



## Model-Driven Telemetry

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This document provides information on the support for Model-Driven Telemetry and how to configure Cisco cBR series routers to avail the support.

Your software release may not support all the features that are documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. The Feature Information Table at the end of this document provides information about the documented features and lists the releases in which each feature is supported.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to <http://tools.cisco.com/ITDIT/CFN/>. An account on <http://www.cisco.com/> is not required.

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## Hardware Compatibility Matrix for the Cisco cBR Series Routers



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**Note** The hardware components that are introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

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Table 1: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	<b>Cisco IOS-XE Release 16.5.1 and Later Releases</b> Cisco cBR-8 Supervisor: <ul style="list-style-type: none"> <li>• PID—CBR-SUP-250G</li> <li>• PID—CBR-CCAP-SUP-160G</li> </ul>	<b>Cisco IOS-XE Release 16.5.1 and Later Releases</b> Cisco cBR-8 CCAP Line Cards: <ul style="list-style-type: none"> <li>• PID—CBR-LC-8D30-16U30</li> <li>• PID—CBR-LC-8D31-16U30</li> <li>• PID—CBR-RF-PIC</li> <li>• PID—CBR-RF-PROT-PIC</li> <li>• PID—CBR-CCAP-LC-40G</li> <li>• PID—CBR-CCAP-LC-40G-R</li> <li>• PID—CBR-CCAP-LC-G2-R</li> <li>• PID—CBR-SUP-8X10G-PIC</li> <li>• PID—CBR-2X100G-PIC</li> </ul> Digital PICs: <ul style="list-style-type: none"> <li>• PID—CBR-DPIC-8X10G</li> <li>• PID—CBR-DPIC-2X100G</li> </ul> Cisco cBR-8 Downstream PHY Module: <ul style="list-style-type: none"> <li>• PID—CBR-D31-DS-MOD</li> </ul> Cisco cBR-8 Upstream PHY Modules: <ul style="list-style-type: none"> <li>• PID—CBR-D31-US-MOD</li> </ul>



**Note** Do not use DPICs (8X10G and 2x100G) to forward IP traffic, as it may cause buffer exhaustion, leading to line card reload.

The only allowed traffic on a DPIC interface is DEPI, UEPI, and GCP traffic from the Cisco cBR-8 router to Remote PHY devices. Other traffic such as DHCP, SSH, and UTSC should flow via another router, since DPICs cannot be used for normal routing.

# Information About Model-Driven Telemetry

Model-driven telemetry allows Cisco cBR-8 Converged Broadband Router to continuously stream real time configuration and operating state information to collectors. This module describes model-driven telemetry and provides sample telemetry RPCs.

Model-driven telemetry uses YANG models to express available data. Contents of supported YANG files can be retrieved from cBR8 directly. Collectors can subscribe to specific data items they need, by using these standard-based YANG data models. Telemetry can continuously stream data to the collector with periodical or on-change mode.

YANG-filed MIBs models, following DOCSIS MIBs are converted to YANG models, and they are automatically converted from legacy MIB file to YANG file. All the data for a converted MIB is received from the legacy SNMP agent and then sent to Telemetry receiver by gRPC/NETCONF.

Cisco IOS XE Gibraltar 16.12.1 on Cisco cBR Series Converged Broadband Router includes a native **Cisco-IOS-XE-docsis-oper** YANG file along with the YANG-filed MIB models. In the **Cisco-IOS-XE-docsis-oper** YANG file the output of some show commands will be modeled.



**Note** Ensure that you have enabled the **cable bgsync active** CLI for **Cisco-IOS-XE-docsis-oper**. The **Cisco-IOS-XE-docsis-oper** is required to get the correct data for cable modems.

- CISCO-CABLE-SPECTRUM-MIB
- CISCO-CABLE-WIDEBAND-MIB
- CISCO-DOCS-EXT-MIB
- DOCS-IF-MIB
- DOCS-IF3-MIB
- DOCS-QOS-MIB
- DOCS-SUBMGT3-MIB
- CISCO-ENVMON-MIB
- CISCO-PROCESS-MIB
- OLD-CISCO-INTERFACES-MIB
- SNMPv2-MIB
- ENTITY-MIB
- IF-MIB

## Restrictions for Model Driven Telemetry

Following are the restrictions on using the Model-Driven Telemetry:

- All DOCSIS-specific models are supported for periodical push. On-change push is not supported.
- For the same MIB model, a NETCONF subscription's performance is lower than the legacy SNMP walk.

## Prerequisites to Enable Telemetry

Run the following command to ensure that the prerequisites are in place to configure Telemetry:

```
conf t
ip ssh version 2
netconf-yang
netconf-yang cisco-ia snmp-community-string testing-mib-yang
snmp-server community testing-mib-yang RO
end
```

Ensure that you go through the following recommendations before configuring telemetry:

- Use the **show platform software yang-management process** command to verify that all related processes are running.
- The default listening tcp port number for NETCONF is 830. You can change the default port by using the **netconf-yang ssh port** CLI.
- An snmp-community-string is needed for gRPC/NETCONF to retrieve YANG filed MIB. The default snmp-community-string is 'private'.

## Configuring Telemetry

The following Telemetry protocols are supported on Cisco cBR-8 Converged Broadband Router:

- **gRPC**: gRPC only supports Dial-Out (Configured/Static). Initial connection starts from cBR8 triggered by CLI configuration.
- **NETCONF**: NETCONF only supports Dial-In (Dynamic). Initial connection starts from telemetry collectors.

## Configuring Telemetry using gRPC

The gRPC only supports the dial-out method. You need CLI configurations on cBR-8 to create a gRPC subscription.

To create a dial-out subscription, go through the following sample. Note that the parameters in bold cannot be changed.

```
Conf t
telemetry ietf subscription 100
encoding encode-kvgpb
filter xpath /IF-MIB:IF-MIB/ifTable/ifEntry[ifIndex=263975]
source-address 172.22.9.102
stream yang-push
update-policy periodic 3000
```

```
receiver ip address 10.79.41.133 57566 protocol grpc-tcp
end
```




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**Note** Multiple target XPath is not supported.

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To delete a subscription, run the **no telemetry ietf subscription 100** command.

The following show commands are supported for gRPC:

- **show telemetry ietf subscription configured detail**
- **show telemetry ietf subscription 100 receiver**

The following examples illustrate the usage of the show commands:

```
router# show telemetry ietf subscription configured detail
```

```
Telemetry subscription detail:
```

```
Subscription ID: 100
State: Valid
Stream: yang-push
Filter:
  Filter type: xpath
  XPath: /IF-MIB:IF-MIB/ifTable/ifEntry[ifIndex=263975]
Update policy:
  Update Trigger: periodic
  Period: 3000
Encoding: encode-kvgpb
Source VRF: Mgmt-intf
Source Address: 172.22.9.102
Notes:
```

```
Receivers:
```

Address	Port	Protocol	Protocol Profile
-----			
10.79.41.133	57566	grpc-tcp	

```
router# show telemetry ietf subscription 100 receiver
```

```
Telemetry subscription receivers detail:
```

```
Subscription ID: 100
Address: 10.79.41.133
Port: 57566
Protocol: grpc-tcp
Profile:
State: Connected
Explanation:
```



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- Note**
- A **Valid** state denotes that the configuration is good and accepted.
  - A **Connected** state denotes that the TCP connection is established.
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## Configuring Telemetry using NETCONF

The NETCONF communication happens in the following sequence:

1. Connect to device. Say **<hello>**.
2. Retrieve **<capabilities>**.
3. Investigate and choose the appropriate model.
4. Compose operation.
5. Send message **<rpc>**.
6. Retrieve **<rpc-reply>**.
7. Process **<data>**.

The following example lists how a Telemetry subscriber subscribes to an instances in an MIB:

```
<establish-subscription
  xmlns="urn:ietf:params:xml:ns:yang:ietf-event-notifications"
  xmlns:yp="urn:ietf:params:xml:ns:yang:ietf-yang-push">
  <stream>yp:yang-push</stream>

  <yp:xpath-filter>/IF-MIB:IF-MIB/ifTable/ifEntry[ifIndex=&quot;263975&quot;]</yp:xpath-filter>
  <yp:period>3000</yp:period>
</establish-subscription>

<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="2">
<subscription-result xmlns='urn:ietf:params:xml:ns:yang:ietf-event-notifications'
xmlns:notif-bis="urn:ietf:params:xml:ns:yang:ietf-event-notifications">notif-bis:ok</subscription-result>
<subscription-id
xmlns='urn:ietf:params:xml:ns:yang:ietf-event-notifications'>2147483655</subscription-id>
</rpc-reply>
```



### Note

- The **ifIndex** option lists the model defined in the YANG file.
- The **yp:period** lists the expected time interval between push updates (3000 centisecond in this example).

The following is an example of the show or delete NETCONF subscription option:

```
Router# show telemetry ietf subscription 2147483655 detail
Telemetry subscription detail:
Subscription ID: 2147483655
Type: Dynamic
State: Valid
Stream: yang-push
Filter:
  Filter type: xpath
  XPath: /IF-MIB:IF-MIB/ifTable/ifEntry[ifIndex="263975"]
Update policy:
  Update Trigger: periodic
  Period: 3000
Encoding: encode-xml
Source VRF:
```

Source Address:

Notes:

Receivers:

Address

Port

Protocol

Protocol Profile

10.79.41.133

38914

netconf

Router# clear telemetry ietf subscription 2147483655

## Feature Information for Model-Driven Telemetry

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the <https://cfmng.cisco.com/> link. An account on the Cisco.com page is not required.



**Note** The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

**Table 2: Feature Information for Model-Driven Telemetry**

Feature Name	Releases	Feature Information
Model-Driven Telemetry	Cisco IOS XE Gibraltar 16.12.1	This feature was introduced in Cisco IOS XE Gibraltar 16.12.1 on Cisco cBR Series Converged Broadband Router.

