Configuring Traffic Mirroring on the Cisco IOS XR Software

This module describes the configuration of traffic mirroring on the Cisco CRS Router. Traffic mirroring is sometimes called port mirroring, or switched port analyzer (SPAN).

Feature History for Configuring Traffic Mirroring on the Cisco CRS Router

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release 4.3.0</td>
<td>This feature was introduced on the Cisco CRS Router.</td>
</tr>
</tbody>
</table>

Contents

- Restrictions for Traffic Mirroring, page 284
- Information about Traffic Mirroring, page 284
- Configuring Traffic Mirroring, page 287
- Traffic Mirroring Configuration Examples, page 292
- Additional References, page 296
- Additional References, page 296
Restrictions for Traffic Mirroring

A maximum of eight monitoring sessions, and 800 source ports are supported.

You can configure 800 source ports on a single monitoring session, or configure an aggregate total of 800 source ports on a maximum of eight monitoring sessions.

These forms of traffic mirroring are not supported:

- Mirroring traffic to a GRE tunnel (also known as Encapsulated Remote Switched Port Analyzer [ER-SPAN] in Cisco IOS Software).
- MPLS traffic or tunnel traffic.
- Layer 2 traffic mirroring.
- VRF at destination ports.
- Mirroring for POS interfaces.
- Mirroring of egress traffic.

Information about Traffic Mirroring

These sections provide information about traffic mirroring:

- Introduction to Traffic Mirroring, page 284
- Traffic Mirroring Terminology, page 285

Introduction to Traffic Mirroring

Traffic mirroring, which is sometimes called port mirroring, or Switched Port Analyzer (SPAN) is a Cisco proprietary feature that enables you to monitor Layer 3 network traffic passing in, or out of, a set of Ethernet interfaces. You can then pass this traffic to a network analyzer for analysis.

Traffic mirroring copies traffic from one or more Layer 3 interfaces or sub-interfaces and sends the copied traffic to one or more destinations for analysis by a network analyzer or other monitoring device. Traffic mirroring does not affect the switching of traffic on the source interfaces or sub-interfaces, and allows the mirrored traffic to be sent to a destination next-hop address.

Traffic mirroring was introduced on switches because of a fundamental difference between switches and hubs. When a hub receives a packet on one port, the hub sends out a copy of that packet from all ports except from the one to which the hub received the packet. In the case of switches, after a switch boots, it starts to build up a Layer 2 forwarding table on the basis of the source MAC address of the different packets that the switch receives. After this forwarding table is built, the switch forwards traffic that is destined for a MAC address directly to the corresponding port.

Layer 2 SPAN is not supported on the Cisco CRS Router. The difference from Layer 2 SPAN is that the destination for mirrored packets is specified as a next-hop IP address rather than an explicit interface, and only Layer 3 packets are mirrored. In the Cisco IOS XR Software Release 4.3.0, it is assumed that the next-hop IP address should be looked up in the default VRF routing table.
Implementing Traffic Mirroring on the Cisco CRS Router

Traffic Mirroring Terminology

- Ingress Traffic — Traffic that comes into the router.
- Egress Traffic — Traffic that goes out of the router.
- Source (SPAN) interface — An ingress interface that is monitored using the SPAN feature.
- Destination (SPAN) Nexthop — An egress Nexthop address where a network analyzer is connected.
- Monitor Session A designation for a collection of SPAN configurations consisting of many source interfaces and a set of destinations. In the Cisco IOS XR Software Release 4.3.0, only one destination is supported per monitor session.

Characteristics of the Source Port

A source port, also called a monitored port, is a routed port that you monitor for network traffic analysis. In a single traffic mirroring session, you can monitor source port traffic. Your router can support any number of source ports (up to a maximum number of 800).

A source port has these characteristics:

- It can be any port type, such as Bundle Interface, Gigabit Ethernet, 10-Gigabit Ethernet, or EFPs.

Note Bridge group virtual interfaces (BVIs) are not supported.

- Each source port can be monitored in at most one traffic mirroring session.
- Interfaces over which mirrored traffic may be routed must not be configured as a source port.
- ACL-based traffic mirroring. Traffic is mirrored based on the configuration of the global interface ACL. This is optional on the Cisco CRS Router.
### Information about Traffic Mirroring

*Figure 26: Network Analysis on a Cisco CRS Router With Traffic Mirroring*

In *Figure 26*, the network analyzer is attached to a port that is configured to receive a copy of every packet that host A sends. This port is called a traffic mirroring port.

**Characteristics of the Monitor Session**

A monitor session is a collection of traffic mirroring configurations consisting of a single destination and, potentially, many source interfaces. For any given monitor session, the traffic from the source interfaces (called *source ports*) is sent to the destination. Some optional operations such as ACL filtering can be performed on the mirrored traffic streams. If there is more than one source port in a monitoring session, the traffic from the several mirrored traffic streams is combined at the destination. The result is that the traffic that comes out of the destination is a combination of the traffic from one or more source ports, and the traffic from each source port may or may not have ACLs applied to it.

Monitor sessions have the following characteristics:

- A single Cisco CRS Router can have a maximum of eight monitor sessions.
- A single monitor session can have only one destination.
- A single destination can belong to only one monitor session.
- A single Cisco CRS Router can have a maximum of 800 source ports.
- A monitor session can have a maximum of 800 source ports, as long as the maximum number of source ports from all monitoring sessions does not exceed 800.

**Characteristics of the Destination**

Each session must have a destination that receives a copy of the traffic from the source ports.

A destination has these characteristics:

- A destination is defined by IP address (IPv4 or IPv6), and is not tied to a specific interface (as routing decides which interface the mirrored packets are actually sent over).
- No two monitor sessions must have the same destination IP address.
- Any interface over which the mirrored traffic could potentially be routed must not be configured as a source port.
Figure 27  Network Analysis on a Cisco CRS Router With Traffic Mirroring

<table>
<thead>
<tr>
<th></th>
<th>Source traffic mirroring ports (can be ingress or egress traffic ports)</th>
<th>Destination traffic mirroring port</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Configuring Traffic Mirroring

These tasks describe how to configure traffic mirroring:

- How to Configure Layer-3 Traffic Mirroring, page 287
- How to Configure ACL-Based Traffic Mirroring, page 289

How to Configure Layer-3 Traffic Mirroring

SUMMARY STEPS

1. configure
2. monitor-session session-name [ipv4|ipv6]
3. destination next-hop <ip address>
4. exit
5. interface source-interface
6. monitor-session session-name [ipv4|ipv6] [direction {rx-only|tx-only}]
7. end
   or
   commit
8. show monitor-session [session-name] status
## Configuring Traffic Mirroring on the Cisco IOS XR Software

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RP0/CPU0:router# configure</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> monitor-session session-name [ipv4</td>
<td>ipv6]</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RP0/CPU0:router(config)# monitor-session mon1</code> <code>RP/0/RP0/CPU0:router(config-mon)#</code></td>
<td>Note: This command triggers entry in to the monitor-session sub-mode and creates the session. The session is non-operable until a destination is configured for the session. The destination can be either an IPv4 or IPv6 address.</td>
</tr>
<tr>
<td><strong>Step 3</strong> destination next-hop ip address</td>
<td>Configures the destination for the current monitor-session to be a next-hop IP address (whose type matches that of the monitor-session).</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RP0/CPU0:router(config-mon)# destination next-hop ipv4 254.23.24.5</code></td>
<td>Note: This may only be specified for ipv4 and ipv6 monitor-sessions. A monitor session can be either for IPv4 or for IPv6. It cannot support both together.</td>
</tr>
<tr>
<td><strong>Step 4</strong> exit</td>
<td>Exits monitor session configuration mode and returns to global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RP0/CPU0:router(config-mon)# exit</code> <code>RP/0/RP0/CPU0:router(config)#</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> interface source-interface</td>
<td>Enters interface configuration mode for the specified interface. The interface number is entered in rack/slot/module/port notation. For more information about the syntax for the router, use the question mark (?) online help function.</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RP0/CPU0:router(config)# interface gigabitethernet0/0/0/11.10</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong> monitor-session session-name {ipv4</td>
<td>ipv6} [direction {rx-only</td>
</tr>
<tr>
<td><strong>Example:</strong> <code>RP/0/RP0/CPU0:router(config-if)# monitor-session mon1</code></td>
<td>Note: If no type is given, ethernet is assumed. Only Rx traffic is mirrored.</td>
</tr>
</tbody>
</table>
How to Configure ACL-Based Traffic Mirroring

Prerequisites

The global interface ACL should be configured using one of these commands with the capture keyword:

- ipv4 access-list
- ipv6 access-list
- ethernet-services access-list

For more information, refer to the Cisco IOS XR IP Addresses and Services Command Reference for the Cisco CRS Router or the Cisco IOS XR Virtual Private Network Command Reference for the Cisco CRS Router.

SUMMARY STEPS

1. configure
2. monitor-session session-name [ipv4|ipv6]
3. destination next-hop <ip address>
Configuring Traffic Mirroring on the Cisco IOS XR Software

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RP0/CPU0:router# configure</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> monitor-session session-name [ipv4</td>
<td>ipv6]</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RP0/CPU0:router(config)# monitor-session mon1</td>
<td>Note: This command triggers entry in to the monitor-session sub-mode and creates the session. The session is non-operable until a destination is configured for the session. The destination can be either an IPv4 or IPv6 address.</td>
</tr>
<tr>
<td><strong>Step 3</strong> destination next-hop ip address</td>
<td>Configures the destination for the current monitor-session to be a next-hop IP address (whose type matches that of the monitor-session).</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RP0/CPU0:router(config-mon)# destination next-hop ipv4 254.23.24.5</td>
<td>Note: This may only be specified for ipv4 and ipv6 monitor-sessions. A monitor session can be either for IPv4 or for IPv6. It cannot support both together.</td>
</tr>
<tr>
<td><strong>Step 4</strong> exit</td>
<td>Exits monitor session configuration mode and returns to global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RP0/CPU0:router(config-mon)# exit</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> interface source-interface</td>
<td>Enters interface configuration mode for the specified interface. The interface number is entered in rack/slot/module/port notation. For more information about the syntax for the router, use the question mark (?) online help function.</td>
</tr>
<tr>
<td><strong>Example:</strong> RP/0/RP0/CPU0:router(config)# interface gigabitethernet0/0/11</td>
<td></td>
</tr>
</tbody>
</table>
### Configuring Traffic Mirroring

#### Command or Action

**Step 6**  
`ethernet-services access-group access-list-name [ingress | egress]`
  
  **Example:**  
  RP/0/RP0/CPU0:router(config-if)# ethernet-services access-group acl1 ingress

**Step 7**  
`monitor-session session-name [ipv4|ipv6] [direction {rx-only|tx-only}]`
  
  **Example:**  
  RP/0/RP0/CPU0:router(config-if)# monitor-session mon1 direction rx-only

**Step 8**  
`acl`
  
  **Example:**  
  RP/0/RP0/CPU0:router(config-if-mon)# acl

**Step 9**  
`end`  
`commit`
  
  **Example:**  
  RP/0/RP0/CPU0:router(config-if)# end  
  or  
  RP/0/RP0/CPU0:router(config-if)# commit

**Step 10**  
`show monitor-session [session-name] status [detail] [error]`
  
  **Example:**  
  RP/0/RP0/CPU0:router# show monitor-session

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 6</strong></td>
<td>Associates the access list definition with the interface being mirrored.</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Specifies the monitor session to be used on this interface.</td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td>Specifies that the traffic mirrored is according to the defined global interface ACL.</td>
</tr>
<tr>
<td><strong>Step 9</strong></td>
<td>Saves configuration changes.</td>
</tr>
<tr>
<td><strong>Step 10</strong></td>
<td>Displays information about the monitor session.</td>
</tr>
</tbody>
</table>

#### Troubleshooting ACL-Based Traffic Mirroring

Note the following configuration issues:

- Even when the `acl` command is configured on the source mirroring port, if the ACL configuration command does not use the `capture` keyword, no traffic gets mirrored.
• If the ACL configuration uses the capture keyword, but the acl command is not configured on the source port, although traffic is mirrored, no access list configuration is applied.

This example correctly shows both the capture keyword in the ACL definition and the acl command configured on the interface:

monitor-session tm_example
!
eternet-services access-list tm_filter
 10 deny 0000.1234.5678 0000.abcd.abcd any capture
!
interface GigabitEthernet0/2/0/0
monitor-session tm_example direction rx-only
  acl
      ethernet-services access-group tm_filter ingress
!
end

Traffic Mirroring Configuration Examples

This section contains examples of how to configure traffic mirroring:

• Viewing Monitor Session Status: Example, page 292
• Monitor Session Statistics: Example, page 293
• Layer 3 ACL-Based Traffic Mirroring: Example, page 293

Viewing Monitor Session Status: Example

This example shows sample output of the show monitor-session command with the status keyword:

RP/0/RP0/CPU0:router# show monitor-session test status

Monitor-session test (ipv4)

Destination Nexthop 255.254.254.4
========================================================================================
Source Interface Dir         Status
----------------------------------------------------------------------------------------
Gi0/0/0/2.2      Rx Not operational (source same as destination)
Gi0/0/0/2.3       Rx Not operational (Destination not active)
Gi0/0/0/2.4       Rx Operational
Gi0/0/0/4         Rx Error: see detailed output for explanation

RP/0/RP0/CPU0:router# show monitor-session test status error

Monitor-session test
Destination Nexthop ipv4 address 255.254.254.4
==================================================================================================
Source Interface            Status
===============================================================================================
Gi0/0/0/4                  < Error: FULL Error Details >
Monitor Session Statistics: Example

Use the `show monitor-session` command with the `counters` keyword to show the statistics/counters (received/transmitted/dropped) of different source ports. For each monitor session, this command displays a list of all source interfaces and the replicated packet statistics for that interface.

The full set of statistics displayed for each interface is:

- RX replicated packets and octets
- TX replicated packets and octets
- Non-replicated packet and octets

```
RP/0/RP0/CPU0:router# show monitor-session counters
Monitor-session msl
GigabitEthernet0/2/0/19.10
  Rx replicated: 1000 packets, 68000 octets
  Tx replicated: 1000 packets, 68000 octets
  Non-replicated: 0 packets, 0 octets
```

Use the `clear monitor-session counters` command to clear any collected statistics. By default this command clears all stored statistics; however, an optional interface filter can be supplied.

```
RP/0/RP0/CPU0:router# clear monitor-session counters
```

Layer 3 ACL-Based Traffic Mirroring: Example

This example shows how to configure Layer 3 ACL-based traffic mirroring:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# monitor-session msl
RP/0/RP0/CPU0:router(config-mon)# destination next-hop 10.1.1.0
RP/0/RP0/CPU0:router(config-mon)# commit

RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# interface gig0/2/0/11
RP/0/RP0/CPU0:router(config-if)# ipv4 access-group span ingress
RP/0/RP0/CPU0:router(config-if)# monitor-session msl
RP/0/RP0/CPU0:router(config-if-mon)# commit

RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)# ipv4 access-list span
RP/0/RP0/CPU0:router(config)# ipv4 access-group span
RP/0/RP0/CPU0:router(config-ipv4-acl)# 5 permit ipv4 any any dscp 5 capture
RP/0/RP0/CPU0:router(config-ipv4-acl)# 10 permit ipv4 any any
RP/0/RP0/CPU0:router(config-ipv4-acl)# commit
```

Troubleshooting Traffic Mirroring

When you have issues with your traffic mirroring, begin your troubleshooting by checking the output of the `show monitor-session status` command. This command displays the recorded state of all sessions and source interfaces:

```
Monitor-session sess1
<Session status>

Source Interface  Dir  Status
```

Cisco IOS XR Interface and Hardware Component Configuration Guide for the Cisco
Traffic Mirroring Configuration Examples

In the preceding example, the line marked as `<Session status>` can indicate one of these configuration errors:

<table>
<thead>
<tr>
<th>Session Status</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session is not configured globally</td>
<td>The session does not exist in global configuration. Check <code>show run</code> command output to ensure that a session with the right name has been configured.</td>
</tr>
<tr>
<td>Destination next-hop IPv4/IPv6 address <code>&lt;addr&gt;</code> is not configured</td>
<td>The IPv4 or IPv6 address that has been configured as the destination does not exist.</td>
</tr>
<tr>
<td>Destination next-hop IPv4 address <code>&lt;addr&gt;</code> not reachable</td>
<td>The IPv4 or IPv6 address that has been configured as the destination is not reachable or is not in the Up state. You can verify the status of the destination using the <code>show monitor-session status detail</code> command.</td>
</tr>
</tbody>
</table>

The `<Source interface status>` can report these messages:

<table>
<thead>
<tr>
<th>Source Interface Status</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>Everything appears to be working correctly in traffic mirroring PI. Please follow up with the platform teams in the first instance, if mirroring is not operating as expected.</td>
</tr>
<tr>
<td>Not operational (Session is not configured globally)</td>
<td>The session does not exist in global configuration. Check the <code>show run</code> command output to ensure that a session with the right name has been configured.</td>
</tr>
<tr>
<td>Not operational (destination not known)</td>
<td>The session exists, but it either does not have a destination interface specified, or the destination interface named for the session does not exist (for example, if the destination is a sub-interface that has not been created).</td>
</tr>
<tr>
<td>Not operational (destination not active)</td>
<td>The destination interface or pseudowire is not in the Up state. See the corresponding <code>Session status</code> error messages for suggested resolution.</td>
</tr>
<tr>
<td>Not operational (source state <code>&lt;down-state&gt;</code>)</td>
<td>The source interface is not in the Up state. You can verify the state using the <code>show interfaces</code> command. Check the configuration to see what might be keeping the interface from coming up (for example, a sub-interface needs to have an appropriate encapsulation configured).</td>
</tr>
<tr>
<td>Error: see detailed output for explanation</td>
<td>Traffic mirroring has encountered an error. Run the <code>show monitor-session status detail</code> command to display more information.</td>
</tr>
</tbody>
</table>
The `show monitor-session status detail` command displays full details of the configuration parameters, and of any errors encountered. For example:

```
RP/0/RP0/CPU0:router# show monitor-session status detail
```

```
Monitor-session foo
Destination next-hop GigabitEthernet 0/0/0/0
Source Interfaces
-----------------
GigabitEthernet 0/1/0/0.100:
  Direction: Both
  Status:    Operating
GigabitEthernet 0/2/0/0.200:
  Direction: Tx
  Status:    Error: <blah>

Monitor session bar
No destination configured
Source Interfaces
-----------------
GigabitEthernet 0/3/0/0.100:
  Direction: Rx
  Status:    Not operational(no destination)
```

This detailed output may give you a clear indication of what the problem is.

Here are additional trace and debug commands:

```
RP/0/RP0/CPU0:router# show monitor-session platform trace ?
  all     Turn on all the trace
  errors  Display errors
  events  Display interesting events

RP/0/RP0/CPU0:router# show monitor-session trace ?
  process Filter debug by process

RP/0/RP0/CPU0:router# debug monitor-session platform ?
  all     Turn on all the debugs
  errors  CRS SPAN EA errors
  event   CRS SPAN EA event
  info    CRS SPAN EA info

RP/0/RP0/CPU0:router# debug monitor-session platform all
RP/0/RP0/CPU0:router# debug monitor-session platform event
RP/0/RP0/CPU0:router# debug monitor-session platform info
```

```
RP/0/RP0/CPU0:router# show monitor-session status ?
  detail Display detailed output
  errors  Display only attachments which have errors
  internal Display internal monitor-session information
           Output Modifiers

RP/0/RP0/CPU0:router# show monitor-session status
RP/0/RP0/CPU0:router# show monitor-session status errors
RP/0/RP0/CPU0:router# show monitor-session status internal
```
Additional References

These sections provide references related to implementing traffic mirroring.

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS XR master command reference</td>
<td>Cisco IOS XR Master Commands List for the Cisco CRS Router</td>
</tr>
<tr>
<td>Cisco IOS XR interface configuration commands</td>
<td>Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco CRS Router</td>
</tr>
<tr>
<td>Information about user groups and task IDs</td>
<td>Cisco IOS XR Interface and Hardware Component Command Reference for the Cisco CRS Router</td>
</tr>
</tbody>
</table>

Standards

<table>
<thead>
<tr>
<th>Standards</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>—</td>
</tr>
</tbody>
</table>

MIBs

<table>
<thead>
<tr>
<th>MIBs</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>To locate and download MIBs for selected platforms using Cisco IOS XR Software, use the Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
</tr>
</tbody>
</table>

RFCs

<table>
<thead>
<tr>
<th>RFCs</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.</td>
<td>—</td>
</tr>
</tbody>
</table>
## Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/support">http://www.cisco.com/support</a></td>
</tr>
</tbody>
</table>