G.8032 Ethernet Ring Protection

Cisco Catalyst IE3100 Heavy Duty Series
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1 G.8032 Ethernet Ring Protection

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- G.8032 Ethernet Ring Protection
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- Feature history table

G.8032 Ethernet Ring Protection

Explains the G.8032 Ethernet Ring Protection feature that implements protection switching mechanisms for Ethernet layer ring topologies.

G.8032 Ethernet ring protection is a protection switching feature that

- implements protection switching mechanisms for Ethernet layer ring topologies
- uses the G.8032 Ethernet ring protection (ERP) protocol version 1, defined in ITU-T G.8032, and
- provides protection for Ethernet traffic in a ring topology with non-Cisco devices.

Ring protection links

Explains the specific links used to protect Ethernet rings from loops, ensuring stable network functionality by preventing network disruptions.

Ring protection links are specialized Ethernet ring links that

- ensure continuous network connectivity by protecting the ring from disruptions,
- prohibit the formation of loops that can affect the network, and
- provide redundancy, allowing the Ethernet ring to function even if some links fail.

Ethernet ring structure

An Ethernet ring consists of multiple Ethernet ring nodes. Each node connects to adjacent nodes using two independent ring links. A ring link is defined by the two adjacent nodes it connects and the port used for the ring link (also known as a ring port). There must be at least two Ethernet ring nodes for the ring topology to be valid.

ITU-T G.8032 Ethernet ring protection switching functionality

Describes the Ethernet ring protection functionality that prevents loops and manages traffic flow in ring topologies.

ITU-T G.8032 Ethernet ring protection switching functionality is a network protection mechanism that

- provides loop avoidance,
- uses learning, forwarding, and Filtering Database (FDB) mechanisms, and
- ensures traffic flows continuously through all links except the Ring Protection Link (RPL).

RPL node types and functions

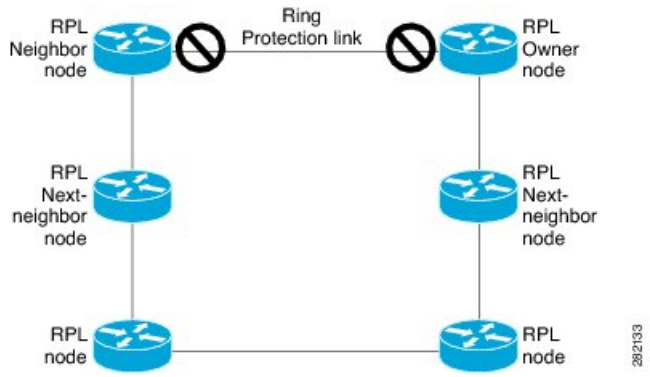
Loop avoidance in an Ethernet ring is achieved by ensuring traffic flows continuously through all links except the Ring Protection Link (RPL).

This is a list of RPL types (or RPL nodes) and their functions:

- RPL owner: Responsible for blocking traffic over the RPL to prevent loops in the Ethernet traffic. There can be only one RPL owner in a ring.
- RPL neighbor node: An Ethernet ring node adjacent to the RPL. It is responsible for blocking its end of the RPL under normal conditions. This node type is optional and prevents RPL usage when protected.
- RPL next-neighbor node: Next-neighbor node is an Ethernet ring node adjacent to an RPL owner node or RPL neighbor node. It is mainly used for FDB flush optimization on the ring. This node is also optional.

The figure illustrates the G.8032 Ethernet ring topology.

Figure 1: G.8032 Ethernet ring topology



R-APS control messages

Describes control messages that nodes on the ring use to coordinate switching the ring protection link on and off.

R-APS control messages are ring coordination mechanisms that

- coordinate switching the ring protection link (RPL) on and off between nodes on the ring
- trigger when a failure occurs along the ring, sending R-APS Signal Failure (R-APS SF) messages in both directions from nodes adjacent to the failed link after they block the port facing the failed link, and
- cause the RPL owner to unblock the RPL port upon receipt of this message.

Loop-free topology behavior

Note

A single link failure in the ring ensures a loop-free topology.

CFM protocols and link failures

Describes how Connectivity Fault Management (CFM) protocols detect and respond to ring link and node failures in Ethernet Ring Protection implementations.

CFM protocols and link failures are network fault detection mechanisms that

- use Connectivity Fault Management (CFM) and line status messages to detect ring link and node failures
- enable Ring Automatic Protection Switching (R-APS) messages for recovery coordination when failed links are restored, and
- support the Ethernet Ring Protection (ERP) protocol for both unidirectional failure and multiple link failure scenarios in a ring topology.

CFM protocol operation and performance

During the recovery phase, when the failed link is restored, the nodes adjacent to the restored link send Ring Automatic Protection Switching (R-APS) No Request (R-APS NR) messages. Upon obtaining this message, the ring protection link (RPL) owner blocks the RPL port and sends two messages: R-APS NR and R-APS RPL (R-APS NR, RB). These messages cause all other nodes, other than the RPL owner in the ring, to unblock all blocked ports.

> **Note**
>
> The G.8032 Ethernet Ring Protection (ERP) protocol uses CFM Continuity Check Messages (CCMs) at an interval of 3.3 milliseconds (ms). At this interval (which is supported only on selected platforms), SONET-like switching time performance and loop-free traffic can be achieved.

When you enable CFM, the G.8032 Ethernet Ring Protection feature ensures recovery times of less than 50 milliseconds. This is achieved by managing the forwarding state of each ring port, preventing loops, and maintaining connectivity in the event of a failure.

> **Note**
>
> This feature can operate without CFM; however, performance of less than 50 milliseconds is not guaranteed without it.

G.8032 ERP timers

Explains the different timers used by the G.8032 Ethernet Ring Protection protocol to avoid race conditions and unnecessary switching operations.

G.8032 ERP timers are network management mechanisms that

- prevent race conditions during network state changes
- filter out intermittent faults and verify network stability, and
- ensure proper sequencing of switching operations in Ethernet ring protection.

Timer types and configuration

The G.8032 protocol uses three main categories of timers:

- **Delay timers**: Used by the Ring Protection Link (RPL) owner to verify that the network has stabilized before blocking the RPL. Note the following points about delay timers.
  - After a signal failure (SF) condition, a Wait-to-Restore (WTR) timer is used to verify that the SF is not intermittent.
  - The WTR timer can be configured by the operator. The default time interval is 5 minutes; the time interval ranges from 1 to 12 minutes.
  - After a force switch (FS) or a manual switch (MS) command is issued, a Wait-to-Block (WTB) timer is used to verify that no background condition exists.

> **Note**
>
> The WTB timer interval may be shorter than the WTR timer interval.

- **Guard timer**: Used by all nodes when changing state; the guard timer blocks latent outdated messages from causing unnecessary state changes. The guard timer can be configured. The default time interval is 500 ms; the time interval ranges from 10 to 2000 ms.
- **Hold-off timers**: Used by the underlying Ethernet layer to filter out intermittent link faults. The hold-off timer can be configured. The default time interval is 0 seconds; the time interval ranges from 0 to 10 seconds. Faults are reported to the ring protection mechanism only if this timer expires.

Benefits

Lists key advantages and capabilities of the Ethernet ring protection technology.

This reference provides the primary benefits and capabilities offered by the Ethernet ring protection technology, including protection timing, scalability limits, supported features, and reliability enhancements.

- Provides sub-50 millisecond protection and recovery for Ethernet traffic.
- Supports up to 32 nodes per ring, ensuring scalability in network design.
- Supports up to 128 VLANs and 1024 MAC addresses.
- Supports both copper and fiber ports for versatile deployment.
- Enables multicast traffic support within the ring topology.
- Ensures rapid fault detection through the CFM protocol, enhancing network reliability.

Supported scenarios

Lists the ideal network environments and use cases for the G.8032 Ethernet Ring Protection feature.

The G.8032 Ethernet Ring Protection feature is best suited for:

1. **Network environments**:
   - Service provider networks with Ethernet ring topologies
   - Large enterprise networks requiring high availability
   - Data centers using Ethernet ring configurations

Use cases

Rapid network recovery is essential in environments where minimal downtime is critical.

High-availability scenarios require consistent network uptime.

Prerequisites

Describes the requirements for configuring nodes with ring topology, including single ring configuration per node and operational CFM protocol for effective fault management functionality.

- Each node must be configured with a single ring.
- The CFM protocol must be operational for fault management.

Restrictions for G.8032 ERPS configuration

Outlines the limitations and compatibility requirements for implementing G.8032 ERPS on Cisco switches.

Be aware of these restrictions when configuring G.8032 ERPS on your network:

- This feature is supported only on Cisco IE31xx series switches and third-party switches with G.8032 compatibility.
- The feature operates independently and cannot be combined with other ring protocols. It should not be enabled on ports configured with STP, DLR, REP, or MRP protocols. Furthermore, no other ring configurations should be retained, even in a dormant state. On ports not configured for G.8032, STP and other protocols are expected to function normally.
- Only one ring per instance is supported. Multiple ring configurations are not supported.
- G.8032 ring ports should be configured in VLAN trunk mode.
- G.8032 ring ports cannot be configured on port-channel interfaces.
- Sub-50 milliseconds convergence is not supported at an interface speed of 100 Mbps. However, it is supported for 1Gigabit Ethernet interfaces.
- The control VLAN should be exclusively used for G.8032 ERPS and CFM control packets and should not be used for any other user or control traffic.
- G.8032 convergence is only supported with a CFM (CCM) interval of 3.3 ms. Other CCM intervals are not supported.
- The G8032 ring node role as a next-neighbor is not supported in the current release.

Configure G.8032 rings

Describes how to establish Ethernet ring protection switching for network redundancy. This process ensures fast recovery from link failures by configuring ring profiles, interface assignments, and CFM domain settings.

G.8032 rings provide protection switching for Ethernet ring topologies.

This process involves these key components:

- Ring profile: The ring profile defines the core parameters for the G.8032 ring.
- Interfaces: You assign physical ports to the ring for traffic forwarding.
- CFM domain: You manage fault detection and notification settings.

The process involves the following stages:

1. **Initial setup and profile creation**:
   - Create the G.8032 ring profile.
   - Ensure interfaces are administratively shut before assignment.

2. **Ring and port configuration**:
   - Configure the G.8032 ring and associated ports.
   - Configure the profile, VLAN inclusion list, and other instance-related configuration.

   The **instance** command remains unchanged to align with other Cisco product configurations and to prevent future CLI changes when multiple ring instances are supported.
3. **Fault detection and activation**:
   - Configure the CFM domain at level 1 and enable EFD notification.
   - Apply VLAN and CFM configurations to the ring ports.
   - Use the **no shutdown** command to bring up the ports.

Configure an Ethernet Ring Profile

Configure the G.8032 Ethernet Ring profile to specify operational and configuration parameters for your network requirements.

Configure the G.8032 Ethernet Ring profile to define operational and configuration parameters for your network.

The G.8032 Ethernet Ring profile specifies the operational and configuration parameters for particular network requirements. You can use the default profile or create a custom one using this procedure.

Ensure you have access to device configuration mode on your network switch.

1. Use the **ethernet ring g8032 profile** *profile-name* command to create the Ethernet ring profile and enter Ethernet ring profile configuration mode.

```
Device(config)# ethernet ring g8032 profile g8032-profile
```

2. (Optional) Use the **timer WTR** *minutes* command to set the duration for the Wait-to-Restore (WTR) timer.

```
Device(config-erp-profile)# timer wtr 1
```

   The valid range is 1 to 12; the default is 5 minutes.
3. (Optional) Use the **timer guard** *interval* command to set the duration for the guard timer.

```
Device(config-erp-profile)# timer guard 600
```

   The valid range is 10 to 2000; the default is 500 milliseconds.
4. (Optional) Use the **timer hold-off** *seconds* command to set the duration for the hold-off timer.

```
Device(config-erp-profile)# timer hold-off 4
```

   The valid range is 0 to 10; the default is 0 seconds.
5. (Optional) Use the **no non-revertive** command to configure a nonrevertive Ethernet ring instance.

```
Device(config-erp-profile)# no non-revertive
```

   By default, revertive mode is enabled.

Configure the Ethernet Ring Protection

Configure the Ethernet Protection Ring (ERP) to ensure reliable and efficient operation of Ethernet networks in ring topologies.

This task configures the Ethernet Ring Protection (ERP) to ensure reliable and efficient operation of Ethernet networks in ring topologies.

The Ethernet Ring Protection (ERP) ensures reliable and efficient operation of Ethernet networks in ring topologies. Follow the procedure given here to configure ERP.

1. Use the **ethernet ring g8032** *ring-name* command to specify the Ethernet ring and enter Ethernet ring port configuration mode.

```
Device(config)# ethernet ring g8032 g8032_ring
```

2. Use the **port0 interface** *type number* command to connect port0 of the local node to the Ethernet ring and enter Ethernet ring protection mode.

```
Device(config-erp-ring)# port0 interface GigabitEthernet1/3
```

Use the **exit** command to enter the Ethernet ring port configuration mode.

```
Device(config-erp-ring-port)# exit
```

3. Use the **port1 interface** *type number* command to connect port1 of the local node of the interface to the Ethernet ring and enter the Ethernet ring protection mode.

```
Device(config-erp-ring)# port1 interface GigabitEthernet1/4
```

Use the **exit** command to enter the Ethernet ring port configuration mode.

```
Device(config-erp-ring-port)# exit
```

4. Use the **instance** *instance-ID* command to assign the Ethernet service instance to monitor the ring port (port0) and detect ring failures.

```
Device(config-erp-ring)# instance 1
```

(Optional) Use the **profile** *profile-name* command to specify the Ethernet ring profile.

```
Device(config-erp-inst)# profile g8032-profile
```

The default profile is automatically applied, if no profile is specified.

5. Use the **RPL** {**port0** | **port1**}{**owner** | **neighbor** } command to specify the Ethernet ring port on the local node as the RPL owner or neighbor.

```
Device(config-erp-inst)# rpl port0 owner
```

Specify the RPL port connected to both the owner and neighbor nodes. These nodes must be adjacent and directly connected by a single link. RPL port configuration is required for both the owner and neighbor nodes, while it is not needed for a normal node. By default, each node is considered a normal node.

6. Use the **inclusion-list VLAN-ids** *VLAN-ID* command to specify the VLANs that are managed (traffic management) by the Ethernet ring protection mechanism.

```
Device(config-erp-inst)# inclusion-list vlan-ids 10, 100-200
```

For *VLAN-ID*, use a list or individual VLAN IDs in the format `a-b` or `c`, where `a-b` denotes a range and `c` represents a single VLAN ID.

7. Use the **APS-channel** command to enter Ethernet ring instance APS-channel configuration mode.

```
Device(config-erp-inst)# aps-channel
```

The APS channel allows control and coordination messages to flow between nodes or devices to ensure the protection mechanism operates correctly and efficiently.

8. (Optional) Use the **level** *level-value* command to specify the APS message level for the node on the Ethernet ring.

```
Device(config-erp-inst-aps)# level 1
```

The APS message level ranges from 0 (lowest) to 7 (highest).

9. Use the **control VLAN** *VLAN-ID* command to define a control VLAN dedicated to carrying APS messages within the network.

```
Device(config-erp-inst-aps)# control vlan 10
```

The control VLAN should not be used for any other purpose.

The valid *VLAN-ID* range is 1 to 4094.

Enable Ethernet fault detection for a service

Configure Ethernet Connectivity and Fault Management (CFM) on a device to enable fast convergence for network services.

Enable Ethernet fault detection to help a service achieve fast convergence. Fast convergence is crucial for reliable, resilient, and high-performing network services.

This procedure configures Ethernet Connectivity and Fault Management (CFM) for G.8032 sub-50ms convergence. The platform supports only 3.3ms CCM messages at Maintenance Domain Level 1.

> **Note**
>
> Ethernet Connectivity and Fault Management (CFM) includes a broad range of messages and protocols. For G.8032 sub-50ms convergence, this platform supports only 3.3ms CCM messages at Maintenance Domain Level 1.

1. Use the **ethernet CFM IEEE** command to enable IEEE-compliant Ethernet CFM on a device.

```
Device(config)# ethernet cfm ieee
```

2. Use the **ethernet CFM global** command to globally enable Ethernet CFM.

```
Device(config)# ethernet cfm global
```

3. Use the **ethernet CFM domain** *domain-name* **level** *level* command to configure the CFM domain and enter Ethernet CFM configuration mode.

```
Device(config)# ethernet cfm domain g8032_domain level 1
```

The *domain-name* is the name of the maintenance domain.

The *level* defines the fault management level within the maintenance domain. We support only level 1.

4. Use one of these three methods to configure the service.

- Use the **service VLAN-id** *VLAN-id* **VLAN** *VLAN-id* **direction down** command to define a VLAN-id based maintenance association and enter Ethernet CFM service instance configuration mode.

```
Device(config-ecfm)# service vlan-id 10 vlan 10 direction down
```

- Use the **service** *name* **VLAN** *VLAN-id* **direction down** command to define a service name based maintenance association and enter Ethernet CFM service instance configuration mode.

```
Device(config-ecfm)# service G8032_Service vlan 10 direction down
```

- Use the **service number** *number* **VLAN** *VLAN-id* **direction down** command to define a service number based maintenance association and enter Ethernet CFM service instance configuration mode.

```
Device(config-ecfm)# service number 12 vlan 10 direction down
```

The valid *VLAN-id* range is from 1 to 4094.

5. Use the **continuity-check** command to enable the transmission of 3.3ms continuity check messages.

```
Device(config-ecfm-srv)# continuity-check
```

6. Use the **efd notify g8032** command to enable CFM to notify registered protocols when a defect is detected or cleared, which matches the current fault alarm priority.

```
Device(config-ecfm-srv)# efd notify g8032
```

This command is essential for achieving sub-50ms convergence.

Configure interface

Configure the specific ports used in the Ethernet ring by setting up interface parameters, VLAN trunking, and Maintenance End Points (MEPs).

Configure an interface to enable proper communication and monitoring within an Ethernet ring topology by setting up the necessary port parameters, VLAN configurations, and connectivity fault management settings.

Interfaces are required to configure the specific ports used in the Ethernet ring. This configuration involves setting up the interface type, VLAN trunking parameters, and Maintenance End Points for network monitoring and fault detection.

Follow these steps to configure an interface:

1. Use the **interface gigabitethernet** *type number* command to specify the interface type and number.

```
Device(config)# interface gigabitethernet 1/3
```

2. Use the **switchport trunk allowed VLAN** *VLAN-list* command to specify the VLANs that are allowed to traverse when this port is in trunking mode.

```
Device(config-if)# switchport trunk allowed vlan 10,100-200
```

The *VLAN-list* denotes the range of VLAN-IDs. It should include the VLANs in the inclusion list.

> **Note**
>
> The control VLAN and inclusion VLAN list should match this configuration.

3. Use the **switchport mode trunk** command to specify a port on the switch to operate in trunk mode, which allows it to carry traffic from multiple VLANs.

```
Device(config-if)# switchport mode trunk
```

4. Use the **ethernet cfm MEP domain** *domain-name* **MPID** *MPID* **service VLAN-ID** *VLAN-ID* command to set a port as internal to a maintenance domain and define it as a Maintenance End Point (MEP).

```
Device(config-if)# ethernet cfm mep domain g8032_domain mpid 12 service number
 10
```

This procedure uses a service number as an example. You can also use a *VLAN-ID* or a service name. The *domain-name* specifies the maintenance domain to which the MEP belongs.

> **Note**
>
> The MPID must be unique on peer devices. No two Maintenance Points within a single service can share the same MPID. Valid values range from 1 to 8191. The *VLAN-ID* represents the specific VLAN that the MEP will be monitoring within the domain. Valid values range from 1 to 4094. Ideally, the control VLAN should also be used for configuring the service VLAN.

Verify G.8032 Ethernet Ring Protection

Provides show commands to verify the configuration and status of G.8032 Ethernet Ring Protection.

Use the **show** commands given here to verify the configuration and status of G.8032 Ethernet ring protection.

show ethernet ring g8032 status

The **show ethernet ring g8032 status** [*ring-name*][**instance** [*instance-id*]] command displays the status information of an Ethernet Ring configured using the G.8032 standard.

```
Device# show ethernet ring g8032 status

Ethernet ring g8032_ring instance 1 is RPL Owner node in Idle State
 Port0: GigabitEthernet1/3
  APS-Channel: GigabitEthernet1/3
```

```
  Status: RPL, blocked
  Remote R-APS NodeId: 0000.0000.0000, BPR: 0
 Port1: GigabitEthernet1/4
  APS-Channel: GigabitEthernet1/4
  Status: Non-RPL
  Remote R-APS NodeId: 0000.0000.0000, BPR: 0
 APS Level: 7
 Profile: g8032_profile
  WTR interval: 1 minutes
  Guard interval: 10 milliseconds
  HoldOffTimer: 0 seconds
  Revertive mode

Device# show ethernet ring g8032 status g8032_ring

Ethernet ring g8032_ring instance 1 is RPL Owner node in Idle State
 Port0: GigabitEthernet1/3
  APS-Channel: GigabitEthernet1/3
  Status: RPL, blocked
  Remote R-APS NodeId: 0000.0000.0000, BPR: 0
 Port1: GigabitEthernet1/4
  APS-Channel: GigabitEthernet1/4
  Status: Non-RPL
  Remote R-APS NodeId: 0000.0000.0000, BPR: 0
 APS Level: 7
 Profile: g8032_profile
  WTR interval: 1 minutes
  Guard interval: 10 milliseconds
  HoldOffTimer: 0 seconds
  Revertive mode

Device# show ethernet ring g8032 status g8032_ring instance 1

Ethernet ring g8032_ring instance 1 is RPL Owner node in Idle State
 Port0: GigabitEthernet1/3
  APS-Channel: GigabitEthernet1/3
  Status: RPL, blocked
  Remote R-APS NodeId: 0000.0000.0000, BPR: 0
 Port1: GigabitEthernet1/4
  APS-Channel: GigabitEthernet1/4
  Status: Non-RPL
  Remote R-APS NodeId: 0000.0000.0000, BPR: 0
 APS Level: 7
 Profile: g8032_profile
  WTR interval: 1 minutes
  Guard interval: 10 milliseconds
  HoldOffTimer: 0 seconds
  Revertive mode
```

show ethernet ring g8032 summary

This command displays a summary of the G.8032 Ethernet Ring, providing a high-level overview of its operational state, status, and key metrics.

```
Device# show ethernet ring g8032 summary

Chassis Node Id: f839.18ab.56a0

States
```

```
----------------------------
 Init              0
 Idle              1
 Protection        0
 Manual Switch     0
 Forced Switch     0
 Pending           0
 ----------------------------
 Total             1
```

show ethernet ring g8032 statistics

The **show ethernet ring g8032 statistics** [*ring-name*][**instance** [*instance-id*]] command displays detailed statistical information about the G.8032 Ethernet Ring, specifically focusing on performance metrics, packet counts, error rates, and other key data related to the operation of the Ethernet ring.

```
Device# show ethernet ring g8032 statistics

Statistics for Ethernet ring g8032_ring instance 1
 Local SF detected:
  Port0: 1
  Port1: 1
 FOP PM detected:
  Port0: 0
  Port1: 0

 R-APS   Port0(Tx/Rx)                    Port1(Tx/Rx)
         Last Tx time                    Last Tx time
         Last Rx time                    Last Rx time

--------------------------------------------------------------------------------

 NR    : 14/0                            14/0
         Tue Feb 11 14:52:13.366         Tue Feb 11 14:52:13.366
         Never                           Never
 NR,RB : 78/0                            78/0
         Tue Feb 11 14:58:33.366         Tue Feb 11 14:58:33.366
         Never                           Never
 SF    : 3/0                             3/0
         Tue Feb 11 14:51:17.814         Tue Feb 11 14:51:17.814
         Never                           Never
 MS    : 0/0                             0/0
         Never                           Never
         Never                           Never
 FS    : 0/0                             0/0
         Never                           Never
         Never                           Never
 EVENT : 0/0                             0/0
         Never                           Never
         Never                           Never

 State           Last entry into state time

--------------------------------------------------------------------------------

 Init          : Tue Feb 11 14:51:13.322
 Idle          : Tue Feb 11 14:52:18.366
 Protection    : Tue Feb 11 14:51:13.370
 Manual Switch : Never
```

```
 Forced Switch : Never
 Pending       : Tue Feb 11 14:51:18.364
```

show ethernet ring g8032 brief

The **show ethernet ring g8032 brief** [*ring-name*][**instance** [*instance-id*]] command displays a brief summary of the G.8032 Ethernet Ring status. This command is typically used for a quick overview of the ring's operational status and basic information.

```
Device# show ethernet ring g8032 brief

R: Interface is the RPL-link
F: Interface is faulty
B: Interface is blocked
FS: Local forced switch
MS: Local manual switch

RingName                        Inst NodeType  NodeState     Port0    Port1
-------------------------------------------------------------------------------
g8032_ring                      1    Owner     Idle          R,B
```

show ethernet ring g8032 profile

The **show ethernet ring g8032 profile** *profile* command displays the profile settings for the G.8032 Ethernet Ring. This profile includes configuration details such as the ring's operational parameters, settings for fault recovery, member devices, and other critical settings that govern how the Ethernet ring operates.

```
Device# show ethernet ring g8032 profile

Ethernet ring profile name: g8032_profile
  WTR interval: 1 minutes
  Guard interval: 10 milliseconds
  HoldOffTimer: 0 seconds
  Revertive mode
```

show ethernet ring g8032 port status

The **show ethernet ring g8032 port status** command displays the status of the interface ports on a G.8032 Ethernet Ring.

```
Device# show ethernet ring g8032 port status

Port: GigabitEthernet1/3
 Ring: my_ring
         Block vlan list: 1-110,112-4095
         Unblock vlan list: 111
         REQ/ACK: 0/0
         Instance 1 is in Blocked Data state

 Port: GigabitEthernet1/4
 Ring: my_ring
         Block vlan list: 1-110,201-4095
```

```
        Unblock vlan list: 111-200
        REQ/ACK: 0/0
        Instance 1 is in Unblocked state
```

show ethernet ring g8032 port status interface

The **show ethernet ring g8032 port status interface** *type number* command displays the status of the interface ports on a G.8032 Ethernet Ring, showing specific information about the operational state and performance of the ports participating in the Ethernet ring.

```
Device# show ethernet ring g8032 port status interface GigabitEthernet1/3

Port: GigabitEthernet1/3
 Ring: g8032_ring
  Block vlan list: 1-9,11-4095
  Unblock vlan list: 10
  REQ/ACK: 0/0
  Instance 1 is in Blocked state
```

Verify connectivity fault management

Lists the show commands used to verify Ethernet CFM configuration and status on network devices.

Use the **show** commands given here to verify the Ethernet CFM.

show ethernet cfm domain brief

This command displays information about Ethernet CFM domains configured on a network device.

```
Device# show ethernet cfm domain brief

Domain Name                                Index Level Services Archive(min)
g8032_domain                                  31     1        1     100
```

show ethernet cfm errors

This command displays information about Ethernet CFM errors on a network device.

```
Device# show ethernet cfm errors
```

show ethernet cfm maintenance-points local

This command displays information about the local maintenance points configured for Ethernet CFM.

```
Device# show ethernet cfm maintenance-points local

Local MEPs:
--------------------------------------------------------------------------------
MPID Domain Name                                Lvl   MacAddress     Type
CC
Ofld Domain Id                                  Dir   Port           Id
```

```
     MA Name                                             SrvcInst       Source

     EVC name

     CCM Mode
-------------------------------------------------------------------------------
11   g8032_domain                                  1     f839.18ab.56a3 Vlan  Y
Yes  null                                          Down  Gi1/3          10
     number 10                                           N/A            Static
     N/A

     Multicast

52   g8032_domain                                  1     f839.18ab.56a4 Vlan  Y
Yes  null                                          Down  Gi1/4          10
     number 10                                           N/A            Static
     N/A

     Multicast


Total Local MEPs: 2

Local MIPs: None
```

show ethernet cfm maintenance-points remote

This command displays information about remote maintenance points (RMEPs) in an Ethernet CFM setup.

```
Device# show ethernet cfm maintenance-points remote

-------------------------------------------------------------------------------
MPID  Domain Name                                  MacAddress          IfSt
PtSt
 Lvl  Domain ID                                    Ingress

 RDI  MA Name                                     Type Id             SrvcInst

      EVC Name                                                        Age

      Local MEP Info

-------------------------------------------------------------------------------
51    g8032_domain                                 6879.0914.9d87      Unkn
Unkn
 1    null                                         Gi1/4

 -    number 10                                    Vlan 10             N/A

      N/A                                                             20s
      MPID: 52 Domain: g8032_domain MA: number 10

Total Remote MEPs: 1
```

show ethernet cfm maintenance-points remote detail

This command displays detailed information about RMEPs in an Ethernet CFM configuration.

```
Device# show ethernet cfm maintenance-points remote detail mpid 11

Version: IEEE-CFM
MAC Address: f839.18ab.56a3
Domain Name: g8032_domain
Domain ID: null
MA Name: number 10
Level: 1
Vlan: 10
MPID: 11
Incoming Port(s): GigabitEthernet1/3
CC Lifetime(sec): 105
Age of Last CC Message(sec): 22
CC Packet Statistics: 0/0 (Received/Error)
MEP interface status: Unkn
MEP port status: Unkn
Receive RDI: FALSE

Total Remote MEPs: 1
```

show ethernet cfm mpdb

This command displays the Maintenance Point Database (MPDB) in an Ethernet CFM configuration.

```
Device# show ethernet cfm mpdb

* = Can Ping/Traceroute to MEP
--------------------------------------------------------------------------------
MPID  Domain Name                                MacAddress          Version

Lvl   Domain ID                                  Ingress

Expd  MA Name                                   Type Id             SrvcInst

      EVC Name                                                       Age

--------------------------------------------------------------------------------
51  * g8032_domain                               6879.0914.9d87      IEEE-CFM
1     null                                        Gi1/4
-     number 10                                   Vlan 10             N/A

      N/A                                                            5s

Total Remote MEPs: 1
```

Feature history table

Explains the introduction of G.8032 Ethernet Ring Protection feature support for Cisco Catalyst IE31xx Rugged Series Switches, including release information and initial implementation details.

Feature Name	Release	Feature Information
G.8032 Ethernet Ring Protection	Cisco IOS XE 17.17.1	Initial support for Cisco Catalyst IE31xx Rugged Series Switches.