for 16 ports(in multiples of 8)
Initiated authorization request with backend. run 'show license authorizations', for request
 status

switch(config)# show license authorizations

Overall status:
  Active: PID:DS-C9148T-K9,SN:XXX22020071
      Status: SMART AUTHORIZATION INSTALLED on Jan 11 2022 15:18:17 UTC
      Last Confirmation code: bd3f5056

Authorizations:
```

```
  MDS 9148T 32G FC switch 8-port upgrade license (MDS_9148T_8P):
    Description: MDS 9148T 32G FC switch 8-port upgrade license
    Total available count: 16
    Enforcement type: ENFORCED
    Term information:
      Active: PID:DS-C9148T-K9,SN:XXX22020071
        Authorization type: SMART AUTHORIZATION INSTALLED
        License type: PERPETUAL
          Term Count: 16

Purchased Licenses:
  No Purchase Information Available
```

Generating Authorization Code in Online Mode with SSM On-Prem

You need to first add the switch to product instance (PI) inventory on SSM On-Prem, if not already added earlier.

```
switch# license smart sync all
```

Run this command on the switch after the license URL is correctly configured for your SSM On-Prem. Perform the following steps to generate authorization code in online mode with SSM On-Prem.

1. Generate authorization code on CSSM for the PI and required number of licenses Make sure that you always use the actual number of ports for which the license is needed. The port count can only be in multiples of block size. It will usually be the sum of existing authorized port count plus the new ports that needs to be enabled.

   ```
   switch# license smart authorization request {add | replace} port-feature {local | all}
   count port-range
   ```

2. Login to CSSM → Inventory → select VA → PI tab → Authorize License-Enforced Features
3. Save the generated authorization code as a file.
4. Import the generated authorization code to SSM On-Prem.
5. Login to SSM On-Prem → Smart Licensing → Inventory → SL Using Policy → Export/Import All → Import from Cisco and import the file saved in step-3.
6. Check that you received the code correctly (status for PI displays "Authorization message received from CSSM")
7. Initiate authorization request from the switch. For example:

   ```
   license smart authorization request add PORT_ACTIV_9396T_PKG all count 16
   ```

8. Verify that you have received the authorization using show license authorization command.
9. Once the Authorization Code is installed, PI will send the authorization confirmation code (Last Confirmation code) to the SSM On-Prem to complete the reservation.

Generating Authorization Code in Offline Mode

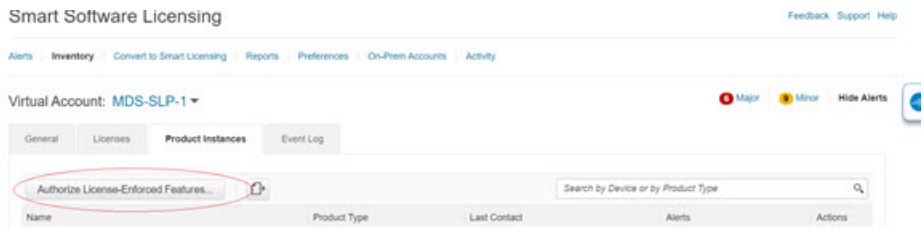
Previously installed licenses will not be automatically converted. The license will be converted only after the first usage is reported manually to CSSM.

To generate authorization code in offline mode, perform these steps:

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts.

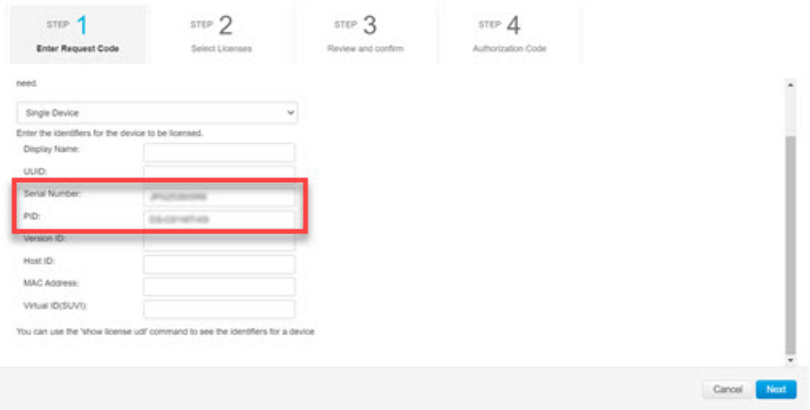
Step 2 Click **Inventory** > **Product Instances** > **Authorize License-Enforced Features**.



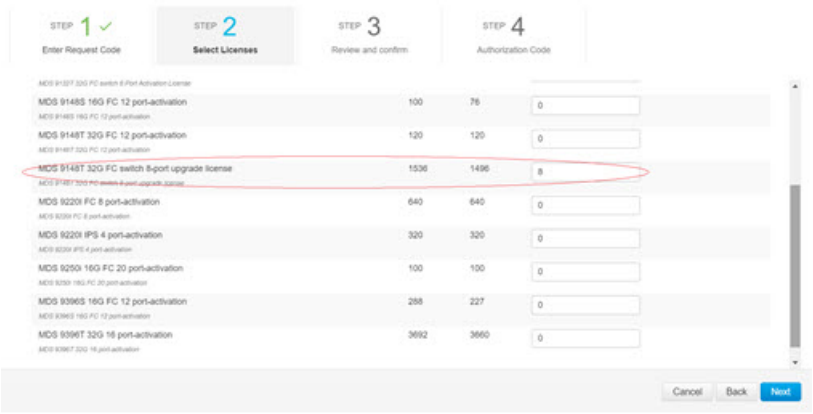
Step 3 In the Enter Request Code section, select the **Single Device** option from the drop-down option if it is not already selected.

Step 4 Enter the Serial Number and PID information of your switch and click **Next**. You will only need to provide the serial number and PID information and need not provide other information on this pane.

The Serial Number and PID information can be viewed using the **show license udi** command on your switch or PI.



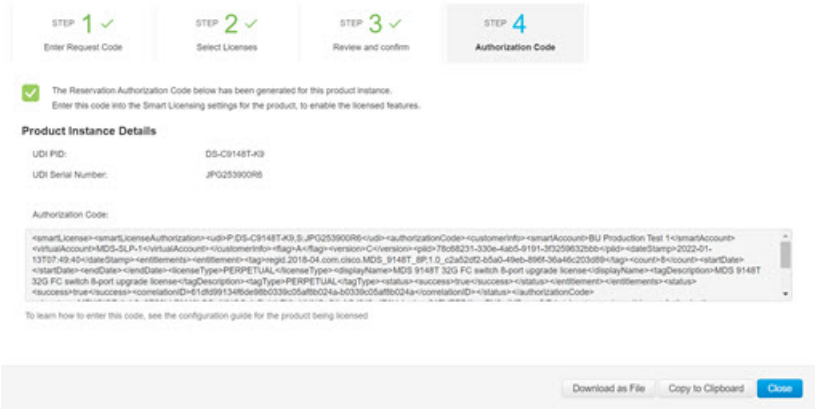
Step 5 In the Selected Licenses section, enter the number of licenses (multiples of block size) under **Reserve** for the appropriate switch and click **Next**.



Step 6 Select a **Device Type** and click **Continue**.

Step 7 Click **Generate Authorization Code**.

Step 8 Click **Download as File** to save the code.



Step 9 Copy the authorization code to the bootflash of your switch.

Step 10 Use the **license smart import** command to import the authorization code on your switch.

```
switch# configure t
switch(config)# license smart import bootflash:authcode.txt
```

```
Done smart import.

switch(config)# show license authorizations

Overall status:
  Active: PID:DS-C9148T-K9,SN:XXX253900X6
      Status: SMART AUTHORIZATION INSTALLED on Apr 18 2017 22:29:18 UTC
      Last Confirmation code: xxxxxxxx
      Status:PAK

Authorizations:
  MDS 9148T 32G FC 8 port activation (MDS_9148T_8P):
    Description: MDS 9148T 32G FC 8 port activation
    Total available count: 8
    Enforcement type: ENFORCED
    Term information:
      Active: PID:DS-C9148T-K9,SN:XXX253900X6
        Authorization type: SMART AUTHORIZATION INSTALLED
```

Step 11 Upload the authorization confirmation code (`Last Confirmation code`) in the **show license authorizations** command output to CSSM for completing reservation.

Common Tasks for Configuring Smart Licensing Using Policy

This section includes the common tasks that are performed on a switch, on the CSLU interface, and on the CSSM Web UI when configuring SLP.

To implement a particular topology, refer to the corresponding workflow to know the sequential order of tasks that apply.

To perform any additional configuration tasks, for instance, to configure a different license, or use an add-on license, or to configure a narrower reporting interval, refer to the corresponding task. Check the Supported Topologies, on page 60 before you proceed.

Logging into Cisco

View the instructions for this section in the Cisco Smart License Utility User Guide.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286327971/release/.

Step 2 Click the appropriate release.

Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Logging into Cisco (SSM On-Prem Interface)

Depending on your needs, when working in SSM On-Prem, either be in connected or disconnected mode. To work in the connected mode, perform these steps to connect to Cisco.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286326948/release/.

Step 2 Click the appropriate release.

Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Step 4 View the "Logging into Cisco SSM On-Prem" section.

Configuring a Smart Account and a Virtual Account

Both the Smart Account and Virtual Account are configured through the **Preferences** tab. Complete the following steps to configure both the Smart and Virtual Accounts for connecting to Cisco.

Procedure

Step 1 Select the **Preferences** tab from the CSLU home screen.

Step 2 Perform the following steps for adding both a Smart Account and Virtual Account:

a. In the **Preferences** window, navigate to the **Smart Account** field and add a **Smart Account Name**.

b. Next, navigate to the **Virtual Account** field and add a **Virtual Account Name**.

Note **Virtual Account Name** is case-sensitive.

If CSSM is connected (in the **Preferences** tab, **Cisco is Available**), select from the list of available Smart Accounts and Virtual Accounts.

If CSSM is not connected (in the **Preferences** tab, **Cisco Is Not Available**), enter the SAs/VAs manually.

Step 3 Click **Save**. The SA/VA accounts are saved to the system.

Only one SA/VA pair can reside on CSLU at a time. Multiple accounts cannot be added. To change to another SA/VA pair, repeat Steps 2a and 2b and then **Save**. A new SA/VA account pair replaces the previously saved pair.

Adding a Product Instances in CSLU

View the instructions for this section in the Cisco Smart License Utility User Guide.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286327971/release/.

Step 2 Click the appropriate release.

Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Collecting Usage Reports — CSLU Initiated

View the instructions for this section in the Cisco Smart License Utility User Guide.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286327971/release/.
Step 2 Click the appropriate release.
Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Export CSV (CSLU Interface)

View the instructions for this section in the Cisco Smart License Utility User Guide.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286327971/release/.
Step 2 Click the appropriate release.
Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Import CSV (CSLU Interface)

View the instructions for this section in the Cisco Smart License Utility User Guide.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286327971/release/.
Step 2 Click the appropriate release.
Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Export to CSSM

View the instructions for this section in the Cisco Smart License Utility User Guide.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286327971/release/.
Step 2 Click the appropriate release.
Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Import from CSSM

View the instructions for this section in the Cisco Smart License Utility User Guide.

Procedure

Step 1 Go to https://software.cisco.com/download/home/286285506/type/286327971/release/.
Step 2 Click the appropriate release.
Step 3 Under the **Related Links and Documentation** section, click **User Guide**.

Ensuring Network Reachability for Product Instance Initiated Communication

This task provides possible configurations that may be required to ensure network reachability for switch-initiated communication. Steps marked as *(Required)* are required for all switches and all other steps may be required or optional depending on the kind of switch and network requirements. Configure the applicable commands.

Before you begin

Supported topologies: Connected to CSSM Through CSLU (switch-initiated communication).

Procedure

Ensure that CSLU is reachable from switch. For more information, see SLP Configuration - Connected to CSSM Through CSLU Topology, on page 62.

Setting Up a Connection to CSSM

Ensure switch is reachable to CSSM. For more information about DNS configuration, see Configuring the Call Home Service for Direct Cloud Access, on page 91.

Configuring Smart Transport Through an HTTPs Proxy

To use a proxy server to communicate with CSSM when using the smart transport mode, perform these steps:

Note *Authenticated* HTTPs proxy configurations are not supported.

Procedure

Step 1 Enter global configuration mode:

Device# **configure terminal**

Step 2 Enable smart transport mode:

switch(config)# **license smart transport smart**

Step 3 Perform this step only when HTTPS proxy is used in the network:

switch(config)# **license smart proxy** {**address** *address_hostname* | **port** *port_num*}

Configures a proxy for the smart transport mode. When a proxy is configured, licensing messages are sent to the proxy along with the final destination URL (CSSM). The proxy sends the message on to CSSM. Provide the address and port information:

- **address** *address_hostname*: Specifies the proxy address. Enter the IP address or hostname of the proxy server.
- **port** *port_num*: Specifies the proxy port. Enter the proxy port number.

Step 4 Exit global configuration mode and return to EXEC mode:

switch(config)# **exit**

Step 5 Save your entries in the configuration file:

switch# **copy running-config startup-config**

Configuring the Call Home Service for Direct Cloud Access

Make sure that Smart Call Home is enabled on the switch before configuring Smart Software Licensing.

Configuring a DNS Client

Before you begin

Make sure that the name server is reachable before configuring a DNS client.

Procedure

Step 1 Enter global configuration mode:

switch# **configure terminal**

Step 2 Enable DNS-based address translation:

switch(config)# **ip domain-lookup**

Step 3 Enable the default domain name feature used to complete unqualified host names:

switch(config)# **ip domain-name** *name*

Any IP host name that does not contain a domain name (that is, any name without a dot) will have the dot and the confoigured domain name appended to it before being added to the host table.

Step 4 Define a list of default domain names to complete unqualified host names:

switch(config)# **ip domain-list** *domain-name*

You can define up to 10 domain names in this list.

Step 5 Specify the first address as the primary server and the second address as the secondary server:

switch(config)# **ip domain-server** *ip-address*

You can configure a maximum of six servers.

Viewing a Smart Call Home Profile

Procedure

Display the Smart Call Home profile:

switch# **show running-config callhome**

Removing the Switch from CSSM

To remove a switch and return all licenses to the license pool, perform these steps:

Before you begin

Supported topologies: all

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts.

Log in using the username and password provided by Cisco.

Step 2 Click the **Inventory** tab.

Step 3 From the **Virtual Account** drop-down list, choose your Virtual Account.

Step 4 Click the **Product Instances** tab.

The list of switches that are available is displayed.

Step 5 Locate the required switch from the switches list. Optionally, enter a name or product type string in the search tab to locate the switch.

Step 6 In the **Actions** column of the switch to be removed, click the **Remove** link.

Step 7 Click **Remove Product Instance**.

Step 8 The license is returned to the license pool and the switch is removed.

Generating a New Token for a Trust Code from CSSM

To generate a token to request a trust code, perform these steps.

Generate one token for each *Virtual Account*. Use the same token for all the switches that are part of one Virtual Account.

Before you begin

Supported topologies: Connected Directly to CSSM

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts.

Log in using the username and password that is provided by Cisco.

Step 2 Click the **Inventory** tab.

Step 3 From the **Virtual Account** drop-down list, choose the required virtual account.

Step 4 Click the **General** tab.

Step 5 Click **New Token**. The **Create Registration Token** window is displayed.

Step 6 In the **Description** field, enter the token description.

Step 7 In the **Expire After** field, enter the number of days the token must be active.

Step 8 (Optional) In the **Max. Number of Uses** field, enter the maximum number of uses allowed after which the token expires.

Step 9 Click **Create Token**.

Step 10 You will see your new token in the list. Click **Actions** and download the token as a *.txt* file.

Installing a Trust Code

To manually install a trust code, perform these steps.

Before you begin

Supported topologies: Connected Directly to CSSM

Procedure

Step 1 In case this task was not already completed, generate and download a trust code file from CSSM:

Generating a New Token for a Trust Code from CSSM

Step 2 Establish a trusted connection with CSSM:

switch# **license smart trust idtoken** *id_token_value* {**local** | **all**} [**force**]

For *id_token_value*, enter the token that was generated in CSSM.

Enter one of following options:

- **local**: Submits the trust request only for the active supervisor is in a High Availability setup. This is the default option.
- **all**: Submits the trust request for active and standby supervisors in a High Availability setup.

Enter the **force** keyword to submit the trust code request despite an existing trust code on the switch.

Trust codes are node-locked to the UDI of the switch. If a UDI is already registered, CSSM does not allow a new registration for the same UDI. Entering the **force** keyword sets a force flag in the message sent to CSSM to create a new trust code even if one exists.

Step 3 Display date and time if trust code is installed:

switch# **show license status**

Date and time are in the local time zone. See the `Trust Code Installed:` field.

Downloading a Policy File from CSSM

If a custom policy was requested or if a policy needs to be applied that is different from the default that is applied to the switch, perform these steps:

Before you begin

Supported topologies:

- No Connectivity to CSSM and No CSLU
- CSLU Disconnected from CSSM
- SSM On-Prem disconnected from CSSM

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts.

Log in using the username and password provided by Cisco.

Step 2 Follow this directory path: **Reports** > **Reporting Policy**.

Step 3 Click **Download**, to save the *.xml* policy file.

You can now install the file on the switch. See Installing a File on the Switch, on page 95.

Uploading Usage Data to CSSM and Downloading an ACK

To upload a RUM report to CSSM and download an ACK *when the switch is not connected to CSSM or CSLU*, perform these steps.

Before you begin

Supported topologies: No Connectivity to CSSM and No CSLU

Procedure

Step 1 Log in to the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts.

Log in using the username and password that is provided by Cisco.

Step 2 Select **Reports** > **Usage Data Files**.

Step 3 Click **Upload Usage Data**. Browse to the file location (RUM report in .txt format), select, and click **Upload Data**.

You cannot delete a usage report in CSSM after it has been uploaded.

Step 4 From the Select Virtual Accounts pop up, select the **Virtual Account** that will receive the uploaded file. The file is uploaded to Cisco and is listed in the Usage Data Files table in the Reports screen showing the File Name, the time it was Reported, which Virtual Account it was uploaded to, the Reporting Status, the Number of Product Instances reported, and the Acknowledgment status.

Step 5 In the Acknowledgment column, click **Download** to save the `tar.gz` acknowledge file for the report that was uploaded.

Wait for the ACK (.txt format) to appear in the Acknowledgment column. If there are many RUM reports to process, CSSM may take a few minutes.

Now, install the file on the switch or transfer it to CSLU or SSM On-Prem.

Installing a File on the Switch

To install a policy or acknowledgment on the switch when the switch is not connected to CSSM, CSLU, or SSM On-Prem, perform these steps.

Before you begin

Supported topologies: No Connectivity to CSSM and No CSLU

You must have the corresponding file saved in a location that is accessible to the switch.

- For a policy, see Downloading a Policy File from CSSM, on page 94.

- For an acknowledgment, see Uploading Usage Data to CSSM and Downloading an ACK, on page 95.

Procedure

Step 1 Copy file from its source location or directory to the flash memory of the switch:

switch# **copy** *source* **bootflash:***file-name*

- *source*: This is the location of the source file or directory to be copied. The source can be either local or remote.
- **bootflash**: This is the destination for boot flash memory.

Step 2 Import and install the file on the switch:

switch# **license smart import bootflash:** *file-name*

After installation, a system message displays the status of installation.

Step 3 Display license authorization, policy, and reporting information for the switch:

switch# **show license all**

Setting the Transport Type, URL, and Reporting Interval

To configure the mode of transport for a switch, perform these steps.

Before you begin

Supported topologies: all

Procedure

Step 1 Enter global configuration mode:

switch# **configure terminal**

Step 2 Select the type of message transport that the switch will use:

switch(config)# **license smart transport** {**callhome** | **cslu** | **off** | **smart**}

Choose from the following options:

- **callhome**: Enables Call Home as the transport mode.
- **cslu**: Enables CSLU as the transport mode. This is the default transport mode.
- **off**: Disables all communication from the switch.
- **smart**: Enables smart transport.

Step 3 Set an URL for the configured transport mode (except Call Home, which is in the Call Home configuration):

switch(config)# **license smart url** {**cslu** *cslu_url* | **smart** *smart_url*}

Depending on the transport mode that was chosen to configure in the previous step, configure the corresponding URL here:

- **cslu** *cslu_url*: The default value for *cslu_url* is set to cslu_local. To set a custom URL, follow below steps:

  If the transport mode is configured as **cslu**, configure this option. Enter the CSLU URL as follows:

  ```
  http://<cslu_ip_or_host>:8182/cslu/v1/pi
  ```

  Note When we use SSM On-Prem, the URL may be different and you must get it directly from SSM On-Prem.

  For `<cslu_ip_or_host>`, enter the host name or the IP address of the Windows host where CSLU is installed. 8182 is the port number and it is the only port number that CSLU uses.

  The **no license smart url cslu** *cslu_url* command reverts to cslu_local.

- **smart** *smart_url*: If the transport type is configured as **smart**, then URL will be automatically configured to:

  https://smartreceiver.cisco.com/licservice/license

  The **no license smart url smart** *smart_url* command reverts to the default URL as above.

Step 4 (Optional) Set the reporting interval in days:

switch(config)# **license smart usage interval** *interval_in_days*

By default, the RUM report is sent every 30 days. The valid value range is 1 to 365 and default value is 30 days.

If a value that is greater than one is set and the transport type is set to **off**, then, between the *interval_in_days* and the policy value for `Ongoing reporting frequency(days):`, the lower of the two values is applied. For example, if *interval_in_days* is set to 100 and the value in the in the policy says `Ongoing reporting frequency (days):90`, RUM reports are sent every 90 days.

If no interval is set and the default is effective, the reporting interval is determined entirely by the policy value. For example, if the default value is effective and only unenforced licenses are in use, if the policy states that reporting is not required, then RUM reports are not sent.

Step 5 Exit global configuration mode and return to EXEC mode:

switch(config)# **exit**

Step 6 Save your entries in the configuration file:

switch# **copy running-config startup-config**

Interactions with Other Features

High Availability

High Availability refers to the MDS Director switches with dual supervisors installed. This section explains considerations that apply to a high availability configuration, when running a software version that supports SLP.

Trust Code Requirements in a High Availability Setup

In a dual supervisor setup, two trust codes are installed. The active switch can submit the requests for both the supervisors and install the trust codes that are returned in an ACK.

Policy Requirements in a High Availability Setup

There are no policy requirements that apply exclusively to a high availability setup. As in case of a standalone switch, only one policy exists in a high availability setup as well, and this is on the active supervisor. The policy on the active applies to the standby in the setup.

Switch *Functions* in a High Availability Setup

This section explains general switch functions in a high availability setup, as well as what the switch does when a standby is added.

For trust codes: The active switch can request and install trust codes for standby supervisor.

For policies: The active switch synchronizes with the standby supervisor.

For reporting: Only the active switch reports usage for standby supervisor in the High Availability set-up.

In addition to scheduled reporting, the following events trigger reporting:

- The addition or removal of a standby supervisor. The RUM report includes information about the standby supervisor that was added or removed.
- A switchover.
- A reload.

For addition of a standby:

- A switch that is connected to CSLU does not take any further action.
- A switch that is directly connected to CSSM performs trust synchronization.

  Trust synchronization involves the following:

  - Installation of trust code on the standby, if not installed already.
  - Installation of policy and purchase information, if applicable.
  - Sending of a RUM report with current usage information.

Upgrades

This section describes how upgrade or migration to SLP is handled. It also clarifies how SLP handles all earlier licensing models including: the earlier version of Smart Licensing and how evaluation or expired licenses from any of the earlier licensing models are handled in SLP environment.

To migrate to SLP, upgrade to a software version that supports SLP. After upgrading, SLP is the only supported licensing model and the switch continues to operate *without any licensing changes*. The SLP section provides details and examples for migration scenarios that apply to Cisco MDS switches.

Note When migrating from traditional licensing model to SLP, license conversion takes place automatically.

Identifying the Current Licensing Model Before Upgrade

Before upgrading to SLP, enter the **show running-config license all** command in privileged EXEC mode to know the current licensing model that is effective on the switch. This command displays information about the current licensing model for all except the RTU licensing model.

Cisco MDS NX-OS Release 9.2(1) and earlier	Cisco MDS NX-OS Release 9.2(2) and later
switch# **show running-config license all** !Command: show running-config license all !Running configuration last done at: Wed Dec 15 06:05:02 2021 !Time: Thu Dec 16 08:04:07 2021 version 9.1(1) license grace-period **no feature license smart**	switch# **show running-config license all** !Command: show running-config license all !No configuration change since last restart !Time: Thu Dec 16 08:03:40 2021 version 9.2(2) license grace-period **license smart transport smart** **license smart url smart https://smartreceiver-stage.cisco.com/licservice/license** **license smart url cslu cslu-local** **license smart usage interval 30**

How an Upgrade Affects Enforcement Types for Existing Licenses

An unenforced license that was being used before upgrade continues to be available after the upgrade. This includes licenses from the earlier licensing models as follows:

- Traditional Licensing (PAK)
- Smart Licensing
- Evaluation or expired licenses from any of the above-mentioned licensing models

How an Upgrade Affects Reporting for Existing Licenses

When upgrading to a software version which supports SLP, reporting is based on the reporting requirements in the policy which can be displayed in the output of the **show license status** command for the following licenses:

- Traditional Licenses (PAK)
- Smart Licenses (Registered and Authorized licenses)

- Evaluation or expired licenses

How an Upgrade Affects Transport Type for Existing Licenses

The transport type, if configured in your existing setup, is retained after upgrade to SLP.

When compared to the earlier version of Smart Licensing, additional transport types are available with SLP. There is also a change in the default transport mode.

The following table clarifies how this may affect upgrades:

Migration	Transport Type Before Upgrade	Transport Type After Upgrade
SL (Eval)	callhome	CSLU
SL (Registered)		callhome
PAK-based	—	CSLU
On-Prem	callhome	CSLU

How an Upgrade Affects the ID Token Registration Process

In the earlier version of Smart Licensing, an ID token was used to register and connect to CSSM. ID token registration is not required in SLP. The ID token generation feature is still available in CSSM and is used to *establish trust* when a switch is directly connected to CSSM. See SLP Configuration - Connected Directly to CSSM Topology.

Downgrades

To downgrade, first downgrade the software version on the switch. This section provides information about downgrades for new deployments and existing deployments (you upgraded to SLP and now want to downgrade).

New Deployment Downgrade

This section applies when there is a newly purchased switch with a software version where SLP was already enabled by default and want to downgrade to a software version where SLP is not supported.

The outcome of the downgrade depends on whether a Trust Code was installed while the SLP environment was operating and further action may be required depending on the release to be downgraded to.

If the topology that was implemented while the SLP environment was connected directly to CSSM, then a trust code installation can be expected or assumed, because it is required as part of topology implementation. For any of the other topologies, trust establishment is not mandatory. Downgrading switches with one of these other topologies will therefore mean that licenses to a registered and authorized state must be restored by following the procedures that are applicable in the Smart Licensing environment. See Table 15: Outcome and Action for New Deployment Downgrade to Smart Licensing, on page 101.

Table 15: Outcome and Action for New Deployment Downgrade to Smart Licensing

In the SLP Environment	Downgrade to...	Outcome and Further Action
Switch, which is connected directly to CSSM, and trust established.	Cisco MDS NX-OS Release 9.2(1) or any lower version that supports Smart Licensing	Moves the switch back to the traditional licensing mode. Action is required: Reregister the switch if the switch was using smart license prior to Cisco MDS NX-OS Release 9.2(2). Generate an ID token in the CSSM Web UI. On the switch, enable smart licensing using **license smart enable** and configure the **license smart register idtoken** *idtoken* command in global configuration mode.
High Availability setup, which is connected directly to CSSM, and trust established.	Cisco MDS NX-OS Release 9.2(1) or any lower version that supports Smart Licensing	Action is required: Reregister the switch. Generate an ID token in the CSSM Web UI. On the switch, enable smart licensing using **license smart enable** and configure the **license smart register idtoken** *idtoken* **all** command in global configuration mode.
Any other topology. (Connected to CSSM Through CSLU, CSLU Disconnected from CSSM, No Connectivity to CSSM and No CSLU)	Cisco MDS NX-OS Release 9.2(1) or any lower version that supports Smart Licensing	Action is required. Restore licenses to a registered and authorized state by following the procedures that are applicable in the Smart Licensing environment.

Upgrade and Then Downgrade

When upgrading to a software version that supports SLP and then downgrading to any of the earlier licensing models, *license consumption does not change*, and any product features that were configured on the switch are preserved — only the features and functions that are available with SLP are not available anymore. Earlier licensing model will be preserved.

Migrating to Smart Licensing Using Policy

To upgrade to SLP, upgrade the software version (image) on the switch to a supported version.

Before you Begin

Read the Upgrades section to understand how SLP handles various aspects of all earlier licensing models.

When migrating from traditional licensing model to SLP, license conversion takes place automatically.

Upgrading the Switch Software

See the corresponding release note for the upgrade procedure. If there are any general release-specific considerations, these are called-out in the corresponding release notes.

Also refer to the sample **show** command outputs of the migration scenarios provided below. Sample outputs are provided for before and after migration, for comparison.

Smart Licensing to Smart Licensing Using Policy

The following is an example of a Cisco MDS 9000 switch migrating from Smart Licensing to SLP. This is a High Availability setup with an active and standby.

The **show** command outputs below call-out key fields to check, before and after migration.

Smart Licensing to Smart Licensing Using Policy: show Commands

show license summary

Before Upgrade (Smart Licensing)

```
switch# show license summary
Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: MDS-Avalon
  Export-Controlled Functionality: Allowed

License Authorization:
  Status: OUT OF COMPLIANCE on Oct 14 06:26:13 2021 UTC

  Last Communication Attempt: SUCCEEDED
  Next Communication Attempt: Oct 14 18:26:56 2021 UTC
  Communication Deadline: Jan 12 06:21:55 2022 UTC

Smart License Conversion:
  Automatic Conversion Enabled: False
  Status: Not started

License Usage:
License                    Entitlement tag                Count   Status
-----------------------------------------------------------------------------
MDS 9396T 32G 16 port a... (PORT_ACTIV_9396T_PKG)           48      OUT OF COMPL
IANCE
MDS 9300 series Enterpr... (ENTERPRISE_PKG)                 1       OUT OF COMPL
IANCE
```

After Upgrade (SLP)

```
switch# show license summary
License Usage:
License                    Entitlement tag                Count   Status
-----------------------------------------------------------------------------
MDS 9396T 32G 16 port-a... (PORT_ACTIV_9396T_PKG)           48      NOT AUTHORIZ
ED
MDS 9300 series Enterpr... (ENTERPRISE_PKG)                 1       IN USE
```

The `Status` field shows that the licenses are now `IN USE` instead of registered and authorized. The `Count` filed indicates the total number of ports that are consuming port licenses.

show license usage

Before Upgrade (Smart Licensing)

```
switch# show license usage
License Authorization:
  Status: OUT OF COMPLIANCE on Oct 14 06:26:13 2021 UTC

(PORT_ACTIV_9396T_PKG):
  Description: MDS 9396T 32G 16 port activation
  Count: 48
  Version: 1.0
  Status: OUT OF COMPLIANCE

(ENTERPRISE_PKG):
  Description: MDS 9300 series Enterprise package
  Count: 1
  Version: 1.0
  Status: OUT OF COMPLIANCE
```

After Upgrade (SLP)

```
switch# show license usage
License Authorization:
  Status: Not Applicable

(PORT_ACTIV_9396T_PKG):
  Description: MDS 9396T 32G 16 port-activation
  Count: 48
  Version: 1.0
  Status: NOT AUTHORIZED
  Enforcement Type: ENFORCED
  License Type: Enforced

(ENTERPRISE_PKG):
  Description: MDS 9300 series Enterprise package
  Count: 1
  Version: 1.0
  Status: IN USE
  Enforcement Type: NOT ENFORCED
  License Type: Generic
```

The license counts remain the same.

show license status

Before Upgrade (Smart Licensing)

```
switch# show license status
Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: MDS-Avalon
  Export-Controlled Functionality: Allowed
  Initial Registration: SUCCEEDED on Oct 14 06:27:26 2021 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Apr 12 06:27:26 2022 UTC
  Registration Expires: Oct 14 06:22:22 2022 UTC
```

```
License Authorization:
  Status: OUT OF COMPLIANCE on Oct 14 06:26:13 2021 UTC

  Last Communication Attempt: SUCCEEDED on Oct 14 06:27:57 2021 UTC
  Next Communication Attempt: Oct 14 18:27:56 2021 UTC
  Communication Deadline: Jan 12 06:22:54 2022 UTC

Smart License Conversion:
  Automatic Conversion Enabled: False
  Status: Not started
```

After Upgrade (SLP)

```
switch# show license status

Utility:
    Status: DISABLED

Smart Licensing using Policy:
    Status: ENABLED

Data Privacy:
    Sending Hostname: yes
    Callhome Hostname Privacy: DISABLED
        Smart Licensing Hostname Privacy: DISABLED
    Version Privacy: DISABLED

Transport:
    Type: CSLU
    Cslu address: cslu-local

Policy:
    Policy in use: Merged from multiple sources
    Reporting ACK required: Yes
    Unenforced/Non-Export:
        First report requirement (days): 90 (CISCO default)
        Ongoing reporting frequency (days): 365 (CISCO default)
        On change reporting (days): 90 (CISCO default)
    Enforced (Pepertual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)
    Export (Perpetual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)

Miscellaneous:
    Custom Id: <empty>

Usage reporting:
    Last ACK received: <none>
    Next ACK deadline: Jan 12 08:39:14 2022 UTC
    Reporting push interval: 30 days
    Next ACK push check: <none>
    Next report push: Oct 14 08:40:00 2021 UTC
    Last report push: <none>
    Last report file write: <none>

Trust Code installed: Jan 12 08:39:14 2022 UTC
Active: PID: DS-C9148T-K9, SN: JPG220700PY
Jan 12 08:39:14 2022 UTC
```

The `Transport:` field:A transport type was configured and therefore retained after upgrade.

The `Policy:` header and details: A custom policy was available in the Smart Account or Virtual Account — this has also been automatically installed on the switch. (After establishing trust, CSSM returns a policy. The policy is then automatically installed.)

The `Usage Reporting:` header: The `Nextreport push:` field provides information about when the switch will send the next RUM report to CSSM.

The `Trust Code Installed:` field: The ID token is successfully converted and a trusted connection has been established with CSSM.

show license udi

Before Upgrade (Smart Licensing)

```
switch# show license udi
UDI: SN:JPG22060061
```

After Upgrade (SLP)

```
switch# show license udi
UDI: PID:DS-C9396T-K9, SN:JPG22060061
HA UDI List:
    Active: PID:DS-C9396T-K9, SN:JPG22060061
```

This is a High Availability setup, and the command displays all UDIs in the setup.

The CSSM Web UI After Migration

Log in to the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts. Under **Inventory** > **Product Instances**.

Registered licenses in the Smart Licensing environment were displayed with the hostname of the switch in the Name column. After upgrading to SLP, they are displayed with the UDI of the switch. All migrated UDIs are displayed. In this example, they are PID:C9500-16X,SN:FCW2233A5ZV and PID:C9500-16X,SN:FCW2233A5ZY.

Only the active switch reports usage. Therefore, PID:C9500-16X,SN:FCW2233A5ZV displays license consumption information under **License Usage**.

Figure 8: Smart Licensing to Smart Licensing Using Policy: Active and Standby Switches After Migration

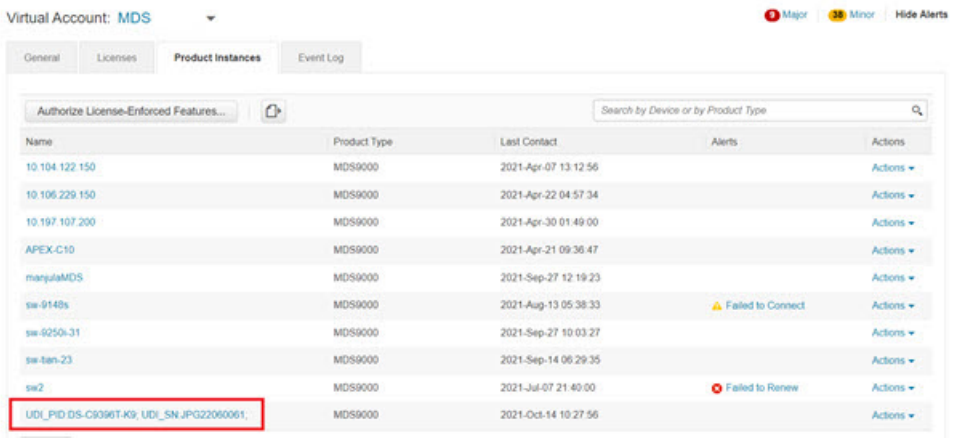


Figure 9: Smart Licensing to Smart Licensing Using Policy: UDI and License Usage under Active Switch

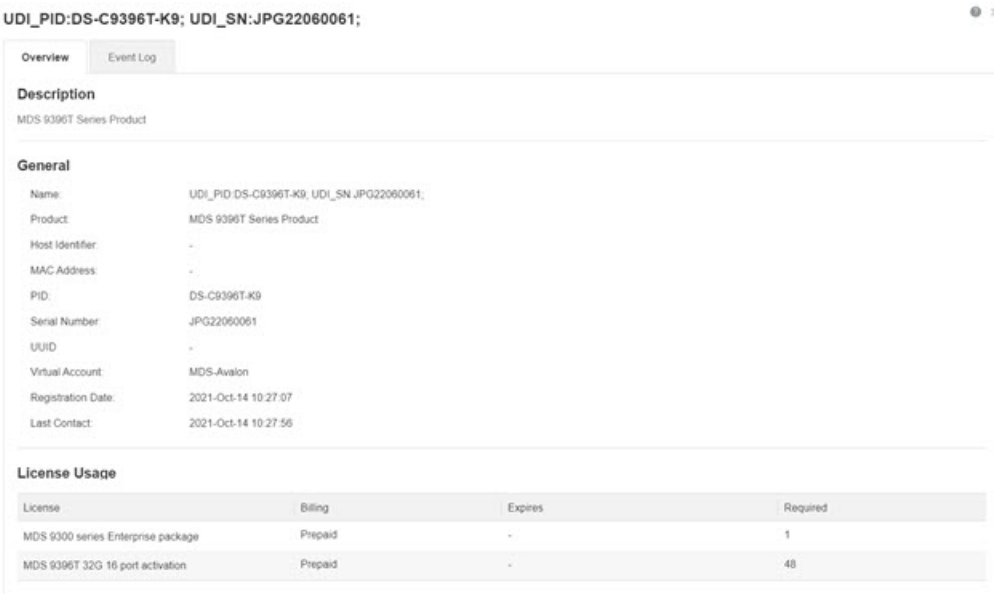


Figure 10: Smart Licensing to Smart Licensing Using Policy: DCN NDB/RTU Licenses Showing up After Upgrade

Reporting After Migration

The switch sends the next RUM report to CSSM, based on the policy.

To change the reporting interval to report more frequently: on the switch, configure the **license smart usage interval** command.

Evaluation or Eval Expired to Smart Licensing Using Policy

The following is an example of a Cisco MDS 9000 switch with evaluation licenses (Smart Licensing) that were migrated to SLP.

The notion of evaluation licenses does not apply to SLP. When the software version is upgraded to one that supports SLP, all licenses are displayed as *IN USE* and the Cisco default policy is applied to the switch.

The following table calls out key changes or new fields to check for in the **show** command outputs, after upgrade to SLP.

Evaluation or Eval Expired to Smart Licensing Using Policy: show Commands

show license summary

Before Upgrade (Smart Licensing, Evaluation Mode)

```
switch# show license summary
Smart Licensing is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: Not Allowed

License Authorization:
  Status: EVAL MODE
  Evaluation Period Remaining: 89 days, 21 hours, 13 minutes, 49 seconds

Smart License Conversion:
  Automatic Conversion Enabled: False
  Status: Not started

License Usage:
License                    Entitlement tag                Count   Status
-----------------------------------------------------------------------------
<empty>                    (ENTERPRISE_PKG)                1       EVAL MODE
<empty>                    (PORT_ACTIV_9396T_PKG)          48      EVAL MODE
```

After Upgrade (SLP)

```
switch# show license summary
License Usage:
License                    Entitlement tag                Count   Status
-----------------------------------------------------------------------------
MDS 9396T 32G 16 port-a... (PORT_ACTIV_9396T_PKG)          48      NOT AUTHORIZED
MDS 9300 series Enterpr... (ENTERPRISE_PKG)                1       IN USE
```

All licenses are migrated and `IN USE`.There are no *EVAL MODE* licenses.

show license usage

Before Upgrade (Smart Licensing, Evaluation Mode)

```
switch# show license usage
License Authorization:
  Status: EVAL MODE
  Evaluation Period Remaining: 89 days, 21 hours, 13 minutes, 10 seconds
```

```
(ENTERPRISE_PKG):
  Description: <empty>
  Count: 1
  Version: 1.0
  Status: EVAL MODE

(PORT_ACTIV_9396T_PKG):
  Description: <empty>
  Count: 48
  Version: 1.0
  Status: EVAL MODE
```

After Upgrade (SLP)

```
switch# show license usage
License Authorization:
  Status: Not Applicable

(PORT_ACTIV_9396T_PKG):
  Description: MDS 9396T 32G 16 port-activation
  Count: 48
  Version: 1.0
  Status: NOT AUTHORIZED
  Enforcement Type: ENFORCED
  License Type: Enforced

(ENTERPRISE_PKG):
  Description: MDS 9300 series Enterprise package
  Count: 1
  Version: 1.0
  Status: IN USE
  Enforcement Type: NOT ENFORCED
  License Type: Generic
```

show license status

Before Upgrade (Smart Licensing, Evaluation Mode)

```
switch# show license status

Smart Licensing is ENABLED

Registration:
  Status: UNREGISTERED
  Export-Controlled Functionality: Not Allowed

License Authorization:
  Status: EVAL MODE
  Evaluation Period Remaining: 89 days, 21 hours, 12 minutes, 51 seconds

Smart License Conversion:
  Automatic Conversion Enabled: False
  Status: Not started
```

After Upgrade (SLP)

```
switch# show license status

Utility:
    Status: DISABLED
```

```
Smart Licensing using Policy:
    Status: ENABLED

Data Privacy:
    Sending Hostname: yes
    Callhome Hostname Privacy: DISABLED
        Smart Licensing Hostname Privacy: DISABLED
    Version Privacy: DISABLED

Transport:
    Type: CSLU
    Cslu address: cslu-local

Policy:
    Policy in use: Merged from multiple sources
    Reporting ACK required: Yes
    Unenforced/Non-Export:
        First report requirement (days): 90 (CISCO default)
        Ongoing reporting frequency (days): 365 (CISCO default)
        On change reporting (days): 90 (CISCO default)
    Enforced (Pepertual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)
    Export (Perpetual/Subscription):
        First report requirement (days): 0 (CISCO default)
        Ongoing reporting frequency (days): 0 (CISCO default)
        On change reporting (days): 0 (CISCO default)

Miscellaneous:
    Custom Id: <empty>

Usage reporting:
    Last ACK received: <none>
    Next ACK deadline: Jan 12 08:39:14 2022 UTC
    Reporting push interval: 30 days
    Next ACK push check: <none>
    Next report push: Oct 14 08:40:00 2021 UTC
    Last report push: <none>
    Last report file write: <none>

Trust Code installed: <none>
```

The CSSM Web UI After Migration

No changes in the CSSM Web UI.

Reporting After Migration

Implement any one of the supported topologies and fulfill reporting requirements. See Supported Topologies, on page 60. The reporting method depends on the implemented topology.

Migration Scenarios for Enforced Port Licenses

This section provides the different scenarios for migrating to SLP.

Table 16: Migration Scenarios for Enforced Port Licenses

Configuration	Greenfield	Traditional to SL	SL 1.0 to SLP	Traditional to SL 1.0 to SLP
Default port licenses	Default port licenses will work as usual. Any additional port that comes up will need authorization code to be installed.			
Default and factory installed licenses	Default and factory installed port licenses will work as usual. Any additional port that comes up (over and above the purchase count) will need authorization code to be installed.			
Default and PAK licenses	—	Default and PAK port licenses will work as usual. Any new port licenses will need authorization code to be installed. Automatic DLC will trigger on migration.	—	Default and PAK port licenses that were enabled in SL 1.0 will continue to work after upgrading to SLP. Any new port licenses will need authorization code to be installed. If DLC was not performed in SL 1.0, automatic DLC will not trigger in SLP. Contact Cisco TAC for migrating the licenses.
Default and port licenses in SL 1.0 (Evaluation only)	—	—	Default and extra port licenses will work as usual. Any new port will need authorization code to be installed. If DLC was not performed in SL 1.0, automatic DLC will not trigger in SLP. Contact Cisco TAC for migrating the licenses.	—

Configuration	Greenfield	Traditional to SL	SL 1.0 to SLP	Traditional to SL 1.0 to SLP
Default and port licenses in SL 1.0 (Registered or Out of Compliance (OOC))	—	—	Default and extra port licenses will work as usual. Any new port will need authorization code to be installed. If DLC was not performed in SL 1.0, automatic DLC will not trigger in SLP. Contact Cisco TAC for migrating the licenses.	—

Troubleshooting Smart Licensing Using Policy

This section provides the list of SLP-related system messages that maybe encountered, possible reasons for failure, and recommended action.

System Message Overview

The system software sends system messages to the console (and, optionally, to a logging server on another system). Not all system messages mean problems with your system. Some messages are informational, and others can help diagnose problems with communications lines, internal hardware, or the system software.

How to Read System Messages

System log messages can contain up to 80 characters. Each system message begins with a percent sign (%) and is structured as follows:

```
%FACILIY-SEVERITY-MNEMONIC: Message-text
```

%FACILITY

Two or more uppercase letters that show the facility to which the message refers. A facility can be a hardware switch, a protocol, or a module of the system software.

SEVERITY

A single-digit code from 0 to 7 that reflects the severity of the condition. The lower the number, the more serious the situation.

Table 17: Message Severity Levels

Severity Level	Description
0 - emergency	System is unusable.
1 - alert	Immediate action required.

Severity Level	Description
2 - critical	Critical condition.
3 - error	Error condition.
4 - warning	Warning condition.
5 - notification	Normal but significant condition.
6 - informational	Informational message only.
7 - debugging	Message that appears during debugging only.

MNEMONIC

A code that uniquely identifies the message.

Message-text

Message-text is a text string describing the condition. This portion of the message sometimes contains detailed information about the event, including terminal port numbers, network addresses, or addresses that correspond to locations in the system memory address space. Because the information in these variable fields changes from message to message, it is represented here by short strings that are enclosed in square brackets ([ ]). A decimal number, for example, is represented as [dec].

Table 18: Variable Fields in Messages

Severity Level	Description
[char]	Single character
[chars]	Character string
[dec]	Decimal number
[enet]	Ethernet address (for example, 0000.FEED.00C0)
[hex]	Hexadecimal number
[inet]	Internet address (for example, 10.0.2.16)
[int]	Integer
[node]	Address or node name
[t-line]	Terminal line number in octal (or in decimal if the decimal-TTY service is enabled)
[clock]	Clock (for example, 01:20:08 UTC Tue Mar 2 1993

System Messages

This section provides the list of SLP-related system messages that maybe encountered, possible reasons for failure (in case it is a failure message), and recommended action (if action is required).

For all error messages, contact your Cisco technical support representative with the following information if you are unable to resolve it by yourself:

The message, exactly as it appears on the console or in the system log.

The output from the **show license tech support** and **show license history message** commands.

SLP-related system messages:

- SMART_LIC-3-POLICY_INSTALL_FAILED
- SMART_LIC-3-COMM_FAILED
- SMART_LIC-3-COMM_RESTORED
- SMART_LIC-3-POLICY_REMOVED
- SMART_LIC-3-TRUST_CODE_INSTALL_FAILED
- SMART_LIC-4-REPORTING_NOT_SUPPORTED
- SMART_LIC-6-POLICY_INSTALL_SUCCESS
- SMART_LIC-6-REPORTING_REQUIRED
- SMART_LIC-6-TRUST_CODE_INSTALL_SUCCESS

SMART_LIC-3-POLICY_INSTALL_FAILED

```
Error Message %SMART_LIC-3-POLICY_INSTALL_FAILED: The installation of a new licensing policy
 has failed: [chars].
```

Explanation

A policy was installed, but an error was detected while parsing the policy code and installation failed. [chars] is the error string with details of the failure.

Possible reasons for failure include:

- A signature mismatch: This means that the system clock is not accurate.
- A timestamp mismatch: This means that the system clock on the switch is not synchronized with CSSM.

Recommended Action

For both possible failure reasons, ensure that the system clock is accurate and synchronized with CSSM. Configure the **ntp server** command.

For example:

```
switch(config)# ntp server 1.1.1.1 prefer
```

If the above does not work and policy installation still fails, contact your Cisco technical support representative.

SMART_LIC-3-AUTHORIZATION_INSTALL_FAILED

```
Error Message %SMART_LIC-3-AUTHORIZATION_INSTALL_FAILED: The install of a new licensing
authorization code has failed on [chars]: [chars].
```

Explanation

Authorization code installation has failed for enforced license.

Recommended Action

Use the **license smart authorization request** {**add** | **replace**} *port-feature* {**local** | **all**} **count** *port-range* command to enable ports or replace the existing authorization code.

SMART_LIC-3-COMM_FAILED

```
Error Message %SMART_LIC-3-COMM_FAILED: Communications failure with the [chars] : [chars]
```

Explanation

Smart Licensing communication either with CSSM or with CSLU failed. The first [chars] is the currently configured transport type, and the second [chars] is the error string with details of the failure. This message appears for every communication attempt that fails.

Possible reasons for failure include:

- CSSM or CSLU is not reachable: This means that there is a network reachability problem.
- 404 host not found: This means that the CSSM server is down.

For topologies where the switch initiates the sending of RUM reports (Connected to CSSM Through CSLU: Product Instance Initiated Only, Connected Directly to CSSM, and CSLU Disconnected from CSSM: Product Instance Initiated Only) if this communication failure message coincides with scheduled reporting (**license smart usage interval** *interval_in_days*), the switch attempts to send out the RUM report for up to 4 hours after the scheduled time has expired. If it is still unable to send out the report (because the communication failure persists), the system resets the interval to 15 minutes. After the communication failure is resolved, the system reverts the reporting interval to the value that was last configured.

Recommended Action

Troubleshooting steps are provided for when CSSM is not reachable and when CSLU is not reachable.

If CSSM is not reachable and the configured transport type is **smart**:

1. Check if the smart URL is configured correctly. Use the **show license status** command to check if the URL is exactly as follows: https://smartreceiver.cisco.com/licservice/license. If it is not, reconfigure the **license smart url smart** *smart_URL* command.
2. Check DNS resolution. Verify that the switch can ping `smartreceiver.cisco.com` or the *nslookup* translated IP. The following example shows how to ping the translated IP:

```
switch# ping 171.70.168.183
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 171.70.168.183, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
```

If CSSM is not reachable and the configured transport type is **callhome**:

1. Check if the URL is entered correctly. Use the **show license status** command to check if the URL is exactly as follows: https://tools.cisco.com/its/service/oddce/services/DDCEService.
2. Check if Call Home profile `CiscoTAC-1` is active and destination URL is correct. Use the **show call-home smart-licensing** command.

```
switch# show callhome smart-licensing
Current smart-licensing transport settings:
```

```
Smart-license messages: enabled
Profile: xml (status: ACTIVE)
```

3. Check DNS Resolution. Verify that the switch can ping `tools.cisco.com` or the *nslookup* translated IP.

```
switch# ping tools.cisco.com
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 173.37.145.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 41/41/42 ms
```

   If the above resolution does not work, check if the switch's mgmt0 interface is set with IP address and the management interface is up. To ensure that the network is up, configure the **no shutdown** command.

   Check if the switch is subnet masked with a subnet IP and if the DNS IP and default gateway are configured.

4. Verify if the IP gateway is set.

   Use the **show ip interface** command to display the current configuration.

   In case the above resolution does not work, double-check your routing rules and firewall settings.

If CSLU is not reachable:

- Check if CSLU discovery works.
  - Zero-touch DNS discovery of `cslu-local` or DNS discovery of your domain.

    In the **show license all** command output, check the `Last ACK received:` field. If this has a recent timestamp, it means that the switch has connectivity with CSLU. If not, check if the switch can ping `cslu-local`. A successful ping confirms that the switch is reachable.

    If the above resolution does not work, configure the name server with an entry where hostname `cslu-local` is mapped to the CSLU IP address (the Windows or Linux host where CSLU is installed). Configure the **ip domain-lookup**, **ip domain-name** *domain-name*, and **ip name-server** *server-address* commands. Here the CSLU IP is 192.168.0.1 and name-server creates entry `cslu-local.example.com`.

```
switch(config)# ip domain-name example.com
switch(config)# ip name-server 192.168.2.1
```

- CSLU URL is configured.

  In the **show license all** command output, under the `Transport:` header check the following:

  The `Type:` must be `cslu` and `Cslu address:` must have the hostname or the IP address of the Windows or Linux host where CSLU is installed. Check if the rest of the address is configured as shown below and check if the port number is 8182.

```
Transport:
Type: CSLU
Cslu address: http://192.168.0.1:8182/cslu/v1/pi
```

  If not, configure the **license smart transport cslu** and **license smart url cslu** *http://<cslu_ip_or_host>:8182/cslu/v1/pi* commands.

  If the above resolution does not work and policy installation still fails, contact your Cisco technical support representative.

SMART_LIC-3-COMM_RESTORED

```
Error Message %SMART_LIC-3-COMM_RESTORED: Communications with the [chars] restored. [chars]
 - depends on the transport type
- Cisco Smart Software Manager (CSSM)
- Cisco Smart License utility (CSLU)
Smart Agent communication with either the Cisco Smart Software Manager (CSSM) or the Cisco
 Smart License utility (CSLU) has been restored. No action required.
```

Explanation

Switch communicating with either the CSSM or CSLU is restored.

Recommended Action

No action required.

SMART_LIC-3-POLICY_REMOVED

```
Error Message %SMART_LIC-3-POLICY_REMOVED: The licensing policy has been removed.
```

Explanation

A previously installed licensing policy has been removed. The `Cisco default` policy is then automatically enabled. This may cause a change in the behavior of smart licensing.

Possible reasons for failure include:

If the **license smart factory reset** command is executed in EXEC mode, all licensing information including the policy is removed.

Note The switch must be reloaded after using the **license smart factory reset** command.

Recommended Action

If the policy was removed intentionally, no further action is required.

If the policy was removed inadvertently, reapply the policy. Depending on the topology that is implemented, follow the corresponding method to retrieve the policy:

- Connected Directly to CSSM:

  Enter the **show license status** command, and check the `Trust Code installed:` field. If trust is established, then CSSM will automatically return the policy. The policy is automatically reinstalled on switches of the corresponding Virtual Account.

  If trust has not been established, complete these tasks:

  Generating a New Token for a Trust Code from CSSM, on page 93 and Installing a Trust Code, on page 93. When these tasks are completed, CSSM will automatically return the policy. The policy is then automatically installed on all switches of that Virtual Account.

- Connected to CSSM Through CSLU:

  For switch-initiated communication, enter the **license smart sync** command in privileged EXEC mode. The synchronization request causes CSLU to push the missing information (a policy or authorization code) to the switch.

- CSLU Disconnected from CSSM:

For switch-initiated communication, enter the **license smart sync** command. The synchronization request causes CSLU to push the missing information (a policy or authorization code) to the switch. Then, complete these tasks in the given order: Export to CSSM, on page 89 > Uploading Usage Data to CSSM and Downloading an ACK, on page 95 > Import from CSSM, on page 90.

- No Connectivity to CSSM and No CSLU

  In an entirely air-gapped network, from a workstation that has connectivity to the Internet and CSSM complete this task: Downloading a Policy File from CSSM, on page 94.

  Then, complete this task on the switch: Installing a File on the Switch, on page 95.

- SSM On-Prem Disconnected from CSSM

  For switch-initiated communication, enter the **license smart sync** command in privileged EXEC mode. The synchronization request causes CSLU on SSM On-Prem to push the missing information (a policy or authorization code) to the switch.

SMART_LIC-3-TRUST_CODE_INSTALL_FAILED

```
Error Message %SMART_LIC-3-TRUST_CODE_INSTALL_FAILED: The install of a new licensing trust
 code has failed on [chars]: [chars].
```

Explanation

Trust code installation has failed. The first [chars] is the UDI where trust code installation was attempted. The second [chars] is the error string with details of the failure.

Possible reasons for failure include:

- A trust code is already installed: Trust codes are node-locked to the UDI of the switch. If the UDI is already registered and you try to install another one, installation fails.
- Smart Account-Virtual Account mismatch: This means that the Smart Account or Virtual Account (for which the token ID was generated) does not include the switch on which the trust code was installed. The token that is generated in CSSM applies at the Smart Account or Virtual Account level and applies only to all switches in that account.
- A signature mismatch: This means that the system clock is not accurate.
- Timestamp mismatch: This means the switch time is not synchronized with CSSM and can cause installation to fail.

Recommended Action

- A trust code is already installed: To install a trust code despite an existing trust code on the switch, reconfigure the **license smart trust idtoken** *id_token_value* {**local** | **all**}[**force**] command in privileged EXEC mode and ensure to include the **force** keyword. Using the **force** keyword sets a force flag in the message sent to CSSM to create a new trust code even if one exists.
- Smart Account-Virtual Account mismatch: Login to the CSSM Web UI at https://software.cisco.com/software/smart-licensing/alerts. Click **Inventory** > **Product Instances**.

  Check if the switch on which the token is to be generated is listed in the selected Virtual Account. If it is, proceed to the next step. If not, check and select the correct Smart Account and Virtual Account. Then, complete these tasks again: Generating a New Token for a Trust Code from CSSM, on page 93 and Installing a Trust Code, on page 93.

- Timestamp mismatch and signature mismatch: Configure the **ntp server** command. For example:

```
switch(config)# ntp server 1.1.1.1 prefer
```

SMART_LIC-4-REPORTING_NOT_SUPPORTED

```
Error Message %SMART_LIC-4-REPORTING_NOT_SUPPORTED: The CSSM OnPrem that this product
instance is connected to is down rev and does not support the enhanced policy and usage
reporting mode.
```

Explanation

The previous version of SSM On-Prem (formerly known as Cisco Smart Software Manager satellite) is not supported in the SLP environment. The switch will behave as follows:

- Stop sending registration renewals and authorization renewals.
- Start recording usage and saving RUM reports locally. The RUM reports are stored locally at *<CSLU_Working_Directory>/data/default/rum/unsent*.

Recommended Action

Refer to and implement one of the supported topologies instead. For more information, see Supported Topologies, on page 60.

SMART_LIC-6-POLICY_INSTALL_SUCCESS

```
Error Message %SMART_LIC-6-POLICY_INSTALL_SUCCESS: A new licensing policy was successfully
 installed.
```

Explanation

A policy was installed as part of an ACK response.

Recommended Action

No action is required. To know which policy is applied (the policy in-use) and its reporting requirements, enter the **show license all** command.

SMART_LIC-6-AUTHORIZATION_INSTALL_SUCCESS

```
Error Message %SMART_LIC-6-AUTHORIZATION_INSTALL_SUCCESS: A new licensing authorization
code was successfully installed on: [chars].
```

Explanation

A new licensing authorization code was installed.

Recommended Action

No action is required. To know installed license status, enter the **show license all** command.

SMART_LIC-6-AUTHORIZATION_REMOVED

```
Error Message %SMART_LIC-6-AUTHORIZATION_REMOVED: A licensing authorization code has been
removed from [chars]
```

Explanation

[chars] is the UDI where the authorization code was removed. This removes the licenses from the switch and may cause a change in the behavior of smart licensing and the features using the licenses.

Recommended Action

No action is required. To see the current state of the license, enter the **show license all** command.

SMART_LIC-6-REPORTING_REQUIRED

```
Error Message %SMART_LIC-6-REPORTING_REQUIRED: A Usage report acknowledgement will be
required in [dec] days.
```

Explanation

This is an alert which means that RUM reporting to Cisco is required. [dec] is the amount of time (in days) left to meet this reporting requirement.

Recommended Action

Ensure that RUM reports are sent within the requested time.

- If the switch is directly connected to CSSM or to CSLU and the switch is configured to initiate communication, wait untill the next schedule time (use the **show license all | grep "Next report push:"** command) or manually trigger the sync using **license smart sync** command from EXEC mode.. The switch will automatically send usage information at the scheduled time.

  If it is not sent at the scheduled time because of technical difficulties, use the **license smart sync** command in EXEC mode.

- If the switch is connected to CSLU but CSLU is disconnected from CSSM, complete these tasks: Export to CSSM, on page 89 > Uploading Usage Data to CSSM and Downloading an ACK, on page 95 > Import from CSSM, on page 90.

- If the switch is disconnected from CSSM and CSLU is not being used either, enter the **license smart save usage** command in EXEC mode to save the required usage information in a file. Then, from a workstation that is connected to CSSM, complete these tasks: Uploading Usage Data to CSSM and Downloading an ACK, on page 95 > Installing a File on the Switch, on page 95.

SMART_LIC-6-TRUST_CODE_INSTALL_SUCCESS

```
Error Message %SMART_LIC-6-TRUST_CODE_INSTALL_SUCCESS: A new licensing trust code was
successfully installed on [chars].
```

Explanation

[chars] is the UDI where the trust code was successfully installed.

Recommended Action

No action is required. To verify that the trust code is installed, enter the **show license status** command in EXEC mode. Look for the updated timestamp under the `Trust Code installed:` field in the output.

Additional References for Smart Licensing Using Policy

Topic	Document
Cisco Smart Software Manager Help	Smart Software Manager Help
Cisco Smart License Utility (CSLU) Installation and User Guides	Cisco Smart License Utility Quick Start Setup Guide Cisco Smart License Utility User Guide

Topic	Document
Cisco Smart Software Licensing for Cisco MDS 9000 Series Switches	Cisco MDS 9000 Series Licensing Guide

Glossary

The following list acronyms and definitions for terms used throughout this document:

- **SLP**: Smart License using Policy. A Cisco NX-OS feature that allows a switch to integrate with the Cisco cloud-based licensing infrastructure.
- **CSLU**: Cisco Smart License Utility. A software agent that collects license usage (RUM) reports from a switch and forwards them to the CSSM. If used, this agent runs on a customer premise server.
- **PI**: Product Instance. An MDS switch running Cisco MDS NX-OS.
- **SA**: Smart Account. The top level customer account in CSSM where purchased licenses are deposited by Cisco.
- **VA**: Virtual Account. Represents an organization within a customer Smart Account, in agreement with customer preferences. There can be multiple VAs per customer Smart Account.
- **UDI**: Unique Device Identifier. An identifier made of the Product ID (PI) and serial number. This is used by the PI to identify itself to the CSSM.
- **CSSM**: Cisco Smart Software Manager. Cisco cloud portal where Cisco licenses can be activated and managed.
- **LCS**: Licensing Crypto Services. When you initially register to CSSM, the SSM On-Prem license server sends a registration file that contains Certificate Signing Requests (CSRs) which will be signed by the Cisco License Crypto Service (LCS).
- **RUM** : Resource Usage Measurement. A license usage report created by a PI and consumed by the CSSM.
- **Pull mode**: A mode in which the CSLU uses netconf/restconf/grpc and YANG or REST to connect to the PI and exchange data.
- **Push mode**: A mode in which the PI initiates communications with the CSLU by sending requests to a REST endpoint in the CSLU.
- **Enforced license**: Enforced license represents a feature set that the product should not be allowed to use without authorization.
- **Unenforced license**: An unenforced license (honor mode) represents a feature set that the MDS will allow to use without an active license. It remains true that a license should be purchased to stay in compliance.
- **Product Authorization Key (PAK)**: The PAK allows you to obtain a license key from one of the sites listed in the software license claim certificate document. After registering at the specified website, you will receive your license key file and installation instructions through email. From Cisco MDS NX-OS Release 9.2(2), PAK licenses are deprecated. Customers using PAK licenses should migrate to SLP at their earliest convenience.

- **Reported state**: Occurs when the switch has reported its license usage to the CSSM and received an acknowledgment.
- **Un-Reported state**: The switch has not yet reported its license usage to CSSM nor received an acknowledgment back from CSSM.
- **Greenfield deployment**: A greenfield deployment is the installation and configuration of a network where none existed before, for example in a new data center.
- **Brownfield deployment**: A brownfield deployment is an upgrade or addition to an existing network and uses some legacy components.