



## Model-Driven Command-Line Interface

This section shows the CLI commands that are based on YANG data models and can be used on the router console.

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### Model-Driven CLI to Display Data Model Structure

*Table 1: Feature History Table*

Feature Name	Release Information	Description
Model-driven CLI to Show YANG Operational Data	Release 7.3.2	<p>This feature enables you to use a traditional CLI command to display YANG data model structures on the router console and also obtain operational data from the router in JSON or XML formats. The functionality helps you transition smoothly between CLI and YANG models, easing data retrieval from your router and network.</p> <p>This feature introduces the <b>show yang operational</b> command.</p>

Cisco IOS XR Software provides a rich set of show commands and data models to access data from the router and network. The show commands present unstructured data, whereas data models are structured data that can be encoded in XML or JSON formats. However, both the access points do not always present the same view. Network operators who work on show commands face challenges with adopting the data models when transitioning to programmatic interfaces.

With this feature, these adoption challenges are overcome using **show yang operational** command that is driven by data models. The command uses the data model as the base to display the structured data using traditional CLI command. Using this command, you can simplify parsing scripts via XML and JSON formats.

A data model has a structured hierarchy: model, module, container, and leaf. The following example shows the structure of `ietf-interfaces.yang` data model:

```

ietf-interfaces.yang
module: iETF-interfaces
+--rw interfaces
| +--rw interface* [name]
| | +--rw name string
| | +--rw description? string
| | +--rw type identityref
| | +--rw enabled? boolean
| | +--rw link-up-down-trap-enable? enumeration {if-mib}?
+--ro interfaces-state
  +--ro interface* [name]
  +--ro name string
  +--ro type identityref
  +--ro admin-status enumeration {if-mib}

```

In the example, the hierarchy of the data model is as follows:

- Model—ietf-interfaces.yang
- Module—ietf-interfaces
- Container—interfaces, interface-state
- Node—interface\* [name]
- Leaf—name, description, type, enabled, link-up-down-trap-enable, admin-status

You can use the **show yang operational** command to navigate to the leaf level as you do in a data model.

The image shows a mapping between CLI and data model, and how the structured data is displayed on the console.

The image displays a terminal window on the left and a YANG data model structure on the right. The terminal shows the following commands and output:

```

RP/0/RSP0/CPU0:vk4# show yang ?
aaa
acl
arp
...
inventory
...

RP/0/RSP0/CPU0:vk4# show yang inventory ?
entities Entities Table
racks Rack Table
xml Output in XML format.
| Output Modifiers
|<cr>

RP/0/RSP0/CPU0:vk4# show yang inventory entities ?
entity Actual entity name

RP/0/RSP0/CPU0:vk4# show yang inventory entities
[Cisco-IOS-XR-invmgr-oper inventory entities]
entity/name=Rack 0
attributes
  inv-basic-bag
  description: ASR-9904 AC Chassis
  vendor-type: 1.3.6.1.4.1.9.12.3.1.3.1301
  name: Rack 0
  hardware-revision: V01
  software-revision: 7.2.1.24I
  serial-number: FOX2012GA1J
  manufacturer-name: CISCO SYSTEMS, INC
  model-name: ASR-9904-AC
  is-field-replaceable-unit: true
  composite-class-code: 65536
  unrecognized-fru: false
  unique-id: 8384513
  inv-asset-bag
  part-number: E0
  manufacturer-assembly-number: 68-4854-01
  manufacturer-assembly-revision: E0
  manufacturer-common-language-equipment-identifier: IPWd00BARA
...

```

The YANG data model structure on the right is as follows:

```

module: Cisco-IOS-XR-invmgr-oper
+--ro inventory
+--ro entities
  ...
+--ro racks
  ...

Yang module: Cisco-IOS-XR-invmgr-oper
+--ro inventory
+--ro entity* [name]
+--ro attributes
  +--ro inv-basic-bag
  +--ro description? string
  +--ro vendor-type? string
  +--ro name? string
  +--ro hardware-revision? string
  +--ro firmware-revision? string
  +--ro software-revision? string
  +--ro chip-hardware-revision? string
  +--ro serial-number? string
  +--ro manufacturer-name? string
  +--ro model-name? string
  +--ro asset-id-str? string
  +--ro asset-identification? int32
  +--ro is-field-replaceable-unit? boolean
  +--ro manufacturer-asset-tags? int32
  +--ro composite-class-code? int32
  +--ro memory-size? int32
  +--ro environmental-monitor-path? string
  +--ro alias? string
  +--ro group-flag? boolean
  +--ro new-deviation-number? int32
  +--ro physical-layer-interface-module-type? int32
  +--ro unrecognized-fru? boolean
  +--ro redundancystate? int32
  +--ro ceport? boolean
  +--ro xr-scoped? boolean
  +--ro unique-id? int32
  +--ro inv-asset-bag
  +--ro part-number? string
  +--ro manufacturer-assembly-number? string
  +--ro manufacturer-assembly-revision? string
  +--ro manufacturer-firmware-identifier? string
  +--ro manufacturer-software-identifier? string
  +--ro manufacturer-common-language-equipment-identifier? string
  +--ro original-equipment-manufacturer-string? string

```

Green arrows in the image indicate the mapping between the CLI output and the YANG model structure. For example, the 'show yang inventory ?' command output maps to the 'inventory' container in the YANG model. The 'show yang inventory entities ?' command output maps to the 'entity' container. The 'show yang inventory entities' command output maps to the 'attributes' container and its leaf nodes.

The table shows various queries that can be used to navigate through the hierarchy of a data model using the CLI command. The queries are demonstrated using `Cisco-IOS-XR-interfaces-oper.yang` data model as an example.

Operational Query	Description
Search specific top-level nodes	<p>Search and produce the output of keywords from top-level nodes.</p> <pre>Router#show yang operational</pre> <pre>Router#show yang operational   include &lt;component&gt;</pre> <p>The following example shows the search result for interfaces:</p> <pre>Router#show yang operational   include interface Wed Jul 7 00:02:37.982 PDT drivers-media-eth-oper:ethernet-interface ifmgr-oper:interface-dampening ifmgr-oper:interface-properties interface-cem-oper:cem l2vpn-oper:generic-interface-list-v2 pfi-im-cmd-oper:interfaces</pre>
All the instances of the container	<p>Lists all the models at the root level container and its container name.</p> <pre>Router#show yang operational ?</pre> <p>You can also see the containers for a partially typed keyword. For example, keyword search for <code>mpls-</code> displays all the containers with <code>mpls</code> :</p> <pre>Router#show yang operational mpls- mpls-io-oper-mpls-ea      mpls-io-oper-mpls-ma mpls-ldp-mlldp-oper:mpls-mlldp mpls-lsd-oper:mpls-lsd   mpls-lsp-oper:mpls-lsd-nodes mpls-ldp-mlldp-oper:mpls-mlldp mpls-vpn-oper:l3vpn      mpls-te-oper:mpls-tp mpls-te-oper:mpls-te</pre> <p>View the container data. The output of the command is in-line with the structure of the data model.</p> <pre>Router#show yang operational mpls-static-oper:mpls-static Request datatree:   filter     mpls-static (ka) {   "Cisco-IOS-XR-mpls-static-oper:mpls-static": {     "vrfs": {       "vrf": [         {           "vrf-name": "default"         }       ]     },     "summary": {       "lsp-count": 0,       "label-count": 0,       "label-error-count": 0,       "label-discrepancy-count": 0,       "vrf-count": 1,       "active-vrf-count": 1,       "interface-count": 0,       "interface-forward-reference-count": 0,       "lsd-connected": true,       "ribv4-connected": false,       "ribv6-connected": false     }   } }</pre>

Operational Query	Description
All the nodes of the container	<pre>Router#show yang operational mpls-static-oper:mpls-static ? JSON      Output in JSON format XML       Output in XML format local-labels summary vrfs           Output Modifiers &lt;cr&gt;</pre> <p><b>Output in JSON Format:</b></p> <pre>Router#show yang operational man-netconf-oper:netconf-yang clients JSON Mon Sep 27 11:38:27.158 PST Request datatree:   filter     netconf-yang (ka)       clients {   "Cisco-IOS-XR-man-netconf-oper:netconf-yang": {     "clients": {       "client": [         {           "session-id": "1396267443",           "version": "1.1",           "connect-time": "52436839",           "last-op-time": "1545",           "last-op-type": "get",           "locked": "No"         }       ]     }   } }</pre> <p><b>Output in XML Format:</b></p> <pre>Router#show yang operational man-netconf-oper:netconf-yang clients XML Mon Sep 27 11:38:34.218 PST Request datatree:   filter     netconf-yang (ka)       clients &lt;netconf-yang xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-man-netconf-oper"&gt; &lt;clients&gt;   &lt;client&gt;     &lt;session-id&gt;1396267443&lt;/session-id&gt;     &lt;version&gt;1.1&lt;/version&gt;     &lt;connect-time&gt;52443884&lt;/connect-time&gt;     &lt;last-op-time&gt;1545&lt;/last-op-time&gt;     &lt;last-op-type&gt;get&lt;/last-op-type&gt;     &lt;locked&gt;No&lt;/locked&gt;   &lt;/client&gt; &lt;/clients&gt; &lt;/netconf-yang&gt;</pre>

Operational Query	Description
Navigate until the last leaf level	<pre>Router#show yang operational mpls-static-oper:mpls-static summary ? JSON                               Output in JSON format XML                                 Output in XML format active-vrf-count im-connected interface-count interface-forward-reference-count mpls-enabled-interface-count vrf-count                                     Output Modifiers &lt;cr&gt;</pre> <p>View data specific to the leaf value. The <code>read only (ro)</code> leaves in a YANG model are considered as the state data (operational).</p> <pre>Router#show yang operational mpls-static-oper:mpls-static summary active-vrf-count Request datatree:   filter     mpls-static (ka)       summary         active-vrf-count {   "Cisco-IOS-XR-mpls-static-oper:mpls-static": {     "summary": {       "active-vrf-count": [     ]   } }</pre>

## Model-Driven CLI to Display Running Configuration in XML and JSON Formats

Table 2: Feature History Table

Feature Name	Release Information	Description
Model-driven CLI to Display Running Configuration in XML and JSON Formats	Release 7.3.2	<p>This feature enables you to display the configuration data for Cisco IOS XR platforms in both JSON and XML formats.</p> <p>This feature introduces the <b>show run   [xml   json]</b> command.</p>

The **show run | [xml | json]** command uses native, OpenConfig and unified models to retrieve and display data.

Use the following variations of the command to generate output:

- **show run | [xml | json]**—Shows configuration in YANG XML or JSON tree.
- **show run | [xml | json] openconfig**—Shows configuration in OpenConfig YANG XML tree.

- **show run | [xml | json] unified**—Shows configuration in unified model YANG XML tree.
- **show run component | [xml | json]**—Shows configuration in YANG XML or JSON tree for the top-level component. For example, **show run interface | xml**
- **show run component | [xml | json] unified**—Shows configuration in unified model YANG XML or JSON tree for the top-level component. For example, **show run interface | json unified**
- **show run component subcomponent | [xml | json]**—Shows configuration in YANG XML or JSON tree for the granular-level component. For example, **show run router bgp 12 neighbor 12.12.12.12 | xml**
- **show run component subcomponent | [xml | json] unified**—Shows configuration in unified model YANG XML or JSON tree for the granular-level component. For example, **show run router bgp 12 neighbor 12.12.12.12 | json unified**

## XML Output

```
Router#show run | xml
Building configuration...
<data>
  <interface-configurations xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-ifmgr-cfg">
    <interface-configuration>
      <active>act</active>
      <interface-name>GigabitEthernet0/0/0/0</interface-name>
      <shutdown></shutdown>
    </interface-configuration>
    <interface-configuration>
      <active>act</active>
      <interface-name>GigabitEthernet0/0/0/1</interface-name>
      <shutdown></shutdown>
    </interface-configuration>
    <interface-configuration>
      <active>act</active>
      <interface-name>GigabitEthernet0/0/0/2</interface-name>
      <shutdown></shutdown>
    </interface-configuration>
  </interface-configurations>
  <interfaces xmlns="http://cisco.com/ns/yang/Cisco-IOS-XR-um-interface-cfg">
    <interface>
      <interface-name>GigabitEthernet0/0/0/0</interface-name>
      <shutdown/>
    </interface>
    <interface>
      <interface-name>GigabitEthernet0/0/0/1</interface-name>
      <shutdown/>
    </interface>
    <interface>
      <interface-name>GigabitEthernet0/0/0/2</interface-name>
      <shutdown/>
    </interface>
  </interfaces>
</data>
```

## JSON Output

```
Router#show run | json
Building configuration...
{
  "data": {
    "Cisco-IOS-XR-ifmgr-cfg:interface-configurations": {
      "interface-configuration": [
        {
          "active": "act",
```

```

    "interface-name": "GigabitEthernet0/0/0/0",
    "shutdown": [
      null
    ]
  },
  {
    "active": "act",
    "interface-name": "GigabitEthernet0/0/0/1",
    "shutdown": [
      null
    ]
  },
  {
    "active": "act",
    "interface-name": "GigabitEthernet0/0/0/2",
    "shutdown": [
      null
    ]
  }
],
"Cisco-IOS-XR-man-netconf-cfg:netconf-yang": {
  "agent": {
    "ssh": true
  }
},
}

```

### Granular-Level Component Output

```

Router#sh run router bgp 12 neighbor 12.12.12.12 | json unified
{
  "data": {
    "Cisco-IOS-XR-um-router-bgp-cfg:router": {
      "bgp": {
        "as": [
          {
            "as-number": 12,
            "neighbors": {
              "neighbor": [
                {
                  "neighbor-address": "12.12.12.12",
                  "remote-as": 12,
                  "address-families": {
                    "address-family": [
                      {
                        "af-name": "ipv4-unicast"
                      }
                    ]
                  }
                }
              ]
            }
          }
        ]
      }
    }
  }
}

```

### Unified Model Output

```

Router#sh run router bgp 12 | xml unified
<data>
  <router xmlns=http://cisco.com/ns/yang/Cisco-IOS-XR-um-router-bgp-cfg>
    <bgp>

```

```
<as>
  <as-number>12</as-number>
  <bgp>
    <router-id>1.1.1.1</router-id>
  </bgp>
  <address-families>
    <address-family>
      <af-name>ipv4-unicast</af-name>
    </address-family>
  </address-families>
  <neighbors>
    <neighbor>
      <neighbor-address>12.12.12.12</neighbor-address>
      <remote-as>12</remote-as>
      <address-families>
        <address-family>
          <af-name>ipv4-unicast</af-name>
        </address-family>
      </address-families>
    </neighbor>
  </neighbors>
</as>
</bgp>
</router>
</data>
```