

Contents

- 1 G.8032 Ethernet Ring Protection Administrative Procedures
 - ◆ 1.1 General Goals for Any Administrative Procedure
 - ◇ 1.1.1 VLAN Procedures
 - 1.1.1.1 Adding a VLAN to the Inclusion List for a Ring
 - 1.1.1.2 Adding a VLAN to the Exclusion List for a Ring
 - 1.1.1.3 Removing a VLAN from the Inclusion List of a Ring Instance or the Exclusion List of a Physical Ring
 - 1.1.1.4 Moving a VLAN to a Different Ring Instance
 - ◇ 1.1.2 Ring Instance Procedures
 - 1.1.2.1 Creating a Ring Instance on the Ethernet Ring
 - 1.1.2.2 Deleting a Ring Instance on the Ethernet Ring
 - 1.1.2.3 Changing the APS Settings for a Ring Instance
 - 1.1.2.4 Moving the RPL to a New Node on the Ethernet Ring
 - 1.1.2.5 Changing the Profile Settings for the Ring Instance
 - ◇ 1.1.3 Physical Ring Procedures
 - 1.1.3.1 Migrating the Path of a Ring to a new Physical Ring Link or Physical Interface
 - 1.1.3.2 Adding a Node to a Ring
 - 1.1.3.3 Removing a Node from a Ring
 - 1.1.3.4 Adding or Modifying CFM Monitoring on a Physical Ring Link or Interface
 - 1.1.3.5 Removing CFM Monitoring from a Physical Ring Link or Interface
 - 1.1.3.6 Changing the Ring Topology from Open to Closed or from Closed to Open

G.8032 Ethernet Ring Protection Administrative Procedures

This article contains information about commonly performed administrative procedures for provisioning and maintaining a G.8032-supported Ethernet Ring Protection (ERP) switching configuration. These administrative procedures include:

- Changes to VLANs (protected or unprotected) within ring instances.
- Changes to ring instances.

The specific ring instances, and the VLANs they contain, may experience a brief traffic outage (also known as a switch-over) while the procedure is being performed. Traffic outages to the VLANs can be minimized by first migrating the VLANs to a different ring instance.

- Changes to the physical nodes, links, and the ring topology (for example, changing a ring from open to closed).

When making changes to physical nodes, links, and the ring topology, all ring instances experience brief traffic outages (switch-overs).

When converting an open-ring topology to a closed-ring topology (or a closed-ring topology to an open-ring topology), the entire ring must be disabled.

General Goals for Any Administrative Procedure

When administering a G.8032 Ethernet Protection Ring (ERP) switching configuration, keep the following goals in mind:

- Avoid creating a network loop.
- Minimize the extent of any traffic outages (switch-overs).
- Avoid letting the Ring Automatic Protection Switching (R-APS) control channel become dormant (inactive). A dormant R-APS control channel may cause a Failure of Protocol ? Time-out (FOP-TO) signal to be triggered by the nodes on the ring.
- Minimize the number of brief traffic outages (switch-overs).

VLAN Procedures

This section contains the procedures for creating and maintaining VLANs in an Ethernet ring topology, and explains how to:

- Add a VLAN to the inclusion list for a ring. (Once a VLAN is added to the inclusion list, the VLAN is considered "protected.")
- Add a VLAN to the exclusion list for a ring.
- Remove a VLAN from the inclusion list of a ring instance or from the exclusion list of a physical ring.
- Move a VLAN to a different ring instance.

The specific VLANs may experience brief traffic outages (switch-overs) while changes to the VLANs are being performed.

Also, these procedures assume that a physical ring with at least one instance has been configured for all nodes in the ring. For more information, see the [Ring Instance Procedures](#) section and the [Physical Ring Procedures](#) section.

Adding a VLAN to the Inclusion List for a Ring

Once a VLAN is added to the inclusion list, the VLAN is considered "protected."

1. Confirm that the VLAN is unused on (removed from) all ring instances on all nodes. An unused VLAN is one that is not included in any inclusion or exclusion list (and is, therefore, blocked by the ring node).
2. Add the VLAN to the inclusion list of the desired ring instance on the Ring Protection Link (RPL) owner. This VLAN remains blocked.
3. Add the VLAN to the inclusion list of all other nodes on the ring. This VLAN is unblocked as it is added to each node on the ring.

Adding a VLAN to the Exclusion List for a Ring

1. Confirm that the VLAN is unused on (removed from) all rings on all nodes. An unused VLAN is one that is not included in any inclusion or exclusion list (and is, therefore, blocked by the ring node).
2. Add the VLAN to the exclusion list for the appropriate nodes on the ring. The VLAN becomes unblocked as it is added to each node. Ensure that a manual break remains in the forwarding path around the ring; otherwise, a network loop is created.

Removing a VLAN from the Inclusion List of a Ring Instance or the Exclusion List of a Physical Ring

1. Remove the VLAN from the inclusion list of a ring instance, or from the exclusion list for all non-RPL owner nodes on the physical ring. The VLAN becomes unused and is, therefore, blocked by each node.
2. Remove the VLAN from the inclusion list of a ring instance or from the exclusion list for the RPL owner node on the physical ring. The VLAN becomes unused and is, therefore, blocked.

Moving a VLAN to a Different Ring Instance

A ring containing G.8032 V1 nodes can support one ring instance only. This procedure applies to rings comprised entirely of G.8032 V2 nodes only.

1. Complete the Remove a VLAN from the Inclusion List of a Ring Instance or the Exclusion List of a Physical Ring procedure.
2. Complete the Adding a VLAN to the Inclusion List for a Ring procedure.

Ring Instance Procedures

This section contains the procedures for creating and maintaining ring instances in a ring topology. These procedures assume that a physical ring has been created and has been configured. For information about creating a physical ring, see the Physical Ring Procedures section.

This section explains how to:

- Create a new ring instance on the Ethernet ring.
- Delete a ring instance on the Ethernet ring.
- Change the Automatic Protection Switching (APS) settings for a ring instance.
- Move the Ring Protection Link (RPL) to a new node on the Ethernet ring.
- Change the profile settings for the ring instance.

The specific ring instances and the VLANs that they contain may experience brief traffic outages (switch-overs) while these procedures are being performed. Traffic outages to the VLANs can be minimized by first migrating the VLANs to a different ring instance.

Creating a Ring Instance on the Ethernet Ring

1. Choose an unused VLAN to use for the Automatic Protection (APS) Switching channel. An unused VLAN is one that is not included in any inclusion or exclusion list (and is, therefore, blocked by the Ethernet ring node).
2. Choose one link and one node to be the Ring Protection Link (RPL) and RPL owner, respectively.

3. Configure a ring instance on each of the non-RPL owner nodes.
4. Configure a ring instance on the RPL owner node; the ring instance transitions to the idle state after the Wait-to-Restore timer expires or after a reversion has occurred.
5. Add one or more VLANs to the ring instance by following the procedure in the [Adding a VLAN to the Inclusion List for a Ring](#) section.

Deleting a Ring Instance on the Ethernet Ring

1. Remove all VLANs from the ring instance by following the procedure in the [Removing a VLAN from the Inclusion List of Ring Instance or the Exclusion List of a Physical Ring](#) section.
2. Delete the ring instance from the non-Ring Protection Link (RPL) owner nodes.
3. Delete the ring instance from the RPL owner node.

Changing the APS Settings for a Ring Instance

A ring instance cannot be in use while you are changing the Automatic Protection Switching (APS) settings. If the VLANs on the ring instance need to remain in use, move the VLANs to a different instance. See the [Moving a VLAN to a Different Ring Instance](#) section.

1. Complete the [Deleting a Ring Instance on the Ethernet Ring](#) procedure.
2. Complete the [Creating a Ring Instance on the Ethernet Ring](#) procedure using the new APS VLAN.

Moving the RPL to a New Node on the Ethernet Ring

1. Apply a manual switch on the new node of the Ring Protection Link (RPL) owner and the RPL. The Ethernet ring will be in Manual Switch (MS) state.
2. On the existing RPL owner node, remove the RPL owner configuration. Removing the RPL owner configuration causes the Finite State Machine (FSM) state to reset and the node to become a "normal" node. The Ethernet ring remains in the MS state.
3. On the node now identified as the new RPL owner, clear the manual switch. Clearing the manual switch causes the ring to go into the pending state.
4. Configure the node as the RPL owner. Configuring the node as the RPL owner causes the FSM to reset and the node begins transmitting No Request (NR) RPL Blocked (RB) messages rather than NR messages. The Ethernet ring goes into the idle state. The Automatic Protection Switching (APS) channel will be dormant during the time required to complete Step 4. Normally, Step 4 can be done by using the **rpl** command in Ethernet ring instance configuration mode (config-erp-inst), in which case the APS channel will not be dormant.

Changing the Profile Settings for the Ring Instance

Profile settings that can be changed include the hold-off timer duration, the Wait-to-Restore (WTR) timer duration, and the reversion (on or off) setting.

1. Confirm that the ring instances are in the idle state. (Certain profile changes, such as changes to timer durations, do not take effect while the ring instances remain in the idle state because timers do not operate in the idle state.)

2. Modify the profile settings for all nodes on the ring. Certain profile settings, such as the WTR duration and the reversion setting, are used only by the Ring Protection Link (RPL) owner node and have no effect on the non-RPL owner nodes.
3. If desired, you can test the WTR duration and reversion settings by applying a manual switch on the ring and then clearing the switch. If the manual switch is applied at the same node as the RPL, the ring instance changes only the state and does not experience a brief data outage (switch-over).
4. If desired, you can test the hold-off interval setting by disabling the ring link. Disabling the ring link causes a fault on the ring, the ring switches over, and a brief traffic outage occurs at all ring instances.

Physical Ring Procedures

This section contains the procedures for maintaining physical ring instances in an Ethernet ring topology. This section explains how to:

- Migrate the path of a ring to a new physical ring link or interface.
- Add a node to a physical ring link.
- Remove a node from a physical ring link.
- Add or modify Connectivity Fault Management (CFM) monitoring for the physical ring link or interface.
- Remove CFM monitoring from a physical ring link or interface.
- Change the ring topology from open to closed or from closed to open.

Migrating the Path of a Ring to a new Physical Ring Link or Physical Interface

During this procedure, all ring instances experience brief traffic outages (switch-overs). The Automatic Protection Switching (APS) channel may become dormant, depending upon the physical ring link configuration completed in Step 5.

1. Install a new physical ring link and ensure that it is functional. If you want to use Connectivity Fault Management (CFM) on this link, configure CFM and ensure it is functional.
2. Disable the new physical interface.
3. Configure Ethernet service instances on the new physical interface and associate them with the bridge domains on the physical ring link.
4. Disable the previously configured physical interface. All ring instances transition to the protection state.
5. Modify the physical ring link configuration on both nodes adjacent to the new link to point to the new physical interface. To help reduce the chance of the APS channel becoming dormant, complete the configuration on one node before changing the configuration on the other node. Otherwise, the APS channel becomes dormant if both nodes are unconfigured or unresolved.
6. Enable the new physical interface. All ring instances transition to the pending state first, and then transition to the idle state after the reversion.
7. If desired, disassociate the Ethernet service instances on the previously configured physical interface from the bridge domains on the physical ring link, and remove the Ethernet service instances.

Adding a Node to a Ring

During this procedure, all ring instances experience a brief traffic outage (switch-over).

1. Restart the new node and confirm that the node is functional.

G.8032_Ethernet_Ring_Protection_(ERP)_Administrative_Procedures

2. Install the new physical links and ensure that the physical links are functional. If you want to use Connectivity Fault Management (CFM) on this physical link, configure CFM and ensure that it is functional.
3. Disable the new physical interface.
4. Add the ring configuration. Confirm that the ring configuration is complete and that the ring configuration has been resolved. Confirm that the ring instance is in the protection state for this node.
5. Set up the new physical ring links on the neighboring nodes by following the [Migrating the Path of a Ring to a new Physical Ring Link or Physical Interface](#) procedure.

Removing a Node from a Ring

The ITU-G standard, "G.8032 : Ethernet Ring Protection Switching" (published in March 2010) contains management procedure guidelines in Appendix IX. Appendix IX describes a process for removing a node from a ring, using forced switches as part of the process. Forced switches have the following disadvantages:

- Forced switches must be applied on *each* ring instance.
- Forced switches are disregarded by the node when an instance configuration is deleted or unresolved. If the forced switches are disregarded, the procedure in Appendix IX.2 of the standard must be followed to recover the ring. For more information about the ITU-G standard, click [here](#).

Therefore, the procedure below recommends disabling interfaces instead of using forced switches.

1. If applicable, install the new physical link between the neighboring nodes. The goal of this new physical link is to bypass the node being removed from the ring. After installing the new physical link, ensure that the new link is functional.
2. Complete the steps in the [Migrating the Path of a Ring to a new Physical Ring Link or Physical Interface](#) procedure on the neighboring nodes.
3. Delete the ring configuration from the node being removed.

Adding or Modifying CFM Monitoring on a Physical Ring Link or Interface

Note: A CFM upstream maintenance endpoint (MEP) configuration should **not** be used to monitor a physical ring link or interface. Only a CFM downstream MEP or port MEP between two directly connected nodes should be used.

During this procedure, all ring instances experience a brief traffic outage (switch-over).

1. Configure the downstream MEP on both ends of the link and confirm that the MEP is functional (that is, there are no fault conditions).
2. Disable the physical interfaces on both nodes adjacent to the link. All ring instances transition to the protection state.
3. Modify the ring configuration on both nodes adjacent to the link to point to the new monitoring VLAN. To help reduce the chance of the Automatic Protection Switching (APS) channel becoming dormant, complete the configuration on one node before changing the configuration on the other node. Otherwise, the APS channel becomes dormant if both nodes are unconfigured or unresolved.
4. Enable the physical interface on both nodes adjacent to the link. All ring instances transition to the pending state first, and then transition to the idle state after the reversion.

Removing CFM Monitoring from a Physical Ring Link or Interface

During this procedure, all ring instances experience a brief traffic outage (switch-over).

1. Disable the physical interfaces on both nodes adjacent to the link. All ring instances transition to the protection state.
2. Modify the ring configuration on both nodes adjacent to the link to remove the monitoring VLAN. To help reduce the chance of the Automatic Protection Switching (APS) channel becoming dormant, complete the configuration on one node before changing the configuration on the other node. Otherwise, the APS channel becomes dormant if both nodes are unconfigured or unresolved.
3. Enable the physical interface on both nodes adjacent to the link. All ring instances transition to the pending state first, and then transition to the idle state after the reversion.
4. Delete the CFM configuration on both ends of the link.

Changing the Ring Topology from Open to Closed or from Closed to Open

This procedure affects the operation of *all* Automatic Protection Switching (APS) channels of *all* ring instances. Therefore, do not complete this procedure on an operational ring. Doing so could introduce a network loop in the APS channel.

1. Delete all ring instances by following the procedure in the [Deleting a Ring Instance on the Ethernet Ring](#) section.
2. Modify the open-ring configuration on all nodes.
3. Create all ring instances by following the procedure in the [Creating a Ring Instance on the Ethernet Ring](#) section.