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Interchassis Redundancy Using Virtual Chassis Feature Guide for MX Series Routers

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Table of Contents

List of Figures

List of Tables

About the Documentation

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Supported Platforms

For the features described in this document, the following platforms are supported:

- MX Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   system {
     scripts {
       commit {
         file ex-script.xsl;
       }
     }
   }
   interfaces {
     fxp0 {
       disable;
       unit 0 {
         family inet {
           address 10.0.0.1/24;
         }
       }
     }
   }
   ```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

   ```
   [edit]
   user@host# load merge /var/tmp/ex-script.conf
   load complete
   ```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   commit {
     file ex-script-snippet.xsl; }
   ```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

Documentation Conventions

Table 1 on page xiii defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Table 2 on page xiii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the**configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`

Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
Italic text like this	• Introduces or emphasizes important new terms. • Identifies book names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS System Basics Configuration Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Enclose optional keywords or variables.	**stub <default-metric** ***metric*****>;**
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	**community name members [** ***community-ids*** **]**

Indention and braces ({ })	Identify a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

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- URL or page number
- Software release version (if applicable)

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- Product warranties—For product warranty information, visit http://www.juniper.net/support/warranty/.
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- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://www.juniper.net/alerts/

- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: https://tools.juniper.net/SerialNumberEntitlementSearch/

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You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see http://www.juniper.net/support/requesting-support.html.

PART 1

Overview

CHAPTER 1

Interchassis Redundancy and Virtual Chassis

Interchassis Redundancy and Virtual Chassis Overview

As more high-priority voice and video traffic is carried on the network, interchassis redundancy has become a baseline requirement for providing stateful redundancy on broadband subscriber management equipment such as broadband services routers, broadband network gateways, and broadband remote access servers. To provide a stateful interchassis redundancy solution for MX Series 3D Universal Edge Routers, you can configure a Virtual Chassis.

This topic provides an overview of interchassis redundancy and the Virtual Chassis, and explains the benefits of configuring a Virtual Chassis on supported MX Series routers.

Interchassis Redundancy Overview

Traditionally, redundancy in broadband edge equipment has used an intrachassis approach, which focuses on providing redundancy within a single system. However, a single-system redundancy mechanism no longer provides the degree of high availability required by service providers who must carry mission-critical voice and video traffic on their network. Consequently, service providers are requiring interchassis redundancy solutions that can span multiple systems that are colocated or geographically dispersed.

Interchassis redundancy is a high availability feature that prevents network outages and protects routers against access link failures, uplink failures, and wholesale chassis failures without visibly disrupting the attached subscribers or increasing the network management burden for service providers. Network outages can cause service providers to lose revenues

and require them to register formal reports with government agencies. A robust interchassis redundancy implementation enables service providers to fulfill strict service-level agreements (SLAs) and avoid unplanned network outages to better meet the needs of their customers.

Virtual Chassis Overview

One approach to providing interchassis redundancy is the Virtual Chassis model. In general terms, a *Virtual Chassis* configuration enables a collection of member routers to function as a single virtual router, and extends the features available on a single router to the member routers in the Virtual Chassis. The interconnected member routers in a Virtual Chassis are managed as a single network element that appears to the network administrator as a single chassis with additional line card slots, and to the access network as a single system.

To provide a stateful interchassis redundancy solution for MX Series 3D Universal Edge Routers, you can configure a Virtual Chassis. An MX Series Virtual Chassis interconnects two MX Series routers into a logical system that you can manage as a single network element. The member routers in a Virtual Chassis are designated as the *Virtual Chassis master router* (also known as the *protocol master*) and the *Virtual Chassis backup router* (also known as the *protocol backup*). The member routers are interconnected by means of dedicated *Virtual Chassis ports* that you configure on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces.

An MX Series Virtual Chassis is managed by the *Virtual Chassis Control Protocol* (*VCCP*), which is a dedicated control protocol based on IS-IS. VCCP runs on the Virtual Chassis port interfaces and is responsible for building the Virtual Chassis topology, electing the Virtual Chassis master router, and establishing the interchassis routing table to route traffic within the Virtual Chassis.

Supported Platforms for MX Series Virtual Chassis

You can configure a Virtual Chassis on the following MX Series 3D Universal Edge Routers with Trio MPC/MIC interfaces (for configuration of Virtual Chassis ports) and dual Routing Engines:

- MX240 3D Universal Edge Router
- MX480 3D Universal Edge Router
- MX960 3D Universal Edge Router

In addition, graceful Routing Engine switchover (GRES) and nonstop active routing (NSR) must be enabled on both member routers in the Virtual Chassis.

Benefits of Configuring a Virtual Chassis

Configuring a Virtual Chassis for MX Series routers provides the following benefits:

- Simplifies network management of two routers that are either colocated or geographically dispersed across a Layer 2 point-to-point network.
- Provides resiliency against network outages and protects member routers against access link failures, uplink failures, and chassis failures without visibly disrupting

attached subscribers or increasing the network management burden for service providers.

- Extends the high availability capabilities of applications such as graceful Routing Engine switchover (GRES) and nonstop active routing (NSR) beyond a single MX Series router to both member routers in the Virtual Chassis.
- Enables service providers to fulfill strict service level agreements (SLAs) and avoid unplanned network outages to better meet their customers' needs.
- Provides the ability to scale bandwidth and service capacity as more high-priority voice and video traffic is carried on the network.

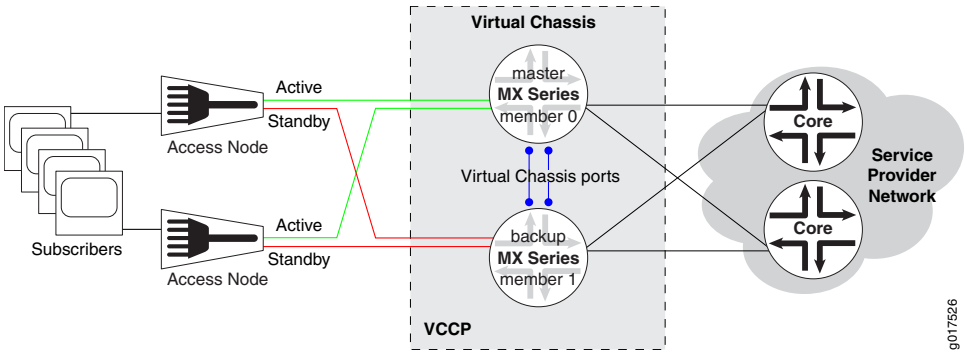
Related Documentation

- Virtual Chassis Components Overview on page 5
- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Virtual Chassis Components Overview

A Virtual Chassis configuration for MX Series 3D Universal Edge Routers interconnects two MX Series routers into a logical system that you can manage as a single network element. Figure 1 on page 5 illustrates a typical topology for a two-member MX Series Virtual Chassis.

Figure 1: Sample Topology for MX Series Virtual Chassis



This overview describes the basic hardware and software components of the Virtual Chassis configuration illustrated in Figure 1 on page 5, and covers the following topics:

- Virtual Chassis Master Router on page 6
- Virtual Chassis Backup Router on page 6
- Virtual Chassis Line-card Router on page 7
- Virtual Chassis Ports on page 7
- Virtual Chassis Port Trunks on page 8
- Slot Numbering in the Virtual Chassis on page 8

Virtual Chassis Master Router

One of the two member routers in the Virtual Chassis becomes the *master router*, also known as the *protocol master*. The Virtual Chassis master router maintains the global configuration and state information for both member routers, and runs the chassis management processes. The master Routing Engine that resides in the Virtual Chassis master router becomes the global master for the Virtual Chassis.

Specifically, the master Routing Engine that resides in the Virtual Chassis master router performs the following functions in a Virtual Chassis:

- Manages both the master and backup member routers
- Runs the chassis management processes and control protocols
- Receives and processes all incoming and exception path traffic destined for the Virtual Chassis
- Propagates the Virtual Chassis configuration (including member IDs, roles, and configuration group definitions and applications) to the members of the Virtual Chassis

The first member of the Virtual Chassis becomes the initial master router by default. After the Virtual Chassis is formed with both member routers, the Virtual Chassis Control Protocol (VCCP) software runs a mastership election algorithm to elect the master router for the Virtual Chassis configuration.

NOTE: **You cannot configure mastership election for an MX Series Virtual Chassis in the current release.**

Virtual Chassis Backup Router

The member router in the Virtual Chassis that is not designated as the master router becomes the *backup router*, also known as the *protocol backup*. The Virtual Chassis backup router takes over mastership of the Virtual Chassis if the master router is unavailable, and synchronizes routing and state information with the master router. The master Routing Engine that resides in the Virtual Chassis backup router becomes the global backup for the Virtual Chassis.

Specifically, the master Routing Engine that resides in the Virtual Chassis backup router performs the following functions in a Virtual Chassis:

- If the master router fails or is unavailable, takes over mastership of the Virtual Chassis in order to preserve routing information and maintain network connectivity without disruption
- Synchronizes routing and application state, including routing tables and subscriber state information, with the master Routing Engine that resides in the Virtual Chassis master router

- Relays chassis control information, such as line card presence and alarms, to the master router

Virtual Chassis Line-card Router

NOTE: The line-card role is not supported in the preprovisioned configuration for a two-member MX Series Virtual Chassis. In this release, the line-card role applies only in the context of split detection behavior.

A member router functioning in the **line-card** role runs only a minimal set of chassis management processes required to relay chassis control information, such as line card presence and alarms, to the Virtual Chassis master router.

You cannot explicitly configure a member router with the **line-card** role in the current release. However, if the backup router fails in a two-member Virtual Chassis configuration and split detection is enabled (the default behavior), the master router takes a **line-card** role, and line cards (FPCs) that do not host Virtual Chassis ports go offline. This state effectively isolates the master router and removes it from the Virtual Chassis until connectivity is restored. As a result, routing is halted and the Virtual Chassis configuration is disabled.

Virtual Chassis Ports

Virtual Chassis ports are special Ethernet interfaces that form a point-to-point connection between the member routers in a Virtual Chassis. When you create a Virtual Chassis, you must configure the Virtual Chassis ports on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces. After you configure a Virtual Chassis port, it is renamed **vcp-*slot/pic/port*** (for example, **vcp-2/2/0**), and the line card associated with that port comes online. For example, the sample Virtual Chassis topology shown in Figure 1 on page 5 has a total of four Virtual Chassis ports (represented by the blue dots), two on each of the two member routers.

After a Virtual Chassis port is configured, it is dedicated to the task of interconnecting member routers, and is no longer available for configuration as a standard network port. To restore this port to the global configuration and make it available to function as a standard network port, you must delete the Virtual Chassis port from the Virtual Chassis configuration.

You can configure a Virtual Chassis port on either a 1-Gigabit Ethernet (**ge**) interface or a 10-Gigabit Ethernet (**xe**) interface. However, you cannot configure a combination of 1-Gigabit Ethernet Virtual Chassis ports and 10-Gigabit Ethernet Virtual Chassis ports in the same Virtual Chassis. We recommend that you configure Virtual Chassis ports only on 10-Gigabit Ethernet interfaces. In addition, to minimize network disruption in the event of a router or link failure, configure redundant Virtual Chassis ports that reside on different line cards in each member router.

Virtual Chassis port interfaces carry both VCCP packets and internal control and data traffic. Because the internal control traffic is neither encrypted nor authenticated, make

sure the Virtual Chassis port interfaces are properly secured to prevent malicious third-party attacks on the data.

Virtual Chassis ports use a default class of service (CoS) configuration that applies equally to all Virtual Chassis port interfaces configured in a Virtual Chassis. Optionally, you can create a customized CoS traffic-control profile and apply it to all Virtual Chassis port interfaces. For example, you might want to create a nondefault traffic-control profile that allocates more than the default 5 percent of the Virtual Chassis port bandwidth to control traffic, or that assigns different priorities and excess rates to different forwarding classes.

Virtual Chassis Port Trunks

If two or more Virtual Chassis ports of the same type and speed are configured between the same two member routers in an MX Series Virtual Chassis, the Virtual Chassis Control Protocol (VCCP) bundles these Virtual Chassis port interfaces into a trunk, reduces the routing cost accordingly, and performs traffic load balancing across all of the Virtual Chassis port interfaces (also referred to as Virtual Chassis port links) in the trunk.

A Virtual Chassis port trunk must include only Virtual Chassis ports of the same type and speed. For example, a Virtual Chassis port trunk can include either all 10-Gigabit Ethernet (**xe** media type) Virtual Chassis ports or all 1-Gigabit Ethernet (**ge** media type) Virtual Chassis ports. An MX Series Virtual Chassis does *not* support a combination of 1-Gigabit Ethernet Virtual Chassis ports and 10-Gigabit Ethernet Virtual Chassis ports in the same Virtual Chassis port trunk.

The router uses the following formula to determine the cost metric of a Virtual Chassis port link in a Virtual Chassis port trunk:

Cost = (300 * 1,000,000,000) / *port-speed*

where *port-speed* is the aggegate speed, in bits per second, of the Virtual Chassis port.

For example, a 10-Gigabit Ethernet Virtual Chassis port link has a cost metric of 30 (300 * 1,000,000,000 / 10,000,000,000). A 1-Gigabit Ethernet Virtual Chassis port link has a cost metric of 300 (300 * 1,000,000,000 / 1,000,000,000). Virtual Chassis port links with a lower cost metric are preferred over those with a higher cost metric.

An MX Series Virtual Chassis supports up to 16 Virtual Chassis ports per trunk.

Slot Numbering in the Virtual Chassis

When the Virtual Chassis forms, the slots for line cards (FPCs) that do not host Virtual Chassis ports are renumbered to reflect the slot numbering and offsets used in the Virtual Chassis instead of the physical slot numbers where the line card is actually installed. In a two-member MX Series Virtual Chassis, member 0 in the Virtual Chassis uses FPC slot numbers 0 through 11 with no offset, and member 1 uses FPC slot numbers 12 through 23, with an offset of 12.

For example, a 10-Gigabit Ethernet interface that appears as **xe-14/2/2** (FPC slot 14, PIC slot 2, port 2) in the **show interfaces** command output is actually physical interface

xe-2/2/2 (FPC slot 2, PIC slot 2, port 2) on member 1 after deducting the FPC slot numbering offset of 12 for member 1.

The slot numbering for Virtual Chassis ports uses the physical slot number where the Virtual Chassis port is configured. For example, **vcp-3/2/0** is configured on physical FPC slot 3, PIC slot 2, port 0.

NOTE: For information about how the slot numbering in an MX Series Virtual Chassis affects the use of SNMP, see "Virtual Chassis Slot Number Mapping for Use with SNMP" on page 142.

Virtual Chassis Control Protocol

An MX Series Virtual Chassis is managed by the Virtual Chassis Control Protocol (VCCP), which is a dedicated control protocol based on IS-IS. VCCP runs on the Virtual Chassis port interfaces and performs the following functions in the Virtual Chassis:

- Discovers and builds the Virtual Chassis topology
- Runs the mastership election algorithm to determine the Virtual Chassis master router
- Establishes the interchassis routing table to route traffic within the Virtual Chassis

Like IS-IS, VCCP exchanges link-state PDUs for each member router to construct a shortest path first (SPF) topology and to determine each member router's role (master or backup) in the Virtual Chassis. Because VCCP supports only point-to-point connections, no more than two member routers can be connected on any given Virtual Chassis port interface.

Member IDs, Roles, and Serial Numbers

To configure an MX Series Virtual Chassis, you must create a preprovisioned configuration that provides the following required information for each member router:

- Member ID—A numeric value (**0** or **1**) that identifies the member router in a Virtual Chassis configuration.
- Role—The role to be performed by each member router in the Virtual Chassis. In a two-member MX Series Virtual Chassis, you must assign both member routers the **routing-engine** role, which enables either router to function as the master router or backup router of the Virtual Chassis.
- Serial number—The chassis serial number of each member router in the Virtual Chassis. To obtain the router's serial number, find the label affixed to the side of the MX Series chassis, or issue the **show chassis hardware** command on the router to display the serial number in the command output.

The preprovisioned configuration permanently associates the member ID and role with the member router's chassis serial number. When a new member router joins the Virtual Chassis, the VCCP software compares the router's serial number against the values specified in the preprovisioned configuration. If the serial number of a joining router does

not match any of the configured serial numbers, the VCCP software prevents that router from becoming a member of the Virtual Chassis.

Related Documentation

- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Guidelines for Configuring Virtual Chassis Ports on page 10
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Split Detection Behavior in a Virtual Chassis on page 20
- Virtual Chassis Slot Number Mapping for Use with SNMP on page 142
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Guidelines for Configuring Virtual Chassis Ports

To interconnect the member routers in a Virtual Chassis for MX Series 3D Universal Edge Routers, you must configure Virtual Chassis ports on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces. After it is configured, a Virtual Chassis port is dedicated to the task of interconnecting member routers, and is no longer available for configuration as a standard network port.

Consider the following guidelines when you configure Virtual Chassis ports in an MX Series Virtual Chassis:

- An MX Series Virtual Chassis supports up to 16 Virtual Chassis ports per trunk.

  If two or more Virtual Chassis ports of the same type and speed (that is, either all 10-Gigabit Ethernet Virtual Chassis ports or all 1-Gigabit Ethernet Virtual Chassis ports) are configured between the same two member routers in an MX Series Virtual Chassis, the Virtual Chassis Control Protocol (VCCP) bundles these Virtual Chassis port interfaces into a trunk, reduces the routing cost accordingly, and performs traffic load balancing across all of the Virtual Chassis port interfaces in the trunk.

- An MX Series Virtual Chassis does *not* support a combination of 1-Gigabit Ethernet (**ge** media type) Virtual Chassis ports and 10-Gigabit Ethernet (**xe** media type) Virtual Chassis ports within the same Virtual Chassis.

  You must configure either all 10-Gigabit Virtual Chassis ports or all 1-Gigabit Virtual Chassis ports in the same Virtual Chassis. We recommend that you configure Virtual Chassis ports on 10-Gigabit Ethernet (**xe**) interfaces.

  This restriction has no effect on access ports or uplink ports in an MX Series Virtual Chassis configuration.

- Configure redundant Virtual Chassis ports that reside on different line cards in each member router.

  For a two-member MX Series Virtual Chassis, we recommend that you configure a minimum of two 10-Gigabit Ethernet Virtual Chassis ports on different line cards in each member router, for a total minimum of four 10-Gigabit Ethernet Virtual Chassis ports in the Virtual Chassis. In addition, make sure the Virtual Chassis port bandwidth

is equivalent to no less than 50 percent of the aggregate bandwidth required for user data traffic. The following examples illustrate these recommendations:

- If the bandwidth in your network is equivalent to two 10-Gigabit Ethernet interfaces (20 Gbps) on the access-facing side of the Virtual Chassis and two 10-Gigabit Ethernet interfaces (20 Gbps) on the core-facing side of the Virtual Chassis, we recommend that you configure two 10-Gigabit Ethernet Virtual Chassis ports, which is the recommended minimum in a Virtual Chassis for redundancy purposes.
- If the aggregate bandwidth in your network is equivalent to ten 10-Gigabit Ethernet interfaces (100 Gbps), we recommend that you configure a minimum of five 10-Gigabit Ethernet Virtual Chassis ports, which is 50 percent of the aggregate bandwidth.

- A user data packet traversing the Virtual Chassis port interfaces between member routers is discarded at the Virtual Chassis egress port if the MTU size of the packet exceeds 9150 bytes.

  The maximum MTU size of a Gigabit Ethernet interface or 10-Gigabit Ethernet interface on a single MX Series router is 9192 bytes. In an MX Series Virtual Chassis configuration, user data packets that traverse Gigabit Ethernet or 10-Gigabit Ethernet Virtual Chassis port interfaces have 42 extra bytes of Virtual Chassis-specific header data, which reduces their maximum MTU (payload) size to 9150 bytes. The user data packet is transmitted in its entirety across the Virtual Chassis port interface. However, because packet fragmentation and reassembly is not supported on Virtual Chassis port interfaces, user data packets that exceed 9150 bytes are discarded at the Virtual Chassis egress port.

Related Documentation

- Virtual Chassis Components Overview on page 5
- Configuring Virtual Chassis Ports to Interconnect Member Routers on page 52
- Class of Service Overview for Virtual Chassis Ports on page 27
- Guidelines for Configuring Class of Service for Virtual Chassis Ports on page 32
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

CHAPTER 2

Virtual Chassis Features

Global Roles and Local Roles in a Virtual Chassis

In a Virtual Chassis configuration for MX Series 3D Universal Edge Routers, each of the two member routers and each of the two Routing Engines in each member router has a distinct role. A *global role* defines the function of each member router in the Virtual Chassis, and applies globally across the entire Virtual Chassis. A *local role* defines the function of each Routing Engine in the member router, and applies locally only to that member router.

Global roles change when you switch the Virtual Chassis mastership, and both global roles and local roles change when you switch the Routing Engine mastership in one of the member routers. In addition, the **line-card** global role, though not supported in a preprovisioned configuration for a two-member MX Series Virtual Chassis, applies in the context of split detection behavior.

This topic describes the global roles and local roles in a MX Series Virtual Chassis so you can better understand how the Virtual Chassis behaves during a global mastership switch, a local Routing Engine switchover, or when split detection is enabled.

Role Name Format

The global and local role names in an MX Series Virtual Chassis use the following format:

VC-*GlobalRole*<*LocalRole*>

where:

- ***GlobalRole*** applies to the global function of the member router for the entire Virtual Chassis, and can be one of the following:
  - **M**—Virtual Chassis master router, also referred to as the protocol master.
  - **B**—Virtual Chassis backup router, also referred to as the protocol backup.
  - **L**—Virtual Chassis line-card router. The **line-card** role is not supported in the preprovisioned configuration for a two-member MX Series Virtual Chassis. The **line-card** role applies only in the context of split detection behavior.
- ***LocalRole*** (optional) applies to the function of the Routing Engine in the local member router, and can be one of the following:
  - **m**—Master Routing Engine
  - **s**—Standby Routing Engine

Global Role and Local Role Descriptions

Table 3 on page 14 describes the global roles and local roles in an MX Series Virtual Chassis.

Table 3: Global Roles and Local Roles in an MX Series Virtual Chassis

Virtual Chassis Role	Type of Role	Description
VC-M	Global	Master router for the Virtual Chassis
VC-B	Global	Backup router for the Virtual Chassis
VC-L	Global	Line-card router for the Virtual Chassis NOTE: The **line-card** role is not supported in the preprovisioned configuration for a two-member MX Series Virtual Chassis. The **line-card** role applies only in the context of split detection behavior.
VC-Mm	Local	Master Routing Engine in the Virtual Chassis master router
VC-Ms	Local	Standby Routing Engine in the Virtual Chassis master router
VC-Bm	Local	Master Routing Engine in the Virtual Chassis backup router
VC-Bs	Local	Standby Routing Engine in the Virtual Chassis backup router

Table 3: Global Roles and Local Roles in an MX Series Virtual Chassis *(continued)*

Virtual Chassis Role	Type of Role	Description
VC-Lm	Local	Master Routing Engine in the Virtual Chassis line-card router NOTE: The **line-card** role is not supported in the preprovisioned configuration for a two-member MX Series Virtual Chassis. The **line-card** role applies only in the context of split detection behavior.
VC-Ls	Local	Standby Routing Engine in the Virtual Chassis line-card router NOTE: The **line-card** role is not supported in the preprovisioned configuration for a two-member MX Series Virtual Chassis. The **line-card** role applies only in the context of split detection behavior.

Related Documentation

- Virtual Chassis Components Overview on page 5
- Mastership Election in a Virtual Chassis on page 16
- Switching the Global Master and Backup Roles in a Virtual Chassis Configuration on page 57
- Disabling Split Detection in a Virtual Chassis Configuration on page 60

Mastership Election in a Virtual Chassis

In a two-member MX Series Virtual Chassis, either member router can be elected as the master router (also known as the protocol master, or VC-M) of the Virtual Chassis. The first member router to join the Virtual Chassis becomes the initial master router by default. After the Virtual Chassis is formed with both member routers, the Virtual Chassis Control Protocol (VCCP) software runs a mastership election algorithm to elect the master router for the Virtual Chassis configuration.

If the master router in a Virtual Chassis fails, the backup router (also known as the protocol backup, or VC-B) takes over mastership of the Virtual Chassis. You can also switch the global roles of the master router and backup router in a Virtual Chassis by issuing the request virtual-chassis routing-engine master switch command.

NOTE: You cannot configure mastership election for an MX Series Virtual Chassis in the current release.

The VCCP software uses the following algorithm to elect the master router for an MX Series Virtual Chassis:

1. Choose the member router that has the highest value for the internal mastership election flag.

   The mastership election algorithm uses an internal flag that keeps track of the member state for the purpose of electing the Virtual Chassis master router. In most cases, VCCP elects the member router with the higher flag value over the member router with the lower flag value as the protocol master.

   To display the mastership election flag value, issue the show virtual-chassis protocol database **extensive** command. The flag value used for mastership election appears in the **TLVs** field of the command output, as shown in the following example:

   ```
   {master:member1-re0}

   user@host> show virtual-chassis protocol database member 0 extensive
    ...
     TLVs:
       Node Info: Member ID: 1, VC ID: 5a6a.e747.8511, Flags: 3, Priority: 129
          System ID: 001d.b510.0800, Device ID: 1
    ...
   ```

2. Choose the member router with the highest mastership priority value.

   The mastership priority value is assigned to the member router by the VCCP software, and is not configurable in the current release. The mastership priority value can be one of the following:

   - **129**—The **routing-engine** role is assigned to the member router.
   - **128**—No role is assigned to the member router.

- **0**—The **line-card** role is assigned to the member router (not supported in the current release).

To display the mastership priority value for the member routers in the Virtual Chassis, issue the **show virtual-chassis status** command.

3. Choose the member router that is active in the Virtual Chassis.
4. Choose the member router that belongs to the Virtual Chassis with the largest number of members.

NOTE: **This criterion is not used in the current release because all MX Series Virtual Chassis configurations have two member routers.**

5. Choose the member router that is the accepted (elected) protocol master of the Virtual Chassis.
6. Choose the member router that is the current protocol master (VC-M) of the same Virtual Chassis.
7. Choose the member router that is the current protocol backup (VC-B) of the same Virtual Chassis.
8. Choose the member router that has been part of the Virtual Chassis configuration for the longest period of time.
9. Choose the member router that was the previous protocol master of the same Virtual Chassis.
10. Choose the member router with the lowest media access control (MAC) address.

Related Documentation

- Virtual Chassis Components Overview on page 5
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Switching the Global Master and Backup Roles in a Virtual Chassis Configuration on page 57

Switchover Behavior in a Virtual Chassis

When an active or primary hardware or software component fails or is temporarily shut down, you can manually configure a *switchover* to a backup component that takes over the functions of the unavailable primary component. You can configure two types of switchovers in a Virtual Chassis configuration for MX Series 3D Universal Edge Routers:

- Global switchover—Changes the mastership in an MX Series Virtual Chassis by switching the global roles of the master router and backup router in the Virtual Chassis configuration.
- Local switchover—Toggles the local mastership of the dual Routing Engines in a member router of the Virtual Chassis.

During a switchover, the roles assigned to the member routers and Routing Engines in a Virtual Chassis configuration change. This topic describes the role transitions that occur so you can better understand how an MX Series Virtual Chassis behaves during a global or local switchover. The topic also describes how you can determine whether the member routers are ready for a global graceful Routing Engine switchover (GRES) operation from a database synchronization perspective.

- Virtual Chassis Role Transitions During a Global Switchover on page 18
- Virtual Chassis Role Transitions During a Local Switchover on page 19
- GRES Readiness in a Virtual Chassis Configuration on page 20

Virtual Chassis Role Transitions During a Global Switchover

To change the mastership in an MX Series Virtual Chassis and cause a global switchover, you issue the **request virtual-chassis routing-engine master switch** command from the master router. After you issue this command, the current master router in the Virtual Chassis (VC-M) becomes the backup router (VC-B), and the current backup router (VC-B) becomes the master router (VC-M).

A global switchover in an MX Series Virtual Chassis causes the role transitions listed in Table 4 on page 18.

Table 4: Virtual Chassis Role Transitions During Global Switchover

Virtual Chassis Role *Before* Global Switchover	Virtual Chassis Role *After* Global Switchover
Virtual Chassis master router (VC-M)	Virtual Chassis backup router (VC-B)
Virtual Chassis backup router (VC-B)	Virtual Chassis master router (VC-M)
Master Routing Engine in the Virtual Chassis master router (VC-Mm)	Master Routing Engine in the Virtual Chassis backup router (VC-Bm)
Standby Routing Engine in the Virtual Chassis master router (VC-Ms)	Standby Routing Engine in the Virtual Chassis backup router (VC-Bs)

Table 4: Virtual Chassis Role Transitions During Global Switchover *(continued)*

Virtual Chassis Role *Before* Global Switchover	Virtual Chassis Role *After* Global Switchover
Master Routing Engine in the Virtual Chassis backup router (VC-Bm)	Master Routing Engine in the Virtual Chassis master router (VC-Mm)
Standby Routing Engine in the Virtual Chassis backup router (VC-Bs)	Standby Routing Engine in the Virtual Chassis master router (VC-Ms)

The local roles (**master** and **standby**, or **m** and **s**) of the Routing Engines do not change after a global switchover. For example, as shown in Table 4 on page 18, the master Routing Engine in the Virtual Chassis backup router (VC-Bm) remains the master Routing Engine in the Virtual Chassis master router (VC-Mm) after the global switchover.

Virtual Chassis Role Transitions During a Local Switchover

To ensure redundancy in a two-member MX Series Virtual Chassis configuration, each of the two member routers must be configured with dual Routing Engines. To toggle local mastership between the master Routing Engine and the standby Routing Engine in the member router, you issue the **request chassis routing-engine master switch** command.

A local switchover in an MX Series Virtual Chassis causes the role transitions listed in Table 5 on page 19.

Table 5: Virtual Chassis Role Transitions During Local Switchover

Virtual Chassis Role *Before* Local Switchover	Virtual Chassis Role *After* Local Switchover
Master Routing Engine in the Virtual Chassis master router (VC-Mm)	Standby Routing Engine in the Virtual Chassis backup router (VC-Bs)
Standby Routing Engine in the Virtual Chassis master router (VC-Ms)	Master Routing Engine in the Virtual Chassis backup router (VC-Bm)
Master Routing Engine in the Virtual Chassis backup router (VC-Bm)	Master Routing Engine in the Virtual Chassis master router (VC-Mm)
Standby Routing Engine in the Virtual Chassis backup router (VC-Bs)	Standby Routing Engine in the Virtual Chassis master router (VC-Ms)

The local roles (**master** and **standby**, or **m** and **s**) of the Routing Engines in the Virtual Chassis master router change after a local switchover, but the local roles of the Routing Engines in the Virtual Chassis backup router do not change. For example, as shown in Table 5 on page 19, the master Routing Engine in the Virtual Chassis master router (VC-Mm) becomes the standby Routing Engine in the Virtual Chassis backup router (VC-Bs) after the local switchover. By contrast, the master Routing Engine in the Virtual

Chassis backup router (VC-Bm) remains the master Routing Engine in the Virtual Chassis master router (VC-Mm) after the local switchover.

GRES Readiness in a Virtual Chassis Configuration

Depending on the router configuration, a variable amount of time is required before a router is ready to perform a graceful Routing Engine switchover (GRES). Attempting a GRES operation before the router is ready can cause system errors and unexpected behavior. To determine whether the member routers in an MX Series Virtual Chassis configuration are ready for a GRES operation from a database synchronization perspective, you can issue the **request virtual-chassis routing-engine master switch check** command from the Virtual Chassis master router (VC-Mm) before you initiate the GRES operation.

The **request virtual-chassis routing-engine master switch check** command checks various system and database components on the member routers to determine whether they are ready for GRES, but does not initiate the global GRES operation itself. The readiness check includes ensuring that a system timer, which expires after 300 seconds, has completed before the global GRES operation can begin.

Using the **request virtual-chassis routing-engine master switch check** command before you initiate the GRES operation ensures that the subscriber management and kernel databases on both member routers in an MX Series Virtual Chassis are synchronized and ready for the GRES operation.

Related Documentation

- Virtual Chassis Components Overview on page 5
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Mastership Election in a Virtual Chassis on page 16
- Switching the Global Master and Backup Roles in a Virtual Chassis Configuration on page 57
- Determining GRES Readiness in a Virtual Chassis Configuration on page 58
- *Understanding Graceful Routing Engine Switchover in the Junos OS*

Split Detection Behavior in a Virtual Chassis

If there is a disruption to a Virtual Chassis configuration for MX Series 3D Universal Edge Routers due to the failure of a member router or one or more Virtual Chassis port interfaces, the resulting connectivity loss can cause a split in the Virtual Chassis configuration. *Split detection* identifies the split and can minimize further network disruption.

This topic covers:

- How Split Detection Works in a Virtual Chassis on page 21
- Effect of Split Detection on Virtual Chassis Failure Scenarios on page 21

How Split Detection Works in a Virtual Chassis

Split detection is enabled by default in an MX Series Virtual Chassis. Optionally, you can disable split detection by including the **no-split-detection** statement at the **[edit virtual-chassis]** hierarchy level. Disabling split detection can be useful in certain Virtual Chassis configurations.

For example, if the backup router fails in a two-member Virtual Chassis configuration and split detection is enabled (the default behavior), the master router takes a **line-card** role, and the line cards (FPCs) that do not host Virtual Chassis ports go offline. This state effectively halts routing and disables the Virtual Chassis configuration. By contrast, if the backup router fails in a two-member Virtual Chassis configuration and split detection is disabled, the master router retains mastership and maintains all of the Virtual Chassis ports, effectively resulting in a single-member Virtual Chassis consisting of only the master router.

BEST PRACTICE: We recommend that you disable split detection for a two-member MX Series Virtual Chassis configuration if you think the backup router is more likely to fail than the Virtual Chassis port interfaces to the backup router. Configuring redundant Virtual Chassis ports on different line cards in each member router reduces the likelihood that all Virtual Chassis port interfaces to the backup router can fail.

Effect of Split Detection on Virtual Chassis Failure Scenarios

The behavior of a Virtual Chassis during certain failure scenarios depends on whether split detection is enabled or disabled. Table 6 on page 22 describes the effect of the split detection setting on common failure scenarios in a two-member MX Series Virtual Chassis.

Table 6: Effect of Split Detection on Common Virtual Chassis Failure Scenarios

Type of Failure	Split Detection Setting	Results
Virtual Chassis port interfaces go down	Enabled	• VC-B takes VC-M role. • Previous VC-M takes **line-card** (VC-L) role. The **line-card** role isolates the router and removes it from the Virtual Chassis until connectivity is restored. • Result is a single-member Virtual Chassis consisting of only a single VC-M. The VC-M continues to maintain subscriber state information and route traffic. When Virtual Chassis port interfaces are reconnected: • VC-M retains VC-M role. • VC-L takes VC-B role. • Subscribers are not affected.
Virtual Chassis port interfaces go down	Disabled	When Virtual Chassis port interfaces are disconnected: • VC-M retains VC-M role, and VC-B also takes VC-M role. The result is a Virtual Chassis with two VC-M routers, each of which maintains subscriber state information. • Initially, both VC-M routers have a complete list of subscribers. Because the two routers have the same configuration, the effect on subscribers, traffic patterns, behavior of external applications, and subscriber login and logout operations is unpredictable while the Virtual Chassis port interfaces are disconnected. When Virtual Chassis port interfaces are reconnected: • Original VC-M before the disconnection resumes VC-M role, and original VC-B before the disconnection resumes VC-B role. • Subscribers on the VC-M are preserved. • Subscribers on the VC-B are purged. • The subscribers preserved on the VC-M are unaffected, and all remaining subscribers are able to log back in to the router.

Table 6: Effect of Split Detection on Common Virtual Chassis Failure Scenarios *(continued)*

Type of Failure	Split Detection Setting	Results
Virtual Chassis backup router (VC-B) goes down	Enabled	• VC-M takes **line-card** (VC-L) role, which causes all line cards (FPCs) that do not host Virtual Chassis ports to go offline. • Previous VC-B is out of service. • The **line-card** role isolates the master router and removes it from the Virtual Chassis until connectivity is restored. As a result, the Virtual Chassis is left without a master router, which halts interchassis routing and effectively disables the Virtual Chassis configuration. When the failed router is brought back into service: • The mastership election algorithm is run to determine whether the router takes a VC-M or VC-B role. The Virtual Chassis then becomes operational. • All subscribers can log back in to the router. • Previous subscriber state information is not preserved.
Virtual Chassis backup router (VC-B) goes down	Disabled	• VC-M retains VC-M role and maintains all Virtual Chassis ports. • Previous VC-B is out of service. • Result is a single-member Virtual Chassis consisting of only a single VC-M. The VC-M continues to maintain subscriber state information and route traffic.
Virtual Chassis master router (VC-M) goes down	Split detection setting has no effect on behavior	• VC-B takes over VC-M role regardless of whether split detection is enabled or disabled. • Previous VC-M is out of service. • Result is a single-member Virtual Chassis consisting of only a single VC-M. The new VC-M continues to maintain subscriber state information and route traffic. When the original VC-M is brought back into service, or when the original VC-M is replaced with a new router: • Original VC-M or its replacement takes VC-B role. • Subscribers are not affected.

Table 6: Effect of Split Detection on Common Virtual Chassis Failure Scenarios *(continued)*

Type of Failure	Split Detection Setting	Results
Active access link between the VC-M and the access node, such as a digital subscriber line access multiplexer (DSLAM), goes down	Split detection setting has no effect on behavior	• Previous standby access link becomes the active access link between the VC-B and the access node. • Traffic is routed through the new active access link. • The VC-M continues to maintain subscriber state information and route traffic.

Related Documentation

- Virtual Chassis Components Overview on page 5
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Mastership Election in a Virtual Chassis on page 16
- Switchover Behavior in a Virtual Chassis on page 18
- Disabling Split Detection in a Virtual Chassis Configuration on page 60

Targeted Traffic Distribution on Aggregated Ethernet Interfaces in a Virtual Chassis

By default, member routers in an MX Series Virtual Chassis use hash-based traffic distribution for subscriber interfaces in aggregated Ethernet bundles configured without link protection. The hash-based model distributes subscriber interface traffic over multiple links in the bundle, enabling you to load balance multiple traffic flows through the logical subscriber interface.

As an alternative to using hash-based distribution in an MX Series Virtual Chassis, you can configure targeted traffic distribution for IP demultiplexing (demux) or VLAN demux subscriber interfaces in an aggregated Ethernet bundle that is configured without link protection.

- Targeted Distribution in a Virtual Chassis on page 24
- Benefits of Targeted Distribution on page 25

Targeted Distribution in a Virtual Chassis

Targeted distribution enables you to configure the Virtual Chassis to send (target) all egress data traffic for a logical subscriber interface across a single member link in an *aggregated Ethernet bundle*, also referred to as an IEEE 802.3ad link aggregation group (LAG) bundle. You configure targeted distribution for a demux subscriber interface on the Virtual Chassis master router.

With targeted distribution, the router in a Virtual Chassis assigns the primary member link and backup member link for the aggregated Ethernet bundle across *all* Virtual Chassis port links that belong to the aggregated Ethernet bundle. To accomplish load balancing, the router evenly distributes the demux subscriber interfaces over these member links.

Benefits of Targeted Distribution

Targeted distribution is especially useful in a Virtual Chassis configuration in which subscriber traffic enters through a Virtual Chassis port on one member router and exits through a Virtual Chassis port on a different member router. By combining Virtual Chassis ports from different member routers as member links of the aggregated Ethernet bundle, targeted distribution provides increased redundancy in the event of a chassis or link failure.

Related Documentation

- Redundancy Mechanisms on Aggregated Ethernet Interfaces in a Virtual Chassis on page 25
- Configuring Module Redundancy for a Virtual Chassis on page 61
- Configuring Chassis Redundancy for a Virtual Chassis on page 62

Redundancy Mechanisms on Aggregated Ethernet Interfaces in a Virtual Chassis

An MX Series Virtual Chassis configured with targeted traffic distribution for IP demux or VLAN demux subscribers on aggregated Ethernet interfaces supports three types of redundancy mechanisms: link redundancy, module redundancy, and chassis redundancy.

- Link Redundancy in a Virtual Chassis on page 25
- Module Redundancy in a Virtual Chassis on page 25
- Chassis Redundancy in a Virtual Chassis on page 26

Link Redundancy in a Virtual Chassis

By default, the router uses *link redundancy*, also known as *port redundancy*, as the default redundancy mechanism for targeted distribution on aggregated Ethernet interfaces. With link redundancy, the router assigns backup links for a subscriber based on the link with the fewest number of subscribers.

In an MX Series Virtual Chassis configured with link redundancy, the primary link and backup link can be assigned on the same Modular Port Concentrator/Modular Interface Card (MPC/MIC) module, on different MPC/MIC modules in the same member router, or on different MPC/MIC modules in different member routers. This feature provides redundancy if a link in the MX Series Virtual Chassis configuration fails.

Because link redundancy is the default redundancy mechanism, no special configuration is required on the Virtual Chassis master router to enable it.

Module Redundancy in a Virtual Chassis

You can configure *module redundancy*, also known as *Flexible PIC Concentrator (FPC) redundancy*, to provide redundancy if a module or a link fails. The router assigns backup links for the subscriber interface on a different MPC/MIC module from the primary link, based on the link with the fewest number of subscribers among the links on different modules.

In an MX Series Virtual Chassis configured with link redundancy, the router assigns the primary link and backup link to different MPC/MIC modules. For purposes of link selection, the router gives all MPC/MIC modules in the Virtual Chassis equal weight, and disregards the role (master or backup) of the member router in which the MPC/MIC module is installed. The router uses an algorithm to assign the primary and backup links, and is as likely to assign a primary link to an MPC/MIC module in the Virtual Chassis master router as it is to assign the primary link to an MPC/MIC module in the Virtual Chassis backup router.

Chassis Redundancy in a Virtual Chassis

Unlike link redundancy and module redundancy, which are supported on both standalone routers and Virtual Chassis member routers, chassis redundancy is available only for member routers in an MX Series Virtual Chassis configuration.

Chassis redundancy and module redundancy use the same algorithm for link assignment, with the exception that in a Virtual Chassis with chassis redundancy configured, the router assigns the backup link to an MPC/MIC module in a member router *other* than the router on which the primary link resides. For example, in a two-member MX Series Virtual Chassis, if the primary link for the aggregated Ethernet bundle is assigned to an MPC/MIC module in the Virtual Chassis master router, the router assigns the backup link to an MPC/MIC module in the Virtual Chassis backup router.

Chassis redundancy provides protection if the MPC/MIC module containing the primary link fails. In this event, the subscriber connections fail over to the backup link on the MPC/MIC module in the other member router.

BEST PRACTICE: **We recommend that you do not configure both module (FPC) redundancy and chassis redundancy for the same aggregated Ethernet interface in an MX Series Virtual Chassis. If you do, module redundancy takes precedence over chassis redundancy.**

Related Documentation

- Targeted Traffic Distribution on Aggregated Ethernet Interfaces in a Virtual Chassis on page 24
- Configuring Module Redundancy for a Virtual Chassis on page 61
- Configuring Chassis Redundancy for a Virtual Chassis on page 62

CHAPTER 3

Virtual Chassis Ports and Class of Service

Class of Service Overview for Virtual Chassis Ports

By default, all Virtual Chassis port interfaces in a Virtual Chassis for MX Series 3D Universal Edge Routers use a default class of service (CoS) configuration specifically tailored for Virtual Chassis ports. The default configuration, which applies to all Virtual Chassis ports in the Virtual Chassis, includes classifiers, forwarding classes, rewrite rules, and schedulers. In most cases, the default CoS configuration is adequate for your needs without requiring any additional CoS configuration.

In some cases, however, you might want to customize the traffic-control profile configuration on Virtual Chassis ports. To do so, you can configure an output traffic-control profile and apply it to all Virtual Chassis ports interfaces in the Virtual Chassis.

This topic provides an overview of the default CoS configuration for Virtual Chassis ports and helps you understand the components of the CoS configuration that you can customize.

Default CoS Configuration for Virtual Chassis Ports

In an MX Series Virtual Chassis configuration, the Virtual Chassis ports behave like switch fabric ports to transport packets between the member routers in a Virtual Chassis. More specifically, the Virtual Chassis ports carry internal control traffic within the Virtual Chassis and forward user traffic between line cards in the router.

Like traffic on standard network port interfaces, traffic on Virtual Chassis port interfaces is mapped to one of four forwarding classes, as follows:

- Internal Virtual Chassis Control Protocol (VCCP) traffic is mapped to the network control forwarding class with the code point (IEEE 802.1p bit) value set to '111'b. You cannot change this configuration.
- Control traffic is mapped to the network control forwarding class with the code point (IEEE 802.1p bit) value set to '110'b. You cannot change this configuration.
- User traffic is mapped to the best effort, expedited forwarding, and assured forwarding traffic classes.

The CoS configuration applies globally to all Virtual Chassis ports in the Virtual Chassis. You cannot configure CoS for an individual Virtual Chassis port (such as **vcp-2/2/0**). If you create a new Virtual Chassis port, the global CoS configuration is propagated to the newly created Virtual Chassis port when the member router on which the new Virtual Chassis port resides joins the Virtual Chassis. Alternatively, you can configure CoS for the Virtual Chassis ports by configuring CoS for a standard network port, and then converting the network port to a Virtual Chassis port by issuing the **request virtual-chassis vc-port set** command.

You can convert a standard network port (for example, **xe-2/2/1**) to a Virtual Chassis port by issuing the **request virtual-chassis vc-port set** command. If the standard network port was configured with different CoS settings than the CoS configuration in effect for all Virtual Chassis ports in the Virtual Chassis, the newly converted Virtual Chassis port (**vcp-2/2/1**) uses the CoS configuration defined for all Virtual Chassis port interfaces instead of the original CoS configuration associated with the network port.

The default CoS configuration for Virtual Chassis ports provides the following benefits to keep the Virtual Chassis operating properly:

- Gives preference to internal VCCP traffic that traverses the Virtual Chassis port interfaces
- Prioritizes control traffic over user traffic on the Virtual Chassis port interfaces
- Preserves the CoS properties of each packet as it travels between member routers in the Virtual Chassis

Supported Platforms and Maximums for CoS Configuration of Virtual Chassis Ports

You can configure Virtual Chassis ports only on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces in the following MX Series 3D Universal Edge Routers with dual Routing Engines:

- MX240 3D Universal Edge Router
- MX480 3D Universal Edge Router
- MX960 3D Universal Edge Router

Trio MPC/MIC interfaces support the following maximums for forwarding classes and priority scheduling levels:

- Up to eight forwarding classes
- Up to five priority scheduling levels

Default Classifiers for Virtual Chassis Ports

Classification takes place when a packet enters a Virtual Chassis member router from a network port. For Virtual Chassis configurations that support more than two member routers, the packet is reclassified for CoS treatment according to the default IEEE 802.1p classifier rules that apply to the Virtual Chassis port as the packet travels through the intermediate member routers in the Virtual Chassis. When the packet enters the last member router in the Virtual Chassis, it is reclassified according to the original classifier rules that applied when the packet entered the Virtual Chassis from a network port.

NOTE: This reclassification behavior does not apply to an MX Series Virtual Chassis, which supports only two member routers in the current release.

Because there are no intermediate member routers between the two member routers in an MX Series Virtual Chassis, the packet is not reclassified according to the default classifier rules for the Virtual Chassis port. Instead, the original classifier rules that applied when the packet entered the Virtual Chassis on a network port are retained.

The default IEEE 802.1p classifier rules map the code point (or .1p bit) value to the forwarding class and loss priority. You can display the default IEEE 802.1p classifier rules by issuing the **show class-of-service classifier** command:

```
{master:member0-re0}

user@host> show class-of-service classifier type ieee-802.1
Classifier: ieee8021p-default, Code point type: ieee-802.1, Index: 11
  Code point         Forwarding class                  Loss priority
  000                best-effort                       low
  001                best-effort                       high
  010                expedited-forwarding              low
  011                expedited-forwarding              high
  100                assured-forwarding                low
  101                assured-forwarding                high
  110                network-control                   low
  111                network-control                   high
```

Default Rewrite Rules for Virtual Chassis Ports

When a packet enters the Virtual Chassis from a network port, normal CoS classification takes place. If the packet exits a member router through the Virtual Chassis port to the other member router, the CoS software encapsulates the packet with a virtual LAN (VLAN) tag that contains the code point information used for CoS treatment. The code point value is assigned according to the default IEEE 802.1p rewrite rules, which map the forwarding class and loss priority value to a code point value.

You can display the default IEEE 802.1p rewrite rules by issuing the **show class-of-service rewrite-rule** command:

```
{master:member0-re0}

user@host> show class-of-service rewrite-rule type ieee-802.1
Rewrite rule: ieee8021p-default, Code point type: ieee-802.1, Index: 34
  Forwarding class                  Loss priority       Code point
  best-effort                       low                 000
  best-effort                       high                001
  expedited-forwarding              low                 010
  expedited-forwarding              high                011
  assured-forwarding                low                 100
  assured-forwarding                high                101
  network-control                   low                 110
  network-control                   high                111
```

Default Scheduler Map for Virtual Chassis Ports

When you create a Virtual Chassis port, it automatically functions as a hierarchical scheduler. However, you cannot explicitly configure hierarchical scheduling on Virtual Chassis ports.

Virtual Chassis ports use the same default scheduler used by standard network ports. The network control and best effort forwarding classes are both assigned low priority, and only 5 percent of the bandwidth is allocated to control traffic.

You can display the scheduler parameters and the mapping of schedulers to forwarding classes by issuing the **show class-of-service scheduler-map** command. For brevity, the following example shows only the portions of the output relevant to the default best effort (**default-be**) and default network control (**default-nc**) schedulers.

```
{master:member0-re0}

user@host> show class-of-service scheduler-map
Scheduler map: <default>, Index: 2

  Scheduler: <default-be>, Forwarding class: best-effort, Index: 21
    Transmit rate: 95 percent, Rate Limit: none, Buffer size: 95 percent, Buffer
 Limit: none, Priority: low
    Excess Priority: low
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    <default-drop-profile>
      Medium low      any             1    <default-drop-profile>
      Medium high     any             1    <default-drop-profile>
      High            any             1    <default-drop-profile>

  Scheduler: <default-nc>, Forwarding class: network-control, Index: 23
    Transmit rate: 5 percent, Rate Limit: none, Buffer size: 5 percent, Buffer
Limit: none, Priority: low
    Excess Priority: low
    Drop profiles:
      Loss priority   Protocol    Index    Name
      Low             any             1    <default-drop-profile>
      Medium low      any             1    <default-drop-profile>
      Medium high     any             1    <default-drop-profile>
```



```
    High            any             1    <default-drop-profile>
...
```

Customized CoS Configuration for Virtual Chassis Ports

Depending on your network topology, you might want to customize the CoS configuration for Virtual Chassis ports. For example, you might want to allocate more than the default 5 percent of the Virtual Chassis port bandwidth to control traffic. Or, you might want to assign different priorities and excess rates to different forwarding classes.

Output Traffic-Control Profiles

To create a customized (nondefault) CoS configuration and apply it to all Virtual Chassis ports, you can configure an output traffic-control profile, which defines a set of traffic scheduling resources and references a scheduler map. You then apply the profile to all Virtual Chassis port interfaces. To apply the output traffic-control profile globally to all Virtual Chassis port interfaces, you must use **vcp-*** as the interface name representing all Virtual Chassis port interfaces. You cannot configure CoS for an individual Virtual Chassis port (such as **vcp-1/1/0**).

For an example that shows how to configure an output traffic-control profile customized for Virtual Chassis ports, see "Example: Configuring Class of Service for Virtual Chassis Ports on MX Series 3D Universal Edge Routers" on page 110.

Classifiers and Rewrite Rules

Configuring nondefault IEEE 802.1p ingress classifiers and IEEE 802.1p egress rewrite rules *has no effect* in a two-member MX Series Virtual Chassis.

Because there are no intermediate routers between the two member routers in an MX Series Virtual Chassis, packets are not reclassified according to the default classifier rules for Virtual Chassis ports. Instead, the original classifier rules that applied when the packet entered the Virtual Chassis on a network port are retained, making configuration of nondefault ingress classifiers and nondefault egress rewrite rules unnecessary in the current release.

Per-Priority Shaping

Trio MPC/MIC interfaces support per-priority shaping, which enables you to configure a separate traffic shaping rate for each of the five priority scheduling levels. However, configuring per-priority shaping for Virtual Chassis ports on Trio MPC/MIC interfaces is unnecessary for the following reasons:

- The neighboring member router has exactly the same bandwidth.
- The same type of Virtual Chassis port is present at both ends of the connection.

Related Documentation

- Guidelines for Configuring Class of Service for Virtual Chassis Ports on page 32
- Example: Configuring Class of Service for Virtual Chassis Ports on MX Series 3D Universal Edge Routers on page 110
- *Junos OS Class of Service Library for Routing Devices*

Guidelines for Configuring Class of Service for Virtual Chassis Ports

Consider the following guidelines when you configure class of service (CoS) for Virtual Chassis ports in an MX Series Virtual Chassis:

- Virtual Chassis ports on Trio MPC/MIC interfaces support a maximum of eight forwarding classes and five priority scheduling levels.
- The same CoS configuration applies globally to all Virtual Chassis ports in the Virtual Chassis. You cannot configure CoS for an individual Virtual Chassis port (such as **vcp-3/1/0**).
- The CoS configuration is propagated to a newly created Virtual Chassis port as soon as the member router on which the new Virtual Chassis port resides joins the Virtual Chassis.
- Although Virtual Chassis ports function as hierarchical schedulers, you cannot explicitly configure hierarchical scheduling on Virtual Chassis ports.
- If you configure a nondefault output traffic-control profile to customize the CoS configuration, you must apply the profile to all Virtual Chassis port interfaces at once by using **vcp-*** as the interface name.
- Configuring nondefault IEEE 802.1p ingress classifiers and IEEE 802.1p egress rewrite rules has no effect in a two-member MX Series Virtual Chassis because the forwarding class assigned to a packet is maintained across the Virtual Chassis until the packet reaches the egress network port.
- Configuring per-priority shaping for Virtual Chassis ports is unnecessary because the neighboring member router has exactly the same bandwidth, and the same type of Virtual Chassis port is present at both ends of the connection.

Related Documentation

- Class of Service Overview for Virtual Chassis Ports on page 27
- Example: Configuring Class of Service for Virtual Chassis Ports on MX Series 3D Universal Edge Routers on page 110
- *Junos OS Class of Service Library for Routing Devices*

PART 2

Configuration

CHAPTER 4

Configuration Overview

Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis

To provide a stateful interchassis redundancy solution for MX Series routers, you can configure a Virtual Chassis. A *Virtual Chassis* interconnects two MX Series routers into a logical system that you can manage as a single network element.

To configure a Virtual Chassis for MX Series routers:

1. Prepare your site for the Virtual Chassis configuration.

   See "Preparing for a Virtual Chassis Configuration" on page 40.

2. Install Junos OS licenses on the routers to be configured as members of the Virtual Chassis.

   See "Installing Junos OS Licenses on Virtual Chassis Member Routers" on page 42.

3. Define configuration groups for the Virtual Chassis.

   See "Creating and Applying Configuration Groups for a Virtual Chassis" on page 44.

4. Create the preprovisioned member configuration on the master router in the Virtual Chassis.

   See "Configuring Preprovisioned Member Information for a Virtual Chassis" on page 46.

5. Configure enhanced IP network services on both member routers.

   See "Configuring Enhanced IP Network Services for a Virtual Chassis" on page 48.

6. Enable graceful Routing Engine switchover (GRES) and nonstop active routing (NSR) on both member routers.

See "Enabling Graceful Routing Engine Switchover and Nonstop Active Routing for a Virtual Chassis" on page 49.

7. Set the preprovisioned member IDs and reboot the routers in Virtual Chassis mode.

   See "Configuring Member IDs for a Virtual Chassis" on page 50.

8. Create the Virtual Chassis ports to interconnect the member routers, and commit the Virtual Chassis configuration on the master router.

   See "Configuring Virtual Chassis Ports to Interconnect Member Routers" on page 52.

9. (Optional) Verify the configuration and operation of the Virtual Chassis.

   See the following topics:

   - Verifying the Status of Virtual Chassis Member Routers on page 145
   - Verifying the Operation of Virtual Chassis Ports on page 145
   - Verifying Neighbor Reachability for Member Routers in a Virtual Chassis on page 146
   - Verifying Neighbor Reachability for Hardware Devices in a Virtual Chassis on page 146
   - Viewing Information in the Virtual Chassis Control Protocol Adjacency Database on page 147
   - Viewing Information in the Virtual Chassis Control Protocol Link-State Database on page 147
   - Viewing Information About Virtual Chassis Port Interfaces in the Virtual Chassis Control Protocol Database on page 148
   - Viewing Virtual Chassis Control Protocol Routing Tables on page 148
   - Viewing Virtual Chassis Control Protocol Statistics for Member Routers and Virtual Chassis Ports on page 149

Related Documentation

- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5
- Guidelines for Configuring Virtual Chassis Ports on page 10
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers

You can delete an MX Series Virtual Chassis configuration at any time. You might want to do so if your network configuration changes, or if you want to replace one or both MX Series member routers with different MX Series routers.

To delete a Virtual Chassis configuration for MX Series routers:

1. Delete the Virtual Chassis ports from each member router.

   See "Deleting Virtual Chassis Ports in a Virtual Chassis Configuration" on page 54.

2. Delete the definitions and applications for the following configuration groups on each member router:

   - **member0-re0**
   - **member0-re1**
   - **member1-re0**
   - **member1-re1**

3. Delete the preprovisioned member information configured at the **[edit virtual-chassis]** hierarchy level on the master router.
4. Delete any interfaces that were configured on the member routers when the Virtual Chassis was created.
5. Delete the Virtual Chassis member IDs to reboot each router and disable Virtual Chassis mode.

   See "Deleting Member IDs in a Virtual Chassis Configuration" on page 55.

NOTE: You cannot override a Virtual Chassis configuration simply by using the **load override** command to load a different configuration on the router from an ASCII file or from terminal input, as you can with other configurations. The member ID and Virtual Chassis port definitions are not stored in the configuration file, and are still defined even after the new configuration file is loaded.

Related Documentation

- Example: Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 82
- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5

Upgrading Junos OS in a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers

You can upgrade an MX Series Virtual Chassis configuration from Junos OS Release 11.2 to a later release. This upgrade procedure assumes that both member routers in the Virtual Chassis have dual Routing Engines installed.

NOTE: Make sure all four Routing Engines in the Virtual Chassis (both Routing Engines in the master router and both Routing Engines in the backup router) are running the same Junos OS release.

To upgrade Junos OS in a Virtual Chassis configuration consisting of two MX Series routers, each with dual Routing Engines:

1. Prepare for the upgrade.
2. Install the Junos OS software package on each of the four Routing Engines.
3. Reboot the Routing Engines to run the new Junos OS release.
4. Re-enable graceful Routing Engine switchover and nonstop active routing.

Related Documentation

- Example: Upgrading Junos OS in a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 94
- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5

CHAPTER 5

Configuration Tasks

Preparing for a Virtual Chassis Configuration

Before you configure and use an MX Series Virtual Chassis, we recommend that you prepare the hardware and software in your network for the configuration.

To prepare for configuring an MX Series Virtual Chassis:

1. Make a list of the serial numbers of each router that you want to configure as part of the Virtual Chassis.

   The chassis serial number is located on a label affixed to the side of the of the MX Series chassis. Alternatively, you can obtain the chassis serial number by issuing the **show chassis hardware** command, which is especially useful if you are accessing the router from a remote location. For example:

   ```
   user@gladius> show chassis hardware
   Hardware inventory:
   Item             Version  Part number  Serial number     Description
   Chassis                                JN10C7135AFC      MX240
   .
   .
   .
   ```

2. Note the desired function of each router in the Virtual Chassis.

   In a two-router Virtual Chassis configuration, you must designate each router with the **routing-engine** role, which enables either router to function as the master or backup of the Virtual Chassis.

   - The *master router* maintains the global configuration and state information for all members of the Virtual Chassis, and runs the chassis management processes.
   - The *backup router* synchronizes with the master router and relays chassis control information (such as line-card presence and alarms) to the master router. If the master router is unavailable, the backup router takes mastership of the Virtual Chassis to preserve routing information and maintain network connectivity without disruption.

3. Note the member ID (0 or 1) to be assigned to each router in the Virtual Chassis.
4. Ensure that both MX Series routers in the Virtual Chassis have dual Routing Engines installed, and that all four Routing Engines in the Virtual Chassis are the same model.

   For example, you cannot configure a Virtual Chassis if one member router has RE-S-2000 Routing Engines installed and the other member router has RE-S-1800 Routing Engines installed.

5. Ensure that the necessary Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces on which to configure the Virtual Chassis ports are installed and operational in each router to be configured as a member of the Virtual Chassis.

NOTE: An MX Series Virtual Chassis does not support a combination of 1-Gigabit Ethernet (ge media type) Virtual Chassis ports and 10-Gigabit Ethernet (xe media type) Virtual Chassis ports within the same Virtual Chassis. You must configure either all 10-Gigabit Ethernet Virtual Chassis ports or all 1-Gigabit Ethernet Virtual Chassis ports in the same Virtual Chassis. We recommend that you configure Virtual Chassis ports on 10-Gigabit Ethernet interfaces. This restriction has no effect on access ports or uplink ports in an MX Series Virtual Chassis configuration.

6. If MX Series Enhanced Queuing IP Services DPCs (DPCE-R-Q model numbers) or MX Series Enhanced Queuing Ethernet Services DPCs (DPCE-X-Q model numbers) are installed in a router to be configured as a member of the Virtual Chassis, make sure these DPCs are offline before you configure the Virtual Chassis. Otherwise, the MX Series Virtual Chassis configuration will not function.

   NOTE: MX Series Enhanced Queuing IP Services DPCs (DPCE-R-Q model numbers) and MX Series Enhanced Queuing Ethernet Services DPCs (DPCE-X-Q model numbers) do not interoperate with features of the MX Series Virtual Chassis.

7. Determine the desired location of the dedicated Virtual Chassis ports on both member routers, and use the Virtual Chassis ports to physically interconnect the member routers in a point-to-point topology.
8. Ensure that both MX Series routers to be configured as a member of the Virtual Chassis are running the same Junos OS release, and have basic network connectivity.

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Guidelines for Configuring Virtual Chassis Ports on page 10
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Installing Junos OS Licenses on Virtual Chassis Member Routers

To enable some Junos OS features or router scaling levels, you might have to purchase, install, and manage separate software license packs. The presence on the router of the appropriate software license keys (passwords) determines whether you can configure and use certain features or configure a feature to a predetermined scale.

Before you configure an MX Series Virtual Chassis, install the following Junos OS software licenses on each MX Series router to be configured as a member of the Virtual Chassis:

- MX Virtual Chassis Redundancy Feature Pack—You must purchase and install a unique MX Virtual Chassis Redundancy Feature Pack for each member router in the Virtual Chassis. If you issue the **request virtual-chassis member-id set**, **request virtual-chassis member-id delete**, **request virtual-chassis vc-port set**, or **request virtual-chassis vc-port delete** command to set or delete member IDs or Virtual Chassis ports without first installing an MX Virtual Chassis Redundancy Feature Pack on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.
- Junos OS feature licenses—Purchase and install the appropriate Junos OS feature licenses to enable use of a particular software feature or scaling level in your network. You must install the required feature licenses on each member router in the Virtual Chassis.

Before you begin:

- Prepare your site for the Virtual Chassis configuration.

  See "Preparing for a Virtual Chassis Configuration" on page 40.

- Familiarize yourself with the procedures for installing and managing Junos OS licenses.

  See *Installation and Upgrade Guide*.

To install Junos OS licenses on each member router in the Virtual Chassis:

1. Install the required licenses on the MX Series router to be designated as the protocol master for the Virtual Chassis.
   a. Install the MX Virtual Chassis Redundancy Feature Pack.
   b. Install the Junos OS feature licenses required for your software feature or scaling level.
2. Install the required licenses on the MX Series router to be designated as the protocol backup for the Virtual Chassis.
   a. Install the MX Virtual Chassis Redundancy Feature Pack.
   b. Install the Junos OS feature licenses required for your software feature or scaling level.
3. (Optional) Verify the license installation on each member router.

For example:

```
user@host> show system license
License usage:
                                Licenses     Licenses    Licenses    Expiry
  Feature name                       used    installed      needed
  subscriber-accounting                 0            1           0    permanent
  subscriber-authentication             0            1           0    permanent
  subscriber-address-assignment         0            1           0    permanent
  subscriber-vlan                       0            1           0    permanent
  subscriber-ip                         0            1           0    permanent
  scale-subscriber                      0       256000           0    permanent
  scale-l2tp                            0         1000           0    permanent
  scale-mobile-ip                       0         1000           0    permanent
  virtual-chassis                       0            1           0    permanent
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65
- *Software Features That Require Licenses on MX Series Routers Only*
- *Installation and Upgrade Guide*

Creating and Applying Configuration Groups for a Virtual Chassis

For a Virtual Chassis configuration consisting of two MX Series routers, each of which supports dual Routing Engines, you must create and apply on the master router of the Virtual Chassis the following configuration groups, instead of using the standard **re0** and **re1** configuration groups:

- **member0-re0**
- **member0-re1**
- **member1-re0**
- **member1-re1**

NOTE: The member*n*-re*n* naming format for configuration groups is reserved for exclusive use by member routers in MX Series Virtual Chassis configurations.

Using configuration group names of the form member*n*-re*n* in an existing non-Virtual Chassis configuration or configuration script could interfere with Virtual Chassis operation. This misconfiguration could cause the router to assign no IP address or an incorrect IP address to the fxp0 management Ethernet interface, and could result in a display of the Amnesiac prompt during login.

To create and apply configuration group information from the router to be configured as the master of the MX Series Virtual Chassis:

1. In the console window on the master router (**member 0** in this procedure), create and apply the **member0-re0** configuration group.

   ```
   [edit]
   user@host# copy groups re0 to member0-re0
   user@host# set apply-groups member0-re0
   ```

2. Delete the standard **re0** configuration group from the global configuration on **member 0**.

   ```
   [edit]
   user@host# delete apply-groups re0
   user@host# delete groups re0
   ```

3. Create and apply the **member0-re1** configuration group.

   ```
   [edit]
   user@host# copy groups re1 to member0-re1
   user@host# set apply-groups member0-re1
   ```

4. Delete the standard **re1** configuration group from the global configuration on **member 0**.

   ```
   [edit]
   user@gladius# delete apply-groups re1
   ```

```
user@gladius# delete groups re1
```

5. Create and apply the **member1-re0** configuration information.

```
[edit]
user@host# set groups member1-re0 system host-name host-name
user@host# set groups member1-re0 system backup-router address
user@host# set groups member1-re0 system backup-router destination
  destination-address
user@host# set groups member1-re0 system backup-router destination
  destination-address
...
user@gladius# set groups member1-re0 interfaces fxp0 unit unit-number family inet
  address address
user@gladius# set apply-groups member1-re0
```

The commands in Steps 5 and 6 set the IP address for the **fxp0** management interface and add an IP route for it in the event that routing becomes inactive.

6. Create and apply the **member1-re1** configuration information.

```
[edit]
user@gladius# set groups member1-re1 system host-name host-name
user@gladius# set groups member1-re1 system backup-router address
user@gladius# set groups member1-re1 system backup-router destination
  destination-address
user@gladius# set groups member1-re1 system backup-router destination
  destination-address
...
user@gladius# set groups member1-re1 interfaces fxp0 unit unit-number family inet
  address address
user@gladius# set apply-groups member1-re1
```

7. Commit the configuration.

BEST PRACTICE: We recommend that you use the **commit synchronize** command to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you issue the **commit synchronize** command. Issuing the **commit synchronize** command for an MX Series Virtual Chassis configuration has the same effect as issuing the **commit synchronize force** command.

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65
- For more information about creating and managing configuration groups, see the *Junos OS CLI User Guide*

Configuring Preprovisioned Member Information for a Virtual Chassis

To configure a Virtual Chassis for MX Series routers, you must create a preprovisioned configuration on the master router by including the **virtual-chassis** stanza at the **[edit virtual-chassis]** hierarchy level. The preprovisioned configuration specifies the chassis serial number, member ID, and role for both member routers in the Virtual Chassis.

When a new member router joins the Virtual Chassis, the software compares its serial number against the values specified in the preprovisioned configuration. If the serial number of a joining router does not match any of the configured serial numbers, the software prevents that router from becoming a member of the Virtual Chassis.

To configure the preprovisioned member information for an MX Series Virtual Chassis:

1. Specify that you want to create a preprovisioned Virtual Chassis configuration.

   ```
   [edit virtual-chassis]
   user@host# set preprovisioned
   ```

2. Configure the member ID (**0** or **1**), role (**routing-engine**), and chassis serial number for each member router in the Virtual Chassis.

   ```
   [edit virtual-chassis]
   user@host# set member member-number role routing-engine serial-number
     serial-number
   user@host# set member member-number role routing-engine serial-number
     serial-number
   ```

   NOTE: In a two-member MX Series Virtual Chassis configuration, you must assign the routing-engine role to each router. The routing-engine role enables the router to function either as the master router or backup router of the Virtual Chassis.

3. Disable detection of a split in the Virtual Chassis configuration. (By default, split detection in an MX Series Virtual Chassis is enabled.)

   ```
   [edit virtual-chassis]
   user@host# set no-split-detection
   ```

   BEST PRACTICE: We recommend that you disable split detection for a two-member MX Series Virtual Chassis configuration if you think the backup router is more likely to fail than the Virtual Chassis port links to the backup router. Configuring redundant Virtual Chassis ports on different line cards in each member router reduces the likelihood that all Virtual Chassis port links to the backup router will fail.

4. (Optional) Enable tracing of Virtual Chassis operations.

   For example:

   ```
   [edit virtual-chassis]
   ```

```
user@gladius# set traceoptions file filename
user@gladius# set traceoptions file size maximum-file-size
user@gladius# set traceoptions flag flag
```

5. Commit the configuration.

BEST PRACTICE: We recommend that you use the **commit synchronize** command to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you issue the **commit synchronize** command. Issuing the **commit synchronize** command for an MX Series Virtual Chassis configuration has the same effect as issuing the **commit synchronize force** command.

The following example shows an MX Series Virtual Chassis preprovisioned configuration for two member routers.

```
[edit virtual-chassis]
user@gladius# show
preprovisioned;
no-split-detection;
traceoptions {
    file vccp size 10m;
    flag all;
}
member 0 {
    role routing-engine;
    serial-number JN115FDADAFB;
}
member 1 {
    role routing-engine;
    serial-number JN10C78D1AFC;
}
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Configuring Enhanced IP Network Services for a Virtual Chassis

For an existing MX Series Virtual Chassis to function properly, you must configure enhanced IP network services on all member routers in the Virtual Chassis from the Virtual Chassis master router.

Enhanced IP network services defines how the chassis recognizes and uses certain modules. When you set each member router's network services to **enhanced-ip**, only MPC/MIC modules and MS-DPC modules are powered on in the chassis. Non-service DPCs do not work with enhanced IP network services.

This procedure describes how to configure enhanced IP network services for an existing MX Series Virtual Chassis. For information about configuring enhanced IP network services when you first set up the Virtual Chassis, see *Configuring Enhanced IP Network Services* in "Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis" on page 65.

BEST PRACTICE: We recommend that you use the **commit synchronize** command to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you issue the **commit synchronize** command. Issuing the **commit synchronize** command for an MX Series Virtual Chassis configuration has the same effect as issuing the **commit synchronize force** command.

To configure enhanced IP network services for an existing Virtual Chassis:

1. Log in to the console for the master Routing Engine in the Virtual Chassis master router (member0-re0 in this procedure).
2. Access the chassis hierarchy.

   ```
   {master:member0-re0}[edit]
   user@hostA# edit chassis
   ```

3. Configure enhanced IP network services on member 0.

   ```
   {master:member0-re0}[edit chassis]
   user@hostA# set network-services enhanced-ip
   ```

4. Commit the configuration.
5. When prompted to do so, reboot all Routing Engines in the Virtual Chassis.

   ```
   {master:member0-re0}
   user@hostA> request system reboot
   ```

   The **request system reboot** command reboots both Routing Engines in each member router forming the Virtual Chassis.

6. (Optional) Verify that enhanced IP network services has been properly configured for the Virtual Chassis.

a. Verify that enhanced IP network services is configured on the master Routing Engine in the Virtual Chassis master router (member0-re0).

```
{master:member0-re0}
user@hostA> show chassis network services

Network Services Mode: Enhanced-IP
```

b. Verify that enhanced IP network services is configured on the master Routing Engine in the Virtual Chassis backup router (member1-re0).

```
{backup:member1-re0}
user@hostB> show chassis network services

Network Services Mode: Enhanced-IP
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Enabling Graceful Routing Engine Switchover and Nonstop Active Routing for a Virtual Chassis

Before you configure member IDs and Virtual Chassis ports, you must enable graceful Routing Engine switchover (GRES) and nonstop active routing (NSR) on both member routers in the Virtual Chassis.

To enable graceful Routing Engine switchover and nonstop active routing:

1. Enable graceful Routing Engine switchover and nonstop active routing on member 0 (**gladius**):
   a. Log in to the console on member 0.
   b. Enable graceful switchover.

      ```
      [edit chassis redundancy]
      user@gladius# set graceful-switchover
      ```

   c. Enable nonstop active routing.

      ```
      [edit routing-options]
      user@gladius# set nonstop-routing
      ```

   d. Commit the configuration on member 0.

      ```
      [edit system]
      user@gladius# commit synchronize
      ```

2. Enable graceful Routing Engine switchover and nonstop active routing on member 1 (**trefoil**):
   a. Log in to the console on member 1.
   b. Enable graceful switchover.

      ```
      [edit chassis redundancy]
      ```

```
user@trefoil# set graceful-switchover
```

c. Enable nonstop active routing.

```
[edit routing-options]
user@trefoil# set nonstop-routing
```

d. Commit the configuration on member 1.

```
[edit system]
user@trefoil# commit synchronize
```

NOTE: When you configure nonstop active routing, you must include the **commit synchronize** statement at the **[edit system]** hierarchy level. Otherwise, the commit operation fails.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you use the **commit synchronize** statement. Including the **commit synchronize** statement for an MX Series Virtual Chassis configuration has the same effect as including the **commit synchronize force** statement.

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65
- *Configuring Graceful Routing Engine Switchover*
- *Configuring Nonstop Active Routing*

Configuring Member IDs for a Virtual Chassis

After you commit the preprovisioned configuration on the master router, you must assign the preprovisioned member IDs to both MX Series routers in the Virtual Chassis by using the **request virtual-chassis member-id set** command. Assigning the member ID causes the router to reboot in preparation for forming the Virtual Chassis.

NOTE: If you issue the **request virtual-chassis member-id set** command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To configure the member ID and reboot each MX Series router in Virtual Chassis mode:

1. Set the member ID on the router configured as **member 0**.

```
user@hostA> request virtual-chassis member-id set member 0
```

```
This command will enable virtual-chassis mode and reboot the system.
 Continue? [yes,no] yes
```

After the reboot, all MPCs remain powered off until the Virtual Chassis port connection is configured.

2. Set the member ID on the router configured as **member 1**.

```
user@hostB> request virtual-chassis member-id set member 1
This command will enable virtual-chassis mode and reboot the system.
 Continue? [yes,no] yes
```

After the reboot, all MPCs remain powered off until the Virtual Chassis port connection is configured.

3. (Optional) Verify the member ID configuration for **member 0**.

For example:

```
{master:member0-re0}

user@hostA> show virtual-chassis status
Preprovisioned Virtual Chassis
Virtual Chassis ID: 4f2b.1aa0.de08
                                                Mastership           Neighbor
List
Member ID       Status   Serial No    Model    priority    Role      ID
Interface

0 (FPC   0- 11) Prsnt    JN10C7135AFC mx240          129  Master*
```

4. (Optional) Verify the member ID configuration for **member 1**.

For example:

```
Amnesiac (ttyd0)

login: user
Password:
...

{master:member1-re0}

user> show virtual-chassis status
Virtual Chassis ID: ef98.2c6c.f7f7
                                                Mastership           Neighbor
List
Member ID       Status   Serial No    Model    priority    Role      ID
Interface

1 (FPC  12- 23) Prsnt    JN115D117AFB mx480          128  Master*
```

NOTE: At this point in the configuration procedure, all line cards are offline, and the routers are each designated with the **Master** role because they are not yet interconnected as a fully formed Virtual Chassis. In addition, **member 1** remains in Amnesiac state (has no defined configuration) until the Virtual Chassis forms and the configuration is committed.

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Configuring Virtual Chassis Ports to Interconnect Member Routers

To interconnect the member routers in an MX Series Virtual Chassis, you must use the **request virtual-chassis vc-port set** command to configure Virtual Chassis ports on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces. After it is configured, a Virtual Chassis port is dedicated to the task of interconnecting member routers, and is no longer available for configuration as a standard network port.

NOTE: If you issue the request virtual-chassis vc-port set command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To configure Virtual Chassis ports on Trio MPC/MIC interfaces to interconnect the member routers in an MX Series Virtual Chassis:

1. Configure the Virtual Chassis ports on the router configured as member 0.
   a. Configure the first Virtual Chassis port that connects to member 1.

      ```
      {local:member0-re0}
      ```

      ```
      user@hostA> request virtual-chassis vc-port set fpc-slot fpc-slot-number pic-slot pic-slot-number port port-number
      ```

      After the Virtual Chassis port is created, it is renamed **vcp-*slot/pic/port***, and the line card associated with that port comes online. The line cards in the other member router remain offline until the Virtual Chassis forms.

      For example, the following command configures Virtual Chassis port **vcp-2/2/0** on member 0:

      ```
      {local:member0-re0}
      ```

      ```
      user@hostA> request virtual-chassis vc-port set fpc-slot 2 pic-slot 2 port 0
      vc-port successfully set
      ```

   b. When the first Virtual Chassis port is up on member 0, repeat Step 1a to configure the second Virtual Chassis port that connects to member 1.

      ```
      {local:member0-re0}
      ```

      ```
      user@hostA> request virtual-chassis vc-port set fpc-slot fpc-slot-number pic-slot pic-slot-number port port-number
      ```

2. Configure the Virtual Chassis ports on the router configured as member 1.
   a. Configure the first Virtual Chassis port that connects to member 0.

      ```
      {master:member1-re0}
      ```

```
user@hostB> request virtual-chassis vc-port set fpc-slot fpc-slot-number pic-slot
pic-slot-number port port-number
```

b. When the first Virtual Chassis port is up on member 1, repeat Step 2a to configure the second Virtual Chassis port that connects to member 0.

```
{master:member1-re0}

user@hostB> request virtual-chassis vc-port set fpc-slot fpc-slot-number pic-slot
pic-slot-number port port-number
```

When all of the line cards in all of the member routers are online, and the Virtual Chassis has formed, you can issue Virtual Chassis commands from the terminal window of the master router.

NOTE: When the Virtual Chassis forms, the FPC slots are renumbered to reflect the slot numbering and offsets used in the Virtual Chassis instead of the physical slot numbers where the FPC is actually installed. Member 0 in the Virtual Chassis uses FPC slot numbers 0 through 11 with no offset, and member 1 uses FPC slot numbers 12 through 23, with an offset of 12.

For example, a 10-Gigabit Ethernet interface that appears as xe-14/2/2 (FPC slot 14, PIC slot 2, port 2) in the show interfaces command output is actually interface xe-2/2/2 (FPC slot 2, PIC slot 2, port 2) on member 1 after deducting the FPC slot numbering offset of 12 for member 1.

3. (Optional) Verify the that the Virtual Chassis is properly configured and that the Virtual Chassis ports are operational.

```
{master:member0-re0}

user@hostA> show virtual-chassis status
{master:member0-re0}

user@hostA> show virtual-chassis vc-port all-members
```

4. Commit the configuration on the master router.

The commit step is required to ensure that the configuration groups and Virtual Chassis configuration are propagated to both members of the Virtual Chassis.

BEST PRACTICE: We recommend that you use the commit synchronize command to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the force option is the default and only behavior when you issue the commit synchronize command. Issuing the commit synchronize command for an MX Series Virtual Chassis configuration has the same effect as issuing the commit synchronize force command.

Related Documentation

- Guidelines for Configuring Virtual Chassis Ports on page 10
- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35

- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Deleting Virtual Chassis Ports in a Virtual Chassis Configuration

You can delete a Virtual Chassis port (**vcp-*slot/pic/port***) as part of the procedure for deleting a Virtual Chassis configuration. You can also delete a Virtual Chassis port when you want to replace it with a Virtual Chassis port configured on a different FPC slot, PIC slot, or port number in the router. After you delete a Virtual Chassis port by using the **request virtual-chassis vc-port delete** command, the port becomes available to the global configuration and can again function as a standard network port.

NOTE: If you issue the **request virtual-chassis vc-port delete** command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To remove the Virtual Chassis ports from both member routers in a Virtual Chassis:

1. In the console window on the router configured as **member 0**, remove one or more Virtual Chassis ports.

   ```
   {master:member0-re0}
   ```

   ```
   user@host1> request virtual-chassis vc-port delete fpc-slot fpc-slot-number pic-slot pic-slot-number port port-number
   ```

   For example, the following command deletes **vcp-2/2/0** (the Virtual Chassis port on FPC slot 2, PIC slot 2, and port 0) from **member 0** in the Virtual Chassis.

   ```
   {master:member0-re0}
   ```

   ```
   user@host1> request virtual-chassis vc-port delete fpc-slot 2 pic-slot 2 port 0
   vc-port successfully deleted
   ```

2. In the console window on the router configured as **member 1**, remove one or more Virtual Chassis ports.

   ```
   {master:member1-re0}
   ```

   ```
   user@host2> request virtual-chassis vc-port delete fpc-slot fpc-slot-number pic-slot pic-slot-number port port-number
   ```

3. (Optional) Confirm that the Virtual Chassis ports have been deleted from each of the two member routers.

   When you delete a Virtual Chassis port, its name (**vcp-*slot/pic/port***) no longer appears in the output of the **show virtual-chassis vc-port** command. For example, the following output for the **show virtual-chassis vc-port** command on each member router confirms that all Virtual Chassis ports have been deleted from both member routers.

   For member 0 (**host1**):

   ```
   {master:member0-re0}
   ```

   ```
   user@host1> show virtual-chassis vc-port all-members
   ```

```
member0:
--------------------------------------------------------------------------
```

For member 1 (**host2**):

```
{backup:member1-re0}

user@host2> show virtual-chassis vc-port all-members
member1:
--------------------------------------------------------------------------
```

TIP: Deleting and then re-creating a Virtual Chassis port in an MX Series Virtual Chassis configuration may cause the Virtual Chassis port to appear as **Absent** in the **Status** column of the **show virtual-chassis vc-port** command display. To resolve this issue, reboot the FPC that hosts the re-created Virtual Chassis port.

Related Documentation

- Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 37
- Example: Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 82
- Guidelines for Configuring Virtual Chassis Ports on page 10

Deleting Member IDs in a Virtual Chassis Configuration

In most cases, you delete the member ID from a member router as part of the procedure for deleting a Virtual Chassis configuration. When you delete the member ID by using the **request virtual-chassis member-id delete** command, the router reboots and the software disables Virtual Chassis mode on that router. After the reboot, the router is no longer part of the Virtual Chassis and functions as an independent router.

NOTE: If you issue the **request virtual-chassis member-id delete** command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To delete the Virtual Chassis member IDs from both member routers and disable Virtual Chassis mode:

1. In the console window on the router configured as **member 0**, delete member ID **0**.

```
{master:member0-re0}

user@host1> request virtual-chassis member-id delete
This command will disable virtual-chassis mode and reboot the system.
 Continue? [yes,no] (no) yes

Updating VC configuration and rebooting system, please wait...

{master:member0-re0}
```

```
user@host1>

*** FINAL System shutdown message from root@host1 ***
System going down IMMEDIATELY
```

2. In the console window on the router configured as **member 1**, delete member ID **1**.

```
{master:member1-re0}

user@host2> request virtual-chassis member-id delete
This command will disable virtual-chassis mode and reboot the system.
 Continue? [yes,no] (no) yes

Updating VC configuration and rebooting system, please wait...

{master:member1-re0}
user@host2>

*** FINAL System shutdown message from root@host2 ***
System going down IMMEDIATELY
```

3. (Optional) Confirm that Virtual Chassis mode has been disabled on both member routers.

   For example:

```
user@host1> show virtual-chassis status
error: the virtual-chassis-control subsystem is not running
```

Related Documentation

- Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 37
- Example: Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 82

Switching the Global Master and Backup Roles in a Virtual Chassis Configuration

You can change the mastership in an MX Series Virtual Chassis by switching the global roles of the master router and backup router in the Virtual Chassis configuration. When you change the mastership by issuing the **request virtual-chassis routing-engine master switch** administrative command, the current master router in the Virtual Chassis (also known as the Virtual Chassis protocol master) becomes the backup router, and the current backup router (also known as the Virtual Chassis protocol backup) becomes the master router.

Before you begin:

- Make sure the system configuration is synchronized between the master router and the backup router.

  If the configuration between the member routers is not synchronized when you issue the **request virtual-chassis routing-engine master switch** command, the router displays the following error message and rejects the command.

  ```
  Error: mastership switch request NOT honored, backup not ready
  ```

- Make sure the Virtual Chassis is not in a transition state (for example, the backup router is in the process of disconnecting from the Virtual Chassis) when you issue the **request virtual-chassis routing-engine master switch** command.

  If you attempt to issue the **request virtual-chassis routing-engine master switch** command during a transition state, the router does not process the command.

To switch the global master and backup roles in an MX Series Virtual Chassis:

- Issue the **request virtual-chassis routing-engine master switch** command from the Virtual Chassis master router:

  ```
  {master:member0-re0}
  ```

  ```
  user@host1> request virtual-chassis routing-engine master switch
  Do you want to continue ? [yes,no] (no) yes
  ```

  If you attempt to issue the **request virtual-chassis routing-engine master switch** command from the backup router, the router displays the following error message and rejects the command.

  ```
  error: Virtual Chassis member is not the protocol master
  ```

  Issuing the **request virtual-chassis routing-engine master switch** command from the Virtual Chassis master router causes the global role transitions listed in Table 7 on page 57.

Table 7: Virtual Chassis Global Role Transitions Before and After Mastership Switchover

Virtual Chassis Role Before Switching Mastership	Virtual Chassis Role After Switching Mastership
Master Routing Engine in Virtual Chassis master router (VC-Mm)	Master Routing Engine in Virtual Chassis backup router (VC-Bm)

Table 7: Virtual Chassis Global Role Transitions Before and After Mastership Switchover *(continued)*

Virtual Chassis Role Before Switching Mastership	Virtual Chassis Role After Switching Mastership
Standby Routing Engine in Virtual Chassis master router (VC-Ms)	Standby Routing Engine in Virtual Chassis backup router (VC-Bs)
Master Routing Engine in Virtual Chassis backup router (VC-Bm)	Master Routing Engine in Virtual Chassis master router (VC-Mm)
Standby Routing Engine in Virtual Chassis backup router (VC-Bs)	Standby Routing Engine in Virtual Chassis master router (VC-Ms)

The local roles (**master** and **standby**, or **m** and **s**) of the Routing Engines do not change after you issue the **request virtual-chassis routing-engine master switch** command. For example, as shown in Table 7 on page 57, the master Routing Engine in the Virtual Chassis master router (VC-Mm) remains the master Routing Engine in the Virtual Chassis backup router (VC-Bm) after the switchover.

Related Documentation

- Virtual Chassis Components Overview on page 5
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Mastership Election in a Virtual Chassis on page 16
- Switchover Behavior in a Virtual Chassis on page 18

Determining GRES Readiness in a Virtual Chassis Configuration

Depending on the router configuration, a variable amount of time is required before a router is ready to perform a graceful Routing Engine switchover (GRES). Attempting a GRES operation before the router is ready can cause system errors and unexpected behavior.

To determine whether the member routers in an MX Series Virtual Chassis configuration are ready for a GRES operation from a database synchronization perspective, you can issue the **request virtual-chassis routing-engine master switch check** command from the Virtual Chassis master router (VC-Mm) before you initiate the GRES operation. Using the **request virtual-chassis routing-engine master switch check** command before you initiate the GRES operation ensures that the subscriber management and kernel databases on both member routers in an MX Series Virtual Chassis are synchronized and ready for the GRES operation.

To determine whether the member routers in an MX Series Virtual Chassis are ready for GRES from a database synchronization perspective:

1. Issue the **request virtual-chassis routing-engine master switch check** command from the Virtual Chassis master router (VC-Mm).

   ```
   {master:member0-re0}
   ```

```
user@host> request virtual-chassis routing-engine master switch check
```

The **request virtual-chassis routing-engine master switch check** command checks various system and database components on the member routers to determine whether they are ready for GRES, but does not initiate the global GRES operation itself. The readiness check includes ensuring that a system timer, which expires after 300 seconds, has completed before the global GRES operation can begin.

2. Review the results of the **request virtual-chassis routing-engine master switch check** command to determine whether the member routers in the MX Series Virtual Chassis are ready for a GRES operation from a database synchronization perspective.

   - If the member routers are ready for GRES, the **request virtual-chassis routing-engine master switch check** command returns the command prompt and displays no output.

     ```
     {master:member0-re0}

     user@host> request virtual-chassis routing-engine master switch check
     {master:member0-re0}
     ```

   - If the member routers are not ready for GRES, the **request virtual-chassis routing-engine master switch check** command displays information about the readiness of the system. For example:

     ```
     {master:member0-re0}

     user@host> request virtual-chassis routing-engine master switch check
     error: chassisd Not ready for mastership switch, try after 217 secs.
     mastership switch request NOT honored, backup not ready
     ```

     The specific command output differs depending on the GRES readiness state of the member routers.

Related Documentation

- Switchover Behavior in a Virtual Chassis on page 18
- Virtual Chassis Components Overview on page 5
- Global Roles and Local Roles in a Virtual Chassis on page 13
- *Understanding Graceful Routing Engine Switchover in the Junos OS*

Disabling Split Detection in a Virtual Chassis Configuration

If there is a disruption to an MX Series Virtual Chassis due to failure of a member router or one or more Virtual Chassis port links, the resulting connectivity loss can cause a split in the Virtual Chassis configuration. Split detection, which is enabled by default in an MX Series Virtual Chassis, identifies the split and minimizes further network disruption.

You can disable split detection by including the **no-split-detection** statement at the **[edit virtual-chassis]** hierarchy level. Disabling split detection can be useful in certain Virtual Chassis configurations.

For example, if the backup router fails in a two-member Virtual Chassis configuration and split detection is enabled (the default behavior), the master router takes a **line-card** role, and the line cards (FPCs) that do not host Virtual Chassis ports go offline. This state effectively isolates the master router and removes it from the Virtual Chassis until connectivity is restored. As a result, routing is halted and the Virtual Chassis configuration is disabled. By contrast, if the backup router fails in a two-member Virtual Chassis configuration and split detection is disabled, the master router retains mastership and maintains all of the Virtual Chassis ports, effectively resulting in a single-member Virtual Chassis consisting of only the master router.

BEST PRACTICE: We recommend that you disable split detection for a two-member MX Series Virtual Chassis configuration if you think the backup router is more likely to fail than the Virtual Chassis port interfaces to the backup router. Configuring redundant Virtual Chassis ports on different line cards in each member router reduces the likelihood that all Virtual Chassis port interfaces to the backup router can fail.

To disable split detection in an MX Series Virtual Chassis:

1. Specify that you want to disable the default detection of splits in the Virtual Chassis.

   ```
   [edit virtual-chassis]
   user@gladius# set no-split-detection
   ```

2. Commit the configuration.

Disabling split detection causes different results for different types of Virtual Chassis failures. For information, see "Split Detection Behavior in a Virtual Chassis" on page 20.

Related Documentation

- Split Detection Behavior in a Virtual Chassis on page 20
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Switchover Behavior in a Virtual Chassis on page 18
- Virtual Chassis Components Overview on page 5

Configuring Module Redundancy for a Virtual Chassis

By default, the router uses link redundancy for aggregated Ethernet interfaces (bundles) configured with targeted traffic distribution. As an alternative to using link redundancy, you can configure module redundancy, also known as FPC redundancy, for an MX Series Virtual Chassis configured with targeted traffic distribution for IP demux or VLAN demux subscribers on aggregated Ethernet interfaces.

In an MX Series Virtual Chassis, module redundancy assigns the primary link and backup link to *different* MPC/MIC modules, regardless of the Virtual Chassis role (master or backup) of the member router in which the MPC/MIC module is installed. Module redundancy provides redundancy protection if a module or a link in the Virtual Chassis fails.

Before you begin:

- Configure a Virtual Chassis consisting of two MX Series routers.

  See "Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis" on page 65

- Ensure that the aggregated Ethernet bundle is configured *without* link protection.

  See *Configuring Aggregated Ethernet Link Protection*

To configure module redundancy for an MX Series Virtual Chassis:

1. Log in to the console on the master router of the Virtual Chassis.
2. Specify that you want to configure the demux logical interface.

   ```
   {master:member0-re0} [edit]
   user@host# edit interfaces demux0 unit logical-unit-number
   ```

3. Enable targeted distribution for the interface.

   ```
   {master:member0-re0} [edit intefaces demux0 unit logical-unit-number]
   user@host# set targeted-distribution
   ```

4. Specify the aggregated Ethernet bundle for which you want to configure module redundancy.

   ```
   {master:member0-re0} [edit]
   user@host# edit interfaces aenumber aggregated-ether-options
   ```

5. Enable module (FPC) redundancy for the specified aggregated Ethernet bundle.

   ```
   {master:member0-re0} [edit interfaces aenumber aggregated-ether-options]
   user@host# set logical-interface-fpc-redundancy
   ```

BEST PRACTICE: We recommend that you do not configure both module (FPC) redundancy and chassis redundancy for the same aggregated Ethernet interface in an MX Series Virtual Chassis. If you do, module redundancy takes precedence over chassis redundancy.

Related Documentation

- Targeted Traffic Distribution on Aggregated Ethernet Interfaces in a Virtual Chassis on page 24
- Redundancy Mechanisms on Aggregated Ethernet Interfaces in a Virtual Chassis on page 25
- Configuring Chassis Redundancy for a Virtual Chassis on page 62

Configuring Chassis Redundancy for a Virtual Chassis

By default, the router uses link redundancy for aggregated Ethernet interfaces (bundles) configured with targeted traffic distribution. As an alternative to using link redundancy, you can configure chassis redundancy for an MX Series Virtual Chassis configured with targeted traffic distribution for IP demux or VLAN demux subscribers on aggregated Ethernet interfaces.

In an MX Series Virtual Chassis, chassis redundancy assigns the backup link to an MPC/MIC module in a member router *other* than the member router on which the primary link resides. For example, in a two-member MX Series Virtual Chassis where the primary link for the aggregated Ethernet bundle is on an MPC/MIC module in the master router, chassis redundancy assigns the backup link for the bundle to an MPC/MIC module in the backup router. Chassis redundancy provides protection if the MPC/MIC module containing the primary link fails. In this event, the subscriber connections fail over to the backup link on the MPC/MIC module in the other member router.

Unlike link redundancy and module redundancy, each of which are supported for both standalone routers and Virtual Chassis member routers, chassis redundancy is available only for member routers in an MX Series Virtual Chassis.

Before you begin:

- Configure a Virtual Chassis consisting of two MX Series routers.

  See "Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis" on page 65

- Ensure that the aggregated Ethernet bundle is configured *without* link protection.

  See *Configuring Aggregated Ethernet Link Protection*

To configure chassis redundancy for an MX Series Virtual Chassis:

1. Log in to the console on the master router of the Virtual Chassis.
2. Specify that you want to configure the demux logical interface.

   ```
   {master:member0-re0} [edit]
   user@host# edit interfaces demux0 unit logical-unit-number
   ```

3. Enable targeted distribution for the interface.

   ```
   {master:member0-re0} [edit intefaces demux0 unit logical-unit-number]
   user@host# set targeted-distribution
   ```

4. Specify the aggregated Ethernet bundle for which you want to configure chassis redundancy.

   ```
   {master:member0-re0} [edit]
   user@host# edit interfaces ae number aggregated-ether-options
   ```

5. Enable module (FPC) redundancy for the specified aggregated Ethernet bundle.

   ```
   {master:member0-re0} [edit interfaces ae number aggregated-ether-options]
   user@host# set logical-interface-chassis-redundancy
   ```

BEST PRACTICE: We recommend that you do not configure both module (FPC) redundancy and chassis redundancy for the same aggregated Ethernet interface in an MX Series Virtual Chassis. If you do, module redundancy takes precedence over chassis redundancy.

Related Documentation

- Targeted Traffic Distribution on Aggregated Ethernet Interfaces in a Virtual Chassis on page 24
- Redundancy Mechanisms on Aggregated Ethernet Interfaces in a Virtual Chassis on page 25
- Configuring Module Redundancy for a Virtual Chassis on page 61

CHAPTER 6

Examples

Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis

To provide interchassis redundancy for MX Series 3D Universal Edge Routers, you can configure a Virtual Chassis. A *Virtual Chassis* configuration interconnects two MX Series routers into a logical system that you can manage as a single network element. The member routers in a Virtual Chassis are interconnected by means of Virtual Chassis ports that you configure on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces (network ports) on each MX Series router.

This example describes how to set up and configure a Virtual Chassis consisting of two MX Series routers:

Requirements

This example uses the following software and hardware components:

- Junos OS Release 11.2 and later releases
- One MX240 3D Universal Edge Router

- One MX480 3D Universal Edge Router

NOTE: This configuration example has been tested using the software release listed and is assumed to work on all later releases.

See Table 8 on page 67 for information about the hardware installed in each MX Series router.

BEST PRACTICE: We recommend that you use the **commit synchronize** command throughout this procedure to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you issue the **commit synchronize** command. Issuing the **commit synchronize** command for an MX Series Virtual Chassis configuration has the same effect as issuing the **commit synchronize force** command.

Overview and Topology

To configure the Virtual Chassis shown in this example, you must create a preprovisioned configuration at the **[edit virtual-chassis]** hierarchy level on the router to be designated as the master of the Virtual Chassis. The preprovisioned configuration includes the serial number, member ID, and role for each member router (also known as member chassis) in the Virtual Chassis. When a new member router joins the Virtual Chassis, the software compares its serial number against the values specified in the preprovisioned configuration. If the serial number of a joining router does not match any of the configured serial numbers, the software prevents that router from becoming a member of the Virtual Chassis.

After you commit the preprovisioned configuration on the master router, you must assign the preprovisioned member IDs by issuing the **request virtual-chassis member-id set** administrative command on each router, which causes the router to reboot. When the reboot is complete, you create one or more Virtual Chassis ports by issuing the **request virtual-chassis vc-port set** administrative command on each router. The Virtual Chassis forms when the line cards in both member routers are back online.

This example configures a Virtual Chassis that interconnects two MX Series routers, and uses the basic topology shown in Figure 2 on page 67. For redundancy, two Virtual Chassis ports are configured on each member router.

Figure 2: Sample Topology for a Virtual Chassis with Two MX Series Routers

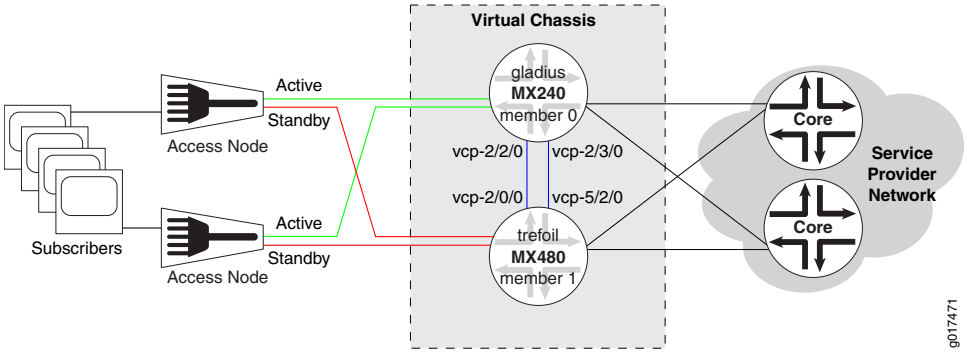


Table 8 on page 67 shows the hardware and software configuration settings for each MX Series router in the Virtual Chassis. You use some of these settings in the preprovisioned configuration and when you assign the member IDs and create the Virtual Chassis ports.

NOTE: MX Series Enhanced Queuing IP Services DPCs (DPCE-R-Q model numbers) and MX Series Enhanced Queuing Ethernet Services DPCs (DPCE-X-Q model numbers) do not interoperate with features of the MX Series Virtual Chassis. If any MX Series Enhanced Queuing DPCs are installed in a router to be configured as a member of a Virtual Chassis, you must ensure that these DPCs are offline before you configure the Virtual Chassis.

Table 8: Components of the Sample MX Series Virtual Chassis

Router Name	Hardware	Serial Number	Member ID	Role	Virtual Chassis Ports	Network Port Slot Numbering
gladius	MX240 router with: • 60-Gigabit Ethernet Enhanced Queuing MPC • 20-port Gigabit Ethernet MIC with SFP • 4-port 10-Gigabit Ethernet MIC with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member0-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member0-re1**)	JN10C7135AFC	0	routing-engine (master)	vcp-2/2/0 vcp-2/3/0	FPC 0 – 11

Table 8: Components of the Sample MX Series Virtual Chassis *(continued)*

Router Name	Hardware	Serial Number	Member ID	Role	Virtual Chassis Ports	Network Port Slot Numbering
trefoil	MX480 router with: • Two 30-Gigabit Ethernet Queuing MPCs • Two 20-port Gigabit Ethernet MICs with SFP • Two 2-port 10-Gigabit Ethernet MICs with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member1-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member1-re1**)	JN115D117AFB	1	routing-engine (backup)	vcp-2/0/0 vcp-5/2/0	FPC 12 – 23 (offset = 12)

Configuration

To configure a Virtual Chassis consisting of two MX Series routers, perform these tasks:

- Preparing for the Virtual Chassis Configuration on page 69
- Creating and Applying Configuration Groups for the Virtual Chassis on page 71
- Configuring Preprovisioned Member Information for the Virtual Chassis on page 72
- Configuring Enhanced IP Network Services on page 74
- Enabling Graceful Routing Engine Switchover and Nonstop Active Routing on page 75
- Configuring Member IDs and Rebooting the Routers to Enable Virtual Chassis Mode on page 76
- Configuring Virtual Chassis Ports to Interconnect Member Routers on page 78

Preparing for the Virtual Chassis Configuration

Step-by-Step Procedure

To prepare for configuring an MX Series Virtual Chassis:

1. Make a list of the serial numbers of both routers that you want to configure as part of the Virtual Chassis.

   The chassis serial number is located on a label affixed to the side of the of the MX Series chassis. Alternatively, you can obtain the chassis serial number by issuing the **show chassis hardware** command, which is especially useful if you are accessing the router from a remote location. For example:

   ```
   user@gladius> show chassis hardware
   Hardware inventory:
   Item             Version  Part number  Serial number     Description
   Chassis                                JN10C7135AFC      MX240
   .
   .
   .
   Fan Tray 0       REV 01   710-021113   JT0119            MX240 Fan Tray
   ```

2. Note the desired role (**routing-engine**) for each router in the Virtual Chassis.

   In a two-router Virtual Chassis configuration, you must designate each router with the **routing-engine** role, which enables either router to function as the master or backup of the Virtual Chassis.

   - The *master router* maintains the global configuration and state information for all members of the Virtual Chassis, and runs the chassis management processes.
   - The *backup router* synchronizes with the master router and relays chassis control information (such as line-card presence and alarms) to the master router. If the master router is unavailable, the backup router takes mastership of the Virtual Chassis to preserve routing information and maintain network connectivity without disruption.

3. Note the member ID (0 or 1) to be assigned to each router in the Virtual Chassis.

   In this example, the master router is assigned member ID 0, and the backup router is assigned member ID 1.

4. Ensure that both MX Series routers in the Virtual Chassis have dual Routing Engines installed, and that all four Routing Engines in the Virtual Chassis are the same model.

   For example, you cannot configure a Virtual Chassis if one member router has RE-S-2000 Routing Engines installed and the other member router has RE-S-1800 Routing Engines installed.

5. Ensure that the necessary Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces on which to configure the Virtual Chassis ports are installed and operational in each router to be configured as a member of the Virtual Chassis.

NOTE: An MX Series Virtual Chassis does not support a combination of 1-Gigabit Ethernet (ge media type) Virtual Chassis ports and 10-Gigabit Ethernet (xe media type) Virtual Chassis ports within the same Virtual Chassis. You must configure either all 10-Gigabit Ethernet Virtual Chassis ports or all 1-Gigabit Ethernet Virtual Chassis ports in the same Virtual Chassis. We recommend that you configure Virtual Chassis ports on 10-Gigabit Ethernet interfaces. This restriction has no effect on access ports or uplink ports in an MX Series Virtual Chassis configuration.

6. If MX Series Enhanced Queuing IP Services DPCs (DPCE-R-Q model numbers) or MX Series Enhanced Queuing Ethernet Services DPCs (DPCE-X-Q model numbers) are installed in a router to be configured as a member of the Virtual Chassis, make sure these DPCs are offline before you configure the Virtual Chassis. Otherwise, the MX Series Virtual Chassis configuration will not function.

NOTE: MX Series Enhanced Queuing IP Services DPCs (DPCE-R-Q model numbers) and MX Series Enhanced Queuing Ethernet Services DPCs (DPCE-X-Q model numbers) do not interoperate with features of the MX Series Virtual Chassis.

7. Determine the desired location of the dedicated Virtual Chassis ports on both member routers, and use the Virtual Chassis ports to physically interconnect the member routers in a point-to-point topology.
8. Ensure that both MX Series routers to be configured as members of the Virtual Chassis are running the same Junos OS release, and have basic network connectivity.
9. Install the MX Virtual Chassis Redundancy Feature Pack license on each router to be configured as part of the Virtual Chassis.
10. Install the necessary Junos OS feature licenses on each router to be configured as part of the Virtual Chassis.

Creating and Applying Configuration Groups for the Virtual Chassis

Step-by-Step Procedure

For a Virtual Chassis configuration consisting of two MX Series routers, each of which supports dual Routing Engines, you must create and apply the following configuration groups on the router to be designated as the master of the Virtual Chassis instead of using the standard re0 and re1 configuration groups:

- **member0-re0**
- **member0-re1**
- **member1-re0**
- **member1-re1**

NOTE: The member*n*-re*n* naming format for configuration groups is reserved for exclusive use by member routers in MX Series Virtual Chassis configurations.

To create and apply configuration group information for the Virtual Chassis:

1. Log in to the console on member 0 (**gladius**).
2. In the console window on member 0, create and apply the **member0-re0** configuration group.

   ```
   [edit]
   user@gladius# copy groups re0 to member0-re0
   user@gladius# set apply-groups member0-re0
   ```

3. Delete the standard **re0** configuration group from the global configuration on member 0.

   ```
   [edit]
   user@gladius# delete apply-groups re0
   user@gladius# delete groups re0
   ```

4. Create and apply the **member0-re1** configuration group on member 0.

   ```
   [edit]
   user@gladius# copy groups re1 to member0-re1
   user@gladius# set apply-groups member0-re1
   ```

5. Delete the standard **re1** configuration group from the global configuration on member 0.

   ```
   [edit]
   user@gladius# delete apply-groups re1
   user@gladius# delete groups re1
   ```

6. Create and apply the **member1-re0** configuration information on member 0.

   ```
   [edit]
   user@gladius# set groups member1-re0 system host-name trefoil
   user@gladius# set groups member1-re0 system backup-router 10.9.0.1
   ```

```
user@gladius# set groups member1-re0 system backup-router destination
  172.16.0.0/12
user@gladius# set groups member1-re0 system backup-router destination
  10.9.0.0/16
...
user@gladius# set groups member1-re0 interfaces fxp0 unit 0 family inet address
  10.9.3.97/21
user@gladius# set apply-groups member1-re0
```

The examples in Steps 5 and 6 set the IP address for the **fxp0** management interface and add an IP route for it in the event that routing becomes inactive.

7. Create and apply the **member1-re1** configuration information on member 0.

```
[edit]
user@gladius# set groups member1-re1 system host-name trefoil
user@gladius# set groups member1-re1 system backup-router 10.9.0.1
user@gladius# set groups member1-re1 system backup-router destination
  172.16.0.0/12
user@gladius# set groups member1-re1 system backup-router destination 10.9.0.0/16
...
user@gladius# set groups member1-re1 interfaces fxp0 unit 0 family inet address
  10.9.3.98/21
user@gladius# set apply-groups member1-re1
```

8. Commit the configuration on member 0.

Results Display the results of the configuration.

```
[edit]
user@gladius# show groups ?
  Possible completions:
    <[Enter]>          Execute this command
    <group_name>       Group name
    global             Group name
    member0-re0        Group name
    member0-re1        Group name
    member1-re0        Group name
    member1-re1        Group name
    |                  Pipe through a command

[edit]
user@gladius# show apply-groups
  apply-groups [ global member0-re0 member0-re1 member1-re0 member1-re1 ];
```

Configuring Preprovisioned Member Information for the Virtual Chassis

Step-by-Step Procedure To configure the preprovisioned member information on member 0 (**gladius**):

1. Log in to the console on member 0.
2. Specify that you want to create a preprovisioned Virtual Chassis configuration.

```
[edit virtual-chassis]
user@gladius# set preprovisioned
```

3. Configure the member ID (**0** or **1**), role (**routing-engine**), and chassis serial number for each member router in the Virtual Chassis.


```
[edit virtual-chassis]
user@gladius# set member 0 role routing-engine serial-number JN10C7135AFC
user@gladius# set member 1 role routing-engine serial-number JN115D117AFB
```

4. Disable detection of a split in the Virtual Chassis configuration. (By default, split detection in an MX Series Virtual Chassis is enabled.)

```
[edit virtual-chassis]
user@gladius# set no-split-detection
```

BEST PRACTICE: We recommend that you disable split detection for a two-member MX Series Virtual Chassis configuration if you think the backup router is more likely to fail than the Virtual Chassis port links to the backup router. Configuring redundant Virtual Chassis ports on different line cards in each member router reduces the likelihood that all Virtual Chassis port links to the backup router will fail.

5. (Optional) Enable tracing of Virtual Chassis operations.

```
[edit virtual-chassis]
user@gladius# set traceoptions file vccp
user@gladius# set traceoptions file size 100m
user@gladius# set traceoptions flag all
```

6. Commit the configuration.

Results Display the results of the configuration.

```
[edit virtual-chassis]
user@gladius# show
preprovisioned;
no-split-detection;
traceoptions {
    file vccp size 100m;
    flag all;
}
member 0 {
    role routing-engine;
    serial-number JN10C7135AFC;
}
member 1 {
    role routing-engine;
    serial-number JN115D117AFB;
}
```

Configuring Enhanced IP Network Services

Step-by-Step Procedure

For an MX Series Virtual Chassis to function properly, you must configure enhanced IP network services on both member routers (member 0 and member 1). Enhanced IP network services defines how the chassis recognizes and uses certain modules. When you set each member router's network services to **enhanced-ip**, only MPC/MIC modules and MS-DPC modules are powered on in the chassis. Non-service DPCs do not work with enhanced IP network services.

This procedure describes how to configure enhanced IP network services when you first set up the Virtual Chassis. For information about configuring enhanced IP network services for an existing MX Series Virtual Chassis, see "Configuring Enhanced IP Network Services for a Virtual Chassis" on page 48.

To configure enhanced IP network services for a Virtual Chassis:

1. Configure enhanced IP network services on member 0 (**gladius**).

   a. Log in to the console on member 0.

   b. Access the chassis hierarchy.

      ```
      [edit]
      user@gladius# edit chassis
      ```

   c. Configure enhanced IP network services for member 0.

      ```
      [edit chassis]
      user@gladius# set network-services enhanced-ip
      ```

   d. Commit the configuration on member 0.

   NOTE: Immediately after you commit the configuration, the software prompts you to reboot the router. You can proceed without rebooting the router at this point because a reboot occurs when you configure the member IDs to enable Virtual Chassis mode, later in this procedure.

2. Configure enhanced IP network services on member 1 (**trefoil**).

   a. Log in to the console on member 1.

   b. Access the chassis hierarchy.

      ```
      [edit]
      user@trefoil# edit chassis
      ```

   c. Configure enhanced IP network services for member 1.

      ```
      [edit chassis]
      user@trefoil# set network-services enhanced-ip
      ```

   d. Commit the configuration on member 1.

NOTE: Immediately after you commit the configuration, the software prompts you to reboot the router. You can proceed without rebooting the router at this point because a reboot occurs when you configure the member IDs to enable Virtual Chassis mode, later in this procedure.

Enabling Graceful Routing Engine Switchover and Nonstop Active Routing

Step-by-Step Procedure

Before you configure member IDs and Virtual Chassis ports, you must enable graceful Routing Engine switchover (GRES) and nonstop active routing (NSR) on both member routers in the Virtual Chassis.

To enable graceful Routing Engine switchover and nonstop active routing:

1. Enable graceful Routing Engine switchover and nonstop active routing on member 0 (**gladius**):

   a. Log in to the console on member 0.

   b. Enable graceful switchover.

      ```
      [edit chassis redundancy]
      user@gladius# set graceful-switchover
      ```

   c. Enable nonstop active routing.

      ```
      [edit routing-options]
      user@gladius# set nonstop-routing
      ```

   d. Commit the configuration on member 0.

      ```
      [edit system]
      user@gladius# commit synchronize
      ```

2. Enable graceful Routing Engine switchover and nonstop active routing on member 1 (**trefoil**):

   a. Log in to the console on member 1.

   b. Enable graceful switchover.

      ```
      [edit chassis redundancy]
      user@trefoil# set graceful-switchover
      ```

   c. Enable nonstop active routing.

      ```
      [edit routing-options]
      user@trefoil# set nonstop-routing
      ```

   d. Commit the configuration on member 1.

      ```
      [edit system]
      user@trefoil# commit synchronize
      ```

NOTE: When you configure nonstop active routing, you must include the **commit synchronize** statement at the **[edit system]** hierarchy level. Otherwise, the commit operation fails.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you use the **commit synchronize** statement. Including the **commit synchronize** statement for an MX Series Virtual Chassis configuration has the same effect as including the **commit synchronize force** statement.

Configuring Member IDs and Rebooting the Routers to Enable Virtual Chassis Mode

Step-by-Step Procedure

To configure (set) the preprovisioned member ID for each MX Series router in the Virtual Chassis, use the **request virtual-chassis member-id set** command. Assigning the member ID causes the router to reboot in preparation for forming the Virtual Chassis.

NOTE: If you issue the **request virtual-chassis member-id set** command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To configure the member ID and reboot each router to enable Virtual Chassis mode:

1. Log in to the console on member 0 (**gladius**).
2. Set the member ID on member 0.

   user@gladius> request virtual-chassis member-id set **member 0**

   ```
   This command will enable virtual-chassis mode and reboot the system.
   Continue? [yes,no] yes
   ```

   Issuing the **request virtual-chassis member-id** command causes the router to reboot in preparation for membership in the Virtual Chassis.

   After the reboot, all MPCs remain powered off until the Virtual Chassis port connection is configured.
3. Log in to the console on member 1 (**trefoil**).
4. Set the member ID on member 1.

   user@trefoil> request virtual-chassis member-id set **member 1**

   ```
   This command will enable virtual-chassis mode and reboot the system.
   Continue? [yes,no] yes
   ```

After the reboot, all MPCs remain powered off until the Virtual Chassis port connection is configured.

Results Display the results of the configuration on each router. At this point in the procedure, all line cards are offline, and the routers are each designated with the **Master** role because they are not yet interconnected as a fully formed Virtual Chassis. In addition, member 1 (**trefoil**) remains in Amnesiac state (has no defined configuration) until the Virtual Chassis forms and the configuration is committed.

For member 0 (**gladius**):

```
{master:member0-re0}

user@gladius> show virtual-chassis status
Preprovisioned Virtual Chassis
Virtual Chassis ID: 4f2b.1aa0.de08
                                                Mastership           Neighbor List

Member ID       Status   Serial No    Model    priority    Role      ID  Interface

0 (FPC   0- 11) Prsnt    JN10C7135AFC mx240          129  Master*
```

For member 1 (**trefoil**):

```
Amnesiac (ttyd0)

login: user
Password:
...

{master:member1-re0}

user> show virtual-chassis status
Virtual Chassis ID: eabf.4e50.91e6
Virtual Chassis Mode: Disabled
                                                Mastership           Neighbor List

Member ID       Status   Serial No    Model    priority    Role      ID  Interface

1 (FPC  12- 23) Prsnt    JN115D117AFB mx480          128  Master*
```

Configuring Virtual Chassis Ports to Interconnect Member Routers

Step-by-Step Procedure

To interconnect the member routers in an MX Series Virtual Chassis, use the **request virtual-chassis vc-port set** command to configure (set) Virtual Chassis ports on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) interfaces.

NOTE: If you issue the request virtual-chassis vc-port set command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To configure Virtual Chassis ports on Trio MPC/MIC interfaces to connect the member routers in the Virtual Chassis:

1. Configure the Virtual Chassis ports on member 0 (**gladius**).
   a. Log in to the console on member 0.
   b. Configure the first Virtual Chassis port that connects to member 1 (**trefoil**).

      ```
      {master:member0-re0}

      user@gladius> request virtual-chassis vc-port set fpc-slot 2 pic-slot 2 port 0
      vc-port successfully set
      ```

      After the Virtual Chassis port is created, it is renamed **vcp-*slot/pic/port*** (for example, **vcp-2/2/0**), and the line card associated with that port comes online. The line cards in the other member router remain offline until the Virtual Chassis forms. Each Virtual Chassis port is dedicated to the task of interconnecting member routers in a Virtual Chassis, and is no longer available for configuration as a standard network port.

   c. When **vcp-2/2/0** is up, configure the second Virtual Chassis port that connects to member 1.

      ```
      {master:member0-re0}

      user@gladius> request virtual-chassis vc-port set fpc-slot 2 pic-slot 3 port 0
      vc-port successfully set
      ```

2. Configure the Virtual Chassis ports on member 1 (**trefoil**).
   a. Log in to the console on member 1.
   b. Configure the first Virtual Chassis port that connects to member 0 (**gladius**).

      ```
      {master:member1-re0}

      user@trefoil> request virtual-chassis vc-port set fpc-slot 2 pic-slot 0 port 0
      vc-port successfully set
      ```

   c. When **vcp-2/0/0** is up, configure the second Virtual Chassis port that connects to member 0.

      ```
      {master:member1-re0}

      user@trefoil> request virtual-chassis vc-port set fpc-slot 5 pic-slot 2 port 0
      ```

```
vc-port successfully set
```

When all of the line cards in all of the member routers are online, and the Virtual Chassis has formed, you can issue Virtual Chassis commands from the terminal window of the master router (**gladius**).

3. Verify that the Virtual Chassis is properly configured and operational.

```
{master:member0-re0}

user@gladius> show virtual-chassis status
{master:member0-re0}

user@gladius> show virtual-chassis vc-port all-members
```

See the Verification section for information about interpreting the output of these commands.

4. Commit the configuration on the master router.

The commit step is required to ensure that the configuration groups and Virtual Chassis configuration are propagated to both members of the Virtual Chassis.

Verification

To confirm that the Virtual Chassis configuration is working properly, perform these tasks:

- Verifying the Member IDs and Roles of the Virtual Chassis Members on page 79
- Verifying the Enhanced IP Network Services Configuration on page 80
- Verifying the Operation of the Virtual Chassis Ports on page 80
- Verifying Neighbor Reachability on page 81

Verifying the Member IDs and Roles of the Virtual Chassis Members

Purpose Verify that the member IDs and roles of the routers belonging to the Virtual Chassis are properly configured.

Action Display the status of the members of the Virtual Chassis configuration:

```
{master:member0-re0}

user@gladius> show virtual-chassis status
Preprovisioned Virtual Chassis
Virtual Chassis ID: a5b6.be0c.9525
                                                    Mastership           Neighbor List
Member ID      Status   Serial No    Model    priority    Role      ID  Interface

0 (FPC   0- 11) Prsnt    JN10C7135AFC mx240          129  Master*    1  vcp-2/2/0
                                                                     1  vcp-2/3/0

1 (FPC  12- 23) Prsnt    JN115D117AFB mx480          129  Backup     0  vcp-2/0/0
                                                                     0  vcp-5/2/0
```

Meaning The value **Prsnt** in the **Status** column of the output confirms that the member routers specified in the preprovisioned configuration are currently connected to the Virtual Chassis. The display shows that member 0 (**gladius**) and member 1 (**trefoil**), which were both configured with the **routing-engine** role, are functioning as the master router and backup

router of the Virtual Chassis, respectively. The **Neighbor List** displays the interconnections between the member routers by means of the Virtual Chassis ports. For example, member 0 is connected to member 1 through **vcp-2/2/0** and **vcp-2/3/0**. The asterisk (*) following **Master** denotes the router on which the command was issued. The **Mastership priority** value is assigned by the software and is not configurable in the current release.

Verifying the Enhanced IP Network Services Configuration

Purpose Verify that enhanced IP network services has been properly configured for the Virtual Chassis.

Action Display the setting of the network services configuration for the master Routing Engine in the Virtual Chassis master router (member0-re0), and for the master Routing Engine in the Virtual Chassis backup router (member1-re0).

```
{master:member0-re0}

user@gladius> show chassis network services
Network Services Mode: Enhanced-IP


{backup:member1-re0}

user@trefoil> show chassis network services
Network Services Mode: Enhanced-IP
```

Meaning The output of the **show chassis network services** command confirms that enhanced IP network services is properly configured on both member routers in the Virtual Chassis.

Verifying the Operation of the Virtual Chassis Ports

Purpose Verify that the Virtual Chassis ports are properly configured and operational.

Action Display the status of the Virtual Chassis ports for both members of the Virtual Chassis.

```
{master:member0-re0}

user@gladius> show virtual-chassis vc-port all-members
member0:
--------------------------------------------------------------------------
Interface       Type              Trunk  Status       Speed        Neighbor
or                                 ID                (mbps)       ID  Interface
Slot/PIC/Port
2/2/0           Configured          3    Up           10000        1   vcp-2/0/0
2/3/0           Configured          3    Up           10000        1   vcp-5/2/0


member1:
--------------------------------------------------------------------------
Interface       Type              Trunk  Status       Speed        Neighbor
or                                 ID                (mbps)       ID  Interface
Slot/PIC/Port
2/0/0           Configured          3    Up           10000        0   vcp-2/2/0
5/2/0           Configured          3    Up           10000        0   vcp-2/3/0
```

Meaning The output confirms that the Virtual Chassis ports you configured are operational. For each member router, the **Interface or Slot/PIC/Port** column shows the location of the Virtual Chassis ports configured on that router. For example, the Virtual Chassis ports on **member0-re0** (**gladius**) are **vcp-2/2/0** and **vcp-2/3/0**. In the **Trunk ID** column, the value **3** indicates that a trunk has formed; if a trunk is not present, this field displays the value **-1** . In the **Status** column, the value **Up** confirms that the interfaces associated with the Virtual Chassis ports are operational. The **Speed** column displays the speed of the Virtual Chassis port interface. The **Neighbor ID/Interface** column displays the member IDs and Virtual Chassis port interfaces that connect to this router. For example, the connections to member 0 (**gladius**) are through **vcp-2/0/0** and **vcp-5/2/0** on member 1 (**trefoil**).

Verifying Neighbor Reachability

Purpose Verify that each member router in the Virtual Chassis can reach the neighbor routers to which it is connected.

Action Display the neighbor reachability information for both member routers in the Virtual Chassis.

```
{master:member0-re0}

user@gladius> show virtual-chassis active-topology all-members
member0:
--------------------------------------------------------------------------
  Destination ID        Next-hop

  1                    1(vcp-2/2/0.32768)


member1:
--------------------------------------------------------------------------
  Destination ID        Next-hop

  0                    0(vcp-2/0/0.32768)
```

Meaning The output confirms that each member router in the Virtual Chassis has a path to reach the neighbors to which it is connected. For each member router, the **Destination ID** specifies the member ID of the destination (neighbor) router. The **Next-hop** column displays the member ID and Virtual Chassis port interface of the next-hop to which packets for the destination ID are forwarded. For example, the next-hop from member 0 (**gladius**) to member 1 (**trefoil**) is through Virtual Chassis port interface **vcp-2/2/0.32768**.

Related Documentation

- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5
- Guidelines for Configuring Virtual Chassis Ports on page 10
- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35

Example: Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers

You can delete an MX Series Virtual Chassis configuration at any time. You might want to do so if your network configuration changes, or if you want to replace one or both MX Series member routers in the Virtual Chassis with different MX Series routers. After you delete the Virtual Chassis configuration, the routers that were formerly members of the Virtual Chassis function as two independent routers.

This example describes how to delete a Virtual Chassis configuration consisting of two MX Series routers:

- Requirements on page 83
- Overview and Topology on page 83
- Configuration on page 85
- Verification on page 92

Requirements

This example uses the following software and hardware components:

- Junos OS Release 11.2 and later releases
- One MX240 3D Universal Edge Router with dual Routing Engines
- One MX480 3D Universal Edge Router with dual Routing Engines

NOTE: This configuration example has been tested using the software release listed and is assumed to work on all later releases.

SeeTable 9 on page 84 for information about the hardware installed in each MX Series router.

BEST PRACTICE: We recommend that you use the **commit synchronize** command to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you issue the **commit synchronize** command. Issuing the **commit synchronize** command for an MX Series Virtual Chassis configuration has the same effect as issuing the **commit synchronize force** command.

Overview and Topology

To delete an MX Series Virtual Chassis configuration, you must:

1. Delete all Virtual Chassis ports.
2. Remove the definitions and applications of the Virtual Chassis configuration groups.
3. Delete the preprovisioned member information configured at the **[edit virtual-chassis]** hierarchy level.
4. Delete any configured interfaces.
5. Remove the member IDs of each member router.

After you issue the **request virtual-chassis member-id delete** command on each router to remove the member ID, the router reboots and the software disables Virtual Chassis mode on that router.

Because the entire Virtual Chassis configuration is propagated from the master router to the other member router when the Virtual Chassis forms, you must delete each component of the Virtual Chassis configuration from both member routers, even though the component was originally configured only on the master router. For example, even though the preprovisioned member information was configured at the **[edit virtual-chassis]** hierarchy level only on the master router, you must delete the **virtual-chassis** stanza from the other member router in the Virtual Chassis.

NOTE: You cannot override a Virtual Chassis configuration simply by using the **load override** command to load a different configuration on the router from an ASCII file or from terminal input, as you can with other configurations. The member ID and Virtual Chassis port definitions are not stored in the configuration file, and are still defined even after the new configuration file is loaded.

This example deletes the Virtual Chassis configuration that uses the basic topology shown in Figure 3 on page 84. For redundancy, each member router is configured with two Virtual Chassis ports, both of which must be removed as part of the deletion process.

Figure 3: Sample Topology for a Virtual Chassis with Two MX Series Routers

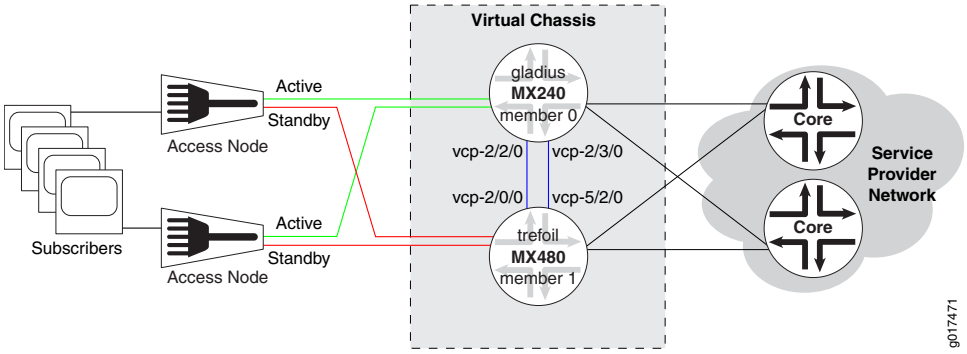


Table 9 on page 84 shows the hardware and software configuration settings for each MX Series router in the Virtual Chassis.

Table 9: Components of the Sample MX Series Virtual Chassis

Router Name	Hardware	Serial Number	Member ID	Role	Virtual Chassis Ports	Network Port Slot Numbering
gladius	MX240 router with: • 60-Gigabit Ethernet Enhanced Queuing MPC • 20-port Gigabit Ethernet MIC with SFP • 4-port 10-Gigabit Ethernet MIC with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member0-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member0-re1**)	JN10C7135AFC	0	routing-engine (master)	vcp-2/2/0 vcp-2/3/0	FPC 0 – 11

Table 9: Components of the Sample MX Series Virtual Chassis *(continued)*

Router Name	Hardware	Serial Number	Member ID	Role	Virtual Chassis Ports	Network Port Slot Numbering
trefoil	MX480 router with: • Two 30-Gigabit Ethernet Queuing MPCs • Two 20-port Gigabit Ethernet MICs with SFP • Two 2-port 10-Gigabit Ethernet MICs with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member1-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member1-re1**)	JN115D117AFB	1	routing-engine (backup)	vcp-2/0/0 vcp-5/2/0	FPC 12 – 23 (offset = 12)

Configuration

To delete a Virtual Chassis configuration consisting of two MX Series routers, perform these tasks:

- Deleting Virtual Chassis Ports on page 86
- Deleting Configuration Group Definitions and Applications on page 87
- Deleting Preprovisioned Member Information on page 89
- Deleting Configured Interfaces on page 89
- Deleting Member IDs to Disable Virtual Chassis Mode on page 90

Deleting Virtual Chassis Ports

Step-by-Step Procedure

To delete a Virtual Chassis port from a member router, you must use the **request virtual-chassis vc-port delete** command.

NOTE: If you issue the **request virtual-chassis vc-port delete** command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To remove the Virtual Chassis ports from each member router:

1. In the console window on member 0 (**gladius**), remove both Virtual Chassis ports (**vcp-2/2/0** and **vcp-2/3/0**).

```
{master:member0-re0}

user@gladius> request virtual-chassis vc-port delete fpc-slot 2 pic-slot 2 port 0
vc-port successfully deleted

{master:member0-re0}

user@gladius> request virtual-chassis vc-port delete fpc-slot 2 pic-slot 3 port 0
vc-port successfully deleted
```

2. In the console window on member 1 (**trefoil**), remove both Virtual Chassis ports (**vcp-2/0/0** and **vcp-5/2/0**).

```
{backup:member1-re0}

user@trefoil> request virtual-chassis vc-port delete fpc-slot 2 pic-slot 0 port 0
vc-port successfully deleted

{backup:member1-re0}

user@trefoil> request virtual-chassis vc-port delete fpc-slot 5 pic-slot 2 port 0
vc-port successfully deleted
```

Results

Display the results of the Virtual Chassis port deletion on each router. Confirm that no Virtual Chassis ports are listed in the output of either the **show virtual-chassis status** command or the **show virtual-chassis vc-port** command.

```
{master:member0-re0}

user@gladius> show virtual-chassis status
Preprovisioned Virtual Chassis
Virtual Chassis ID: 4d6f.54cd.d2c1

                                                Mastership            Neighbor List

Member ID       Status   Serial No    Model    priority    Role      ID  Interface

0 (FPC   0- 11) Prsnt    JN10C7135AFC mx240         129  Master*

1 (FPC  12- 23) NotPrsnt JN115D117AFB mx480
```

```
{master:member0-re0}

user@gladius> show virtual-chassis vc-port
member0:
--------------------------------------------------------------------------
```

TIP: Deleting and then re-creating a Virtual Chassis port in an MX Series Virtual Chassis configuration may cause the Virtual Chassis port to appear as **Absent** in the **Status** column of the **show virtual-chassis vc-port** command display. To resolve this issue, reboot the FPC that hosts the re-created Virtual Chassis port.

Deleting Configuration Group Definitions and Applications

Step-by-Step Procedure

As part of deleting a Virtual Chassis configuration for MX Series routers with dual Routing Engines, you must delete the definitions and applications for the following configuration groups on both member routers:

- **member0-re0**
- **member0-re1**
- **member1-re0**
- **member1-re1**

To retain the information in these configuration groups before you delete them, you must copy them to the standard **re0** and **re1** configuration groups on the router, as described in the following procedure. For example, copy configuration groups **member0-re0** and **member1-re0** to **re0**, and copy **member0-re1** and **member1-re1** to **re1**.

NOTE: The **member*n*-re*n*** naming format for configuration groups is reserved for exclusive use by member routers in MX Series Virtual Chassis configurations.

To delete the configuration group definitions and applications for an MX Series Virtual Chassis:

1. In the console window on member 0 (**gladius**), delete the Virtual Chassis configuration group definitions and applications.

   a. Copy the Virtual Chassis configuration groups to the standard configuration groups **re0** and **re1**.

      ```
      {master:member0-re0}[edit]
      ```

```
user@gladius# copy groups member0-re0 to re0
user@gladius# copy groups member0-re1 to re1
```

b. Apply the **re0** and **re1** configuration groups.

```
{master:member0-re0}[edit]
user@gladius# set apply-groups re0
user@gladius# set apply-groups re1
```

c. Delete the Virtual Chassis configuration group definitions.

```
{master:member0-re0}[edit]
user@gladius# delete groups member0-re0
user@gladius# delete groups member0-re1
user@gladius# delete groups member1-re0
user@gladius# delete groups member1-re1
```

d. Delete the Virtual Chassis configuration group applications.

```
{master:member0-re0}[edit]
user@gladius# delete apply-groups member0-re0
user@gladius# delete apply-groups member0-re1
user@gladius# delete apply-groups member1-re0
user@gladius# delete apply-groups member1-re1
```

2. In the console window on member 1 (**trefoil**), delete the Virtual Chassis configuration group definitions and applications.

a. Copy the Virtual Chassis configuration groups to the standard configuration groups **re0** and **re1**.

```
{backup:member1-re0}[edit]
user@trefoil# copy groups member1-re0 to re0
user@trefoil# copy groups member1-re1 to re1
```

b. Apply the **re0** and **re1** configuration groups.

```
{backup:member1-re0}[edit]
user@trefoil# set apply-groups re0
user@trefoil# set apply-groups re1
```

c. Delete the Virtual Chassis configuration group definitions.

```
{backup:member1-re0}[edit]
user@trefoil# delete groups member0-re0
user@trefoil# delete groups member0-re1
user@trefoil# delete groups member1-re0
user@trefoil# delete groups member1-re1
```

d. Delete the Virtual Chassis configuration group applications.

```
{backup:member1-re0}[edit]
user@trefoil# delete apply-groups member0-re0
user@trefoil# delete apply-groups member0-re1
user@trefoil# delete apply-groups member1-re0
user@trefoil# delete apply-groups member1-re1
```

Results Display the results of the configuration. Confirm that configuration groups **member0-re0**, **member 0-re1**, **member1-re0**, and **member1-re1** do not appear in the output of either the **show groups** command or the **show apply-groups** command.


```
[edit]
user@gladius# show groups ?
Possible completions:
  <[Enter]>            Execute this command
  <group_name>         Group name
  global               Group name
  re0                  Group name
  re1                  Group name
  |                    Pipe through a command

[edit]
user@gladius# show apply-groups
  ## Last changed: 2010-12-01 09:17:27 PST
  apply-groups [ global re0 re1 ];
```

Deleting Preprovisioned Member Information

Step-by-Step Procedure

You must delete the preprovisioned member information, which was configured at the **[edit virtual-chassis]** hierarchy level on the master router and then propagated to the backup router during the formation of the Virtual Chassis.

To delete the preprovisioned member information for the Virtual Chassis:

1. Delete the **virtual-chassis** configuration stanza on member 0 (**gladius**).

   ```
   {master:member0-re0}[edit]
   user@gladius# delete virtual-chassis
   ```

2. Delete the **virtual-chassis** configuration stanza on member 1 (**trefoil**).

   ```
   {backup:member1-re0}[edit]
   user@trefoil# delete virtual-chassis
   ```

Results

Display the results of the deletion. Confirm that the **virtual-chassis** stanza no longer exists on either member router. For example, on **gladius** (member 0):

```
{master:member0-re0}[edit]
user@gladius# show virtual-chassis
<no output>
```

Deleting Configured Interfaces

Step-by-Step Procedure

As part of deleting the Virtual Chassis, we recommend that you delete any interfaces that were configured when the Virtual Chassis was formed. This action ensures that nonexistent interfaces or interfaces belonging to the other member router do not remain on the router after Virtual Chassis mode is disabled.

To delete any interfaces that you configured when creating the Virtual Chassis:

1. In the console window on member 0 (**gladius**), delete any configured interfaces and commit the configuration.

   a. Delete the configured interfaces.

      ```
      {master:member0-re0}[edit]
      user@gladius# delete interfaces
      ```

b. Commit the configuration on member 0.

```
{master:member0-re0}[edit system]
user@gladius# commit synchronize
  member0-re0:
  configuration check succeeds
  member0-re1:
  commit complete
  member0-re0:
  commit complete
```

2. In the console window on member 1 (**trefoil**), delete any configured interfaces and commit the configuration.

   a. Delete the configured interfaces.

```
{backup:member1-re0}[edit]
user@trefoil# delete interfaces
```

   b. Commit the configuration on member 1.

```
{backup:member1-re0}[edit system]
user@trefoil# commit synchronize
  member1-re0:
  configuration check succeeds
  member1-re1:
  commit complete
  member1-re0:
  commit complete
```

Deleting Member IDs to Disable Virtual Chassis Mode

Step-by-Step Procedure

To delete a member ID from a Virtual Chassis member router, you must use the **request virtual-chassis member-id delete** command.

NOTE: If you issue the **request virtual-chassis member-id delete** command without first installing an MX Virtual Chassis Redundancy Feature Pack license on both member routers, the software displays a warning message that you are operating without a valid Virtual Chassis software license.

To delete the Virtual Chassis member IDs and disable Virtual Chassis mode:

1. In the console window on member 0 (**gladius**), delete the member ID and reboot the router.

   a. Exit configuration mode.

```
{master:member0-re0}[edit]
user@gladius# exit
Exiting configuration mode
```

   b. Delete member ID **0**.

```
{master:member0-re0}
```

```
user@gladius> request virtual-chassis member-id delete
This command will disable virtual-chassis mode and reboot the system.
 Continue? [yes,no] (no) yes

Updating VC configuration and rebooting system, please wait...

{master:member0-re0}
user@gladius>

*** FINAL System shutdown message from root@gladius ***

System going down IMMEDIATELY
```

2. In the console window on member 1 (**trefoil**), delete the member ID and reboot the router.

   a. Exit configuration mode.

      ```
      {master:member1-re0}[edit]
      user@trefoil# exit
      Exiting configuration mode
      ```

   b. Delete member ID **1**.

      ```
      {master:member1-re0}

      user@trefoil> request virtual-chassis member-id delete
      This command will disable virtual-chassis mode and reboot the system.
       Continue? [yes,no] (no) yes

      Updating VC configuration and rebooting system, please wait...

      {backup:member1-re0}
      user@trefoil>

      *** FINAL System shutdown message from root@trefoil ***

      System going down IMMEDIATELY
      ```

Results After you issue the **request virtual-chassis member-id delete** command to remove the member ID, the router reboots and the software disables Virtual Chassis mode on that router. The routers that were formerly members of the Virtual Chassis now function as two independent routers.

Display the results of the configuration to confirm that the Virtual Chassis configuration has been deleted on each router. For example, on **gladius** (formerly member 0):

```
user@gladius> show virtual-chassis status
error: the virtual-chassis-control subsystem is not running


user@gladius> show virtual-chassis vc-port
error: the virtual-chassis-control subsystem is not running
```

Verification

To confirm that the Virtual Chassis configuration has been properly deleted, perform these tasks:

- Verifying Deletion of the Virtual Chassis Ports on page 92
- Verifying Deletion of the Virtual Chassis Configuration Groups on page 92
- Verifying Deletion of the Virtual Chassis Member IDs on page 93

Verifying Deletion of the Virtual Chassis Ports

Purpose Verify that the Virtual Chassis ports on both member routers have been deleted from the configuration.

Action Display the status of the Virtual Chassis configuration and Virtual Chassis ports.

```
{master:member0-re0}

user@gladius> show virtual-chassis status
Preprovisioned Virtual Chassis
Virtual Chassis ID: 4d6f.54cd.d2c1

                                                Mastership            Neighbor List

Member ID       Status   Serial No    Model    priority    Role      ID  Interface

0 (FPC   0- 11) Prsnt    JN10C7135AFC mx240         129  Master*

1 (FPC  12- 23) NotPrsnt JN115D117AFB mx480



{master:member0-re0}

user@gladius> show virtual-chassis vc-port
member0:
--------------------------------------------------------------------------
```

Meaning In the output of the **show virtual-chassis status** command, no Virtual Chassis ports (**vcp-*slot/pic/port***) are displayed in the Neighbor List. The asterisk (*) following **Master** denotes the router on which the **show virtual-chassis status** command command was issued.

In the output of the **show virtual-chassis vc-port** command, no Virtual Chassis ports are displayed on the router on which the command was issued.

Verifying Deletion of the Virtual Chassis Configuration Groups

Purpose Verify that the definitions and applications of the following Virtual Chassis configuration groups have been deleted from the global configuration:

- **member0-re0**
- **member0-re1**

- member1-re0
- member1-re1

Action Display the status of the Virtual Chassis configuration group definitions and applications.

```
[edit]
user@gladius# show groups ?
Possible completions:
  <[Enter]>            Execute this command
  <group_name>         Group name
  global               Group name
  re0                  Group name
  re1                  Group name
  |                    Pipe through a command

[edit]
user@gladius# show apply-groups
  apply-groups [ global re0 re1 ];
```

Meaning The output confirms that the Virtual Chassis configuration group definitions and applications have been deleted. In the output of both **show groups** and **show apply-groups**, only the standard configuration groups (**global**, **re0**, and **re1**) are listed. The Virtual Chassis configuration groups (**member0-re0**, **member 0-re1**, **member1-re0**, and **member1-re1**) do not appear.

Verifying Deletion of the Virtual Chassis Member IDs

Purpose Verify that the member IDs for the Virtual Chassis have been deleted, and that the Virtual Chassis is no longer configured on either MX Series router.

Action Display the results of the configuration on each router. For example, on **trefoil** (formerly member 1):

```
user@trefoil> show virtual-chassis status
error: the virtual-chassis-control subsystem is not running


user@trefoil> show virtual-chassis vc-port
error: the virtual-chassis-control subsystem is not running
```

Meaning When you attempt to issue either the **show virtual-chassis status** command or the **show virtual-chassis vc-port** command after the Virtual Chassis has been deleted, the router displays an error message indicating that the Virtual Chassis is no longer configured, and rejects the command.

Related Documentation

- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5
- Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 37

Example: Upgrading Junos OS in a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers

You can upgrade an MX Series Virtual Chassis configuration from Junos OS Release 11.2 to a later release. This upgrade procedure assumes that both member routers in the Virtual Chassis have dual Routing Engines installed.

NOTE: Make sure all four Routing Engines in the Virtual Chassis (both Routing Engines in the master router and both Routing Engines in the backup router) are running the same Junos OS release.

This example describes how to upgrade Junos OS in a Virtual Chassis consisting of two MX Series routers, each of which has dual Routing Engines:

Requirements

This example uses the following software and hardware and components:

- Junos OS Release 11.2 and later releases
- One MX240 3D Universal Edge Router with dual Routing Engines
- One MX480 3D Universal Edge Router with dual Routing Engines

NOTE: This configuration example has been tested using the software release listed and is assumed to work on all later releases.

See Table 10 on page 96 for information about the hardware installed in each MX Series router.

BEST PRACTICE: We recommend that you use the **commit synchronize** command to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you issue the **commit synchronize** command. Issuing the **commit synchronize** command for an MX Series Virtual Chassis configuration has the same effect as issuing the **commit synchronize force** command.

Overview and Topology

To upgrade Junos OS in an MX Series Virtual Chassis configuration, you must:

1. Prepare for the upgrade.
2. Install the Junos OS software package on each of the four Routing Engines.
3. Reboot the Routing Engines to run the new Junos OS release.
4. Re-enable graceful Routing Engine switchover and nonstop active routing.

This example upgrades Junos OS in an MX Series Virtual Chassis configuration that uses the basic topology shown in Figure 4 on page 95. For redundancy, each member router is configured with two Virtual Chassis ports.

Figure 4: Sample Topology for a Virtual Chassis with Two MX Series Routers

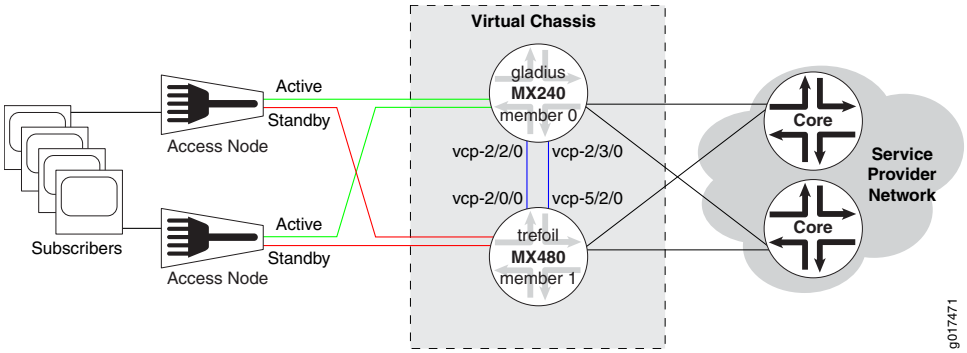


Table 10 on page 96 shows the hardware and software configuration settings for each MX Series router in the Virtual Chassis.

Table 10: Components of the Sample MX Series Virtual Chassis

Router Name	Hardware	Serial Number	Member ID	Role	Virtual Chassis Ports	Network Port Slot Numbering
gladius	MX240 router with: • 60-Gigabit Ethernet Enhanced Queuing MPC • 20-port Gigabit Ethernet MIC with SFP • 4-port 10-Gigabit Ethernet MIC with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member0-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member0-re1**)	JN10C7135AFC	0	routing-engine (master)	vcp-2/2/0 vcp-2/3/0	FPC 0 – 11
trefoil	MX480 router with: • Two 30-Gigabit Ethernet Queuing MPCs • Two 20-port Gigabit Ethernet MICs with SFP • Two 2-port 10-Gigabit Ethernet MICs with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member1-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member1-re1**)	JN115D117AFB	1	routing-engine (backup)	vcp-2/0/0 vcp-5/2/0	FPC 12 – 23 (offset = 12)

Configuration

To upgrade Junos OS in a Virtual Chassis configuration consisting of two MX Series routers, each with dual Routing Engines, perform these tasks:

- Preparing for the Upgrade on page 97
- Installing the Junos OS Software Package on Each Routing Engine on page 97

Preparing for the Upgrade

Step-by-Step Procedure

To prepare for the upgrade process:

1. Use FTP or a Web browser to download the Junos OS software package to the master Routing Engine on the Virtual Chassis master router (**member0-re0**).

   See *Downloading Software* in the *Installation and Upgrade Guide*.

2. Disable nonstop active routing on the master router.

   ```
   {master:member0-re0}[edit routing-options]
   user@gladius# delete nonstop-routing
   ```

3. Disable graceful Routing Engine switchover on the master router.

   ```
   {master:member0-re0}[edit chassis redundancy]
   user@gladius# delete graceful-switchover
   ```

4. Commit the configuration on the master router.

5. Exit CLI configuration mode.

   ```
   {master:member0-re0}[edit]
   user@gladius# exit
   ```

Installing the Junos OS Software Package on Each Routing Engine

Step-by-Step Procedure

Installing the Junos OS software package on each Routing Engine in an MX Series Virtual Chassis prepares the Routing Engines to run the new software release after a reboot. This action is also referred to as *arming* the Routing Engines.

To install the Junos OS software package on all four Routing Engines from the master router (**member0-re0**) in the Virtual Chassis:

1. Install the software package on **member0-re0**. This command also propagates the software package to **member1-re0**.

   ```
   {master:member0-re0}
   user@gladius> request system software add package-name
   ```

   For example:

   ```
   {master:member0-re0}
   user@gladius> request system software add jinstall-11.2R1-8-domestic-signed.tgz
   ```

2. Install the software package on **member0-re1**.

   ```
   {master:member0-re0}
   user@gladius> request system software add package-name re1
   ```

3. Install the software package on **member1-re1**.

   ```
   {master:member0-re0}
   user@gladius> request system software add package-name member 1 re1
   ```

Results Display the results of the installation. Verify that the correct software package has been installed on the local master Routing Engine in **member 0** (**member0-re0**) and on the local master Routing Engine in **member 1** (**member1-re0**).

```
{master:member0-re0}

user@gladius> show version
member0:
--------------------------------------
Hostname: gladius
Model: mx240
. . .
JUNOS Installation Software [11.2R1-8]


member1:
--------------------------------------
Hostname: trefoil
Model: mx480
. . .
JUNOS Installation Software [11.2R1-8]
```

Rebooting the Routing Engines to Run the New Junos OS Release

Step-by-Step Procedure To reboot each of the four Routing Engines in an MX Series Virtual Chassis from the Virtual Chassis master router (**member0-re0**):

1. Reboot **member1-re1**.

   ```
   {master:member0-re0}

   user@gladius> request system reboot member 1 other-routing-engine
   ```

2. Reboot **member0-re1**.

   ```
   {master:member0-re0}

   user@gladius> request system reboot other-routing-engine
   ```

3. Reboot both master Routing Engines (**member0-re0** and **member1-re0**).

   ```
   {master:member0-re0}

   user@gladius> request system reboot all-members
   ```

   This command reboots all line cards in **member 0** (**gladius**) and **member 1** (**trefoil**) to use the new Junos OS release. A traffic disruption occurs until all line cards are back online and the Virtual Chassis re-forms.

Re-enabling Graceful Routing Engine Switchover and Nonstop Active Routing

Step-by-Step Procedure After upgrading the Junos OS release, you need to re-enable graceful Routing Engine switchover and nonstop active routing for the Virtual Chassis.

To re-enable graceful Routing Engine switchover and nonstop active routing from the Virtual Chassis master router (**member0-re0**):

1. In the console window on **member 0** (**gladius**), enable graceful Routing Engine switchover on the master router.

   ```
   {master:member0-re0}[edit chassis redundancy]
   ```

```
user@gladius# set graceful-switchover
```

2. Re-enable nonstop active routing on the master router.

```
{master:member0-re0}[edit routing-options]
user@gladius# set nonstop-routing
```

3. Commit the configuration on the master router.

Related Documentation

- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5
- Upgrading Junos OS in a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 38

Example: Replacing a Routing Engine in a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers

If you remove a Routing Engine from a member router in an MX Series Virtual Chassis for upgrade or repair, you must replace it with a new Routing Engine in the empty Routing Engine slot, and install the same Junos OS release on the new Routing Engine that is running on the other Routing Engines in the Virtual Chassis. The Virtual Chassis remains operational during the replacement procedure.

All four Routing Engines (both Routing Engines in the master router and both Routing Engines in the backup router) in the Virtual Chassis must run the same Junos OS release.

BEST PRACTICE: We recommend that you replace a Routing Engine in an MX Series Virtual Chassis configuration during a maintenance window to minimize the possibility of disruption to subscribers.

This example describes how to replace a Routing Engine in an MX Series Virtual Chassis configuration consisting of two MX Series routers, each of which has dual Routing Engines installed:

- Requirements on page 99
- Overview and Topology on page 100
- Configuration on page 102
- Verification on page 106

Requirements

This example uses the following software and hardware and components:

- Junos OS Release 11.4 and later releases
- One MX240 3D Universal Edge Router with dual Routing Engines
- One MX480 3D Universal Edge Router with dual Routing Engines

NOTE: This configuration example has been tested using the software release listed and is assumed to work on all later releases.

See Table 11 on page 101 for information about the hardware installed in each MX Series router.

BEST PRACTICE: We recommend that you use the **commit synchronize** command to save any configuration changes to the Virtual Chassis.

For an MX Series Virtual Chassis, the **force** option is the default and only behavior when you issue the **commit synchronize** command. Issuing the **commit synchronize** command for an MX Series Virtual Chassis configuration has the same effect as issuing the **commit synchronize force** command.

Overview and Topology

To replace a Routing Engine in an MX Series Virtual Chassis configuration, you must:

1. Remove the Routing Engine that needs repair or upgrade.
2. Return the Routing Engine to Juniper Networks, Inc.
3. Install the new Routing Engine in the empty Routing Engine slot.
4. Modify the Routing Engine factory configuration to enable formation of the Virtual Chassis.
5. Install the same Junos OS release on the new Routing Engine that is running on the other Routing Engines in the Virtual Chassis.
6. Reboot the new Routing Engine to run the Junos OS software release.

Figure 5 on page 101 shows the topology of the MX Series Virtual Chassis configuration used in this example. This example replaces the backup RE-S-2000 Routing Engine in slot 1 of the Virtual Chassis backup router, which is an MX480 router named **trefoil** that is assigned member ID **1**. The backup Routing Engine in slot 1 of **trefoil** is represented in the example as **member1-re1**.

For redundancy, each of the two member routers is configured with two Virtual Chassis ports.

Figure 5: Sample Topology for a Virtual Chassis with Two MX Series Routers

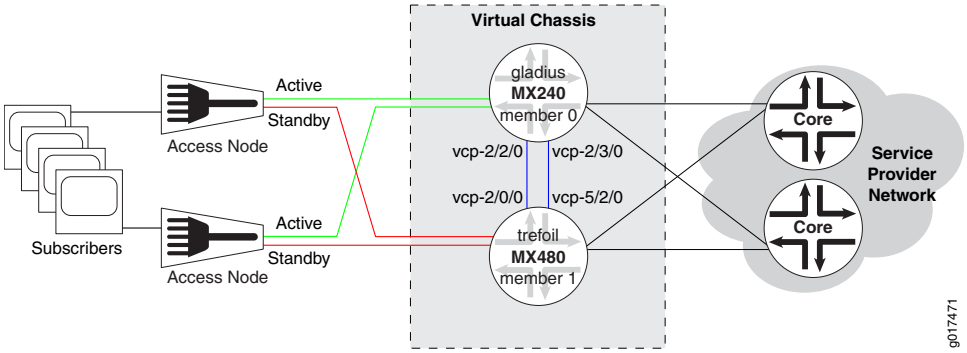


Table 11 on page 101 shows the hardware and software configuration settings for each MX Series router in the Virtual Chassis.

Table 11: Components of the Sample MX Series Virtual Chassis

Router Name	Hardware	Serial Number	Member ID	Role	Virtual Chassis Ports	Network Port Slot Numbering
gladius	MX240 router with: • 60-Gigabit Ethernet Enhanced Queuing MPC • 20-port Gigabit Ethernet MIC with SFP • 4-port 10-Gigabit Ethernet MIC with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member0-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member0-re1**)	JN10C7135AFC	0	routing-engine (master)	vcp-2/2/0 vcp-2/3/0	FPC 0 – 11

Table 11: Components of the Sample MX Series Virtual Chassis *(continued)*

Router Name	Hardware	Serial Number	Member ID	Role	Virtual Chassis Ports	Network Port Slot Numbering
trefoil	MX480 router with: • Two 30-Gigabit Ethernet Queuing MPCs • Two 20-port Gigabit Ethernet MICs with SFP • Two 2-port 10-Gigabit Ethernet MICs with XFP • Master RE-S-2000 Routing Engine in slot 0 (represented in example as **member1-re0**) • Backup RE-S-2000 Routing Engine in slot 1 (represented in example as **member1-re1**)	JN115D117AFB	1	routing-engine (backup)	vcp-2/0/0 vcp-5/2/0	FPC 12 – 23 (offset = 12)

Configuration

To replace a Routing Engine in a Virtual Chassis configuration consisting of two MX Series routers, each with dual Routing Engines, perform these tasks:

- Removing the Routing Engine on page 103
- Returning the Routing Engine to Juniper Networks, Inc. on page 103
- Installing the New Routing Engine on page 103
- Modifying the Routing Engine Factory Configuration on page 103
- Installing the Junos OS Release on the New Routing Engine on page 105

Removing the Routing Engine

Step-by-Step Procedure

To remove the Routing Engine that needs repair or upgrade:

- Remove the Routing Engine according to the procedure for your MX Series router.
  - For an MX240 router, see *Removing an MX240 Routing Engine* in the *MX240 3D Universal Edge Router Hardware Guide*.
  - For an MX480 router, see *Removing an MX480 Routing Engine* in the *MX480 3D Universal Edge Router Hardware Guide*.
  - For an MX960 router, see *Removing an MX960 Routing Engine* in the *MX960 3D Universal Edge Router Hardware Guide*.

Returning the Routing Engine to Juniper Networks, Inc.

Step-by-Step Procedure

To return the Routing Engine to Juniper Networks, Inc:

- Obtain a Return Materials Authorization (RMA) from the Juniper Networks Technical Assistance Center (JTAC) and return the Routing Engine to Juniper Networks, Inc.

  For instructions, see *Returning a Hardware Component to Juniper Networks, Inc.* in the *Hardware Guide* for your MX Series router.

Installing the New Routing Engine

Step-by-Step Procedure

To install the new Routing Engine in the Virtual Chassis member router:

- Install the Routing Engine in the empty Routing Engine slot of the member router according to the procedure for your MX Series router.
  - For an MX240 router, see *Installing an MX240 Routing Engine* in the *MX240 3D Universal Edge Router Hardware Guide*.
  - For an MX480 router, see *Installing an MX480 Routing Engine* in the *MX480 3D Universal Edge Router Hardware Guide*.
  - For an MX960 router, see *Installing an MX960 Routing Engine* in the *MX960 3D Universal Edge Router Hardware Guide*.

Modifying the Routing Engine Factory Configuration

Step-by-Step Procedure

A Routing Engine shipped from the factory is loaded with a default factory configuration that includes the following stanza at the [edit] hierarchy level:

```
[edit]
system {
  commit {
    factory-settings {
      reset-virtual-chassis-configuration;
    }
  }
}
```

When this configuration stanza is present, the Routing Engine can operate only in a standalone chassis and *not* in a Virtual Chassis member router. As a result, if you install this Routing Engine in the standby slot of a Virtual Chassis member router (**member1-re1** in this procedure), the Routing Engine does not automatically synchronize with the master Routing Engine and boot in Virtual Chassis mode.

To ensure that the standby factory Routing Engine successfully synchronizes with the master Routing Engine, you must remove the standalone chassis configuration stanza from the standby factory Routing Engine and verify that it reboots in Virtual Chassis mode before you install the Junos OS release.

To modify the Routing Engine factory configuration to ensure proper operation of the Virtual Chassis:

1. Log in to the console of the new Routing Engine as the user **root** with no password.
2. Configure a plain-text password for the **root** (superuser) login.

   ```
   {local:member1-re1}[edit system]
   root# set root-authentication plain-text-password
   New password: type password here
   Retype new password: retype password here
   ```

3. Delete the standalone chassis configuration.

   ```
   {local:member1-re1}[edit]
   root# delete system commit factory-settings reset-virtual-chassis-configuration
   ```

4. Commit the configuration.

   The new Routing Engine synchronizes the Virtual Chassis member ID with the master Routing Engine and boots in Virtual Chassis mode.

5. Verify that the new Routing Engine is in Virtual Chassis mode.

   During the boot process, the router displays the following output to indicate that it has synchronized the Virtual Chassis member ID (1) with the master Routing Engine and is in Virtual Chassis mode.

   ```
   ...
   virtual chassis member-id = 1
   virtual chassis mode      = 1
   ...
   ```


Installing the Junos OS Release on the New Routing Engine

Step-by-Step Procedure

You must install the same Junos OS release on the new Routing Engine that is running on the other Routing Engines in the MX Series Virtual Chassis. Installing the Junos OS software prepares the Routing Engine to run the new Junos OS release after a reboot. This action is also referred to as *arming* the Routing Engine.

To install the Junos OS release on the new Routing Engine (**member1-re1**) in the Virtual Chassis:

1. Use FTP or a Web browser to download the Junos OS software to the master Routing Engine on the Virtual Chassis master router (**member0-re0**).

   See *Downloading Software* in the *Installation and Upgrade Guide*.

   NOTE: **Make sure you download and install the same Junos OS release that is running on all Routing Engines in the Virtual Chassis.**

2. If you have not already done so, log in to the console of the new Routing Engine as the user **root** with no password.

3. If you have not already done so, configure a plain-text password for the **root** (superuser) login.

   ```
   {local:member1-re1}[edit system]
   root# set root-authentication plain-text-password
   New password: type password here
   Retype new password: retype password here
   ```

4. From the console, commit the configuration.

   ```
   {local:member1-re1}[edit]
   root# commit synchronize and-quit
   ...
   member1-re0:
   configuration check succeeds
   member0-re0:
   commit complete
   member1-re0:
   commit complete
   member1-re1:
   commit complete
   Exiting configuration mode
   ```

5. Use Telnet or SSH to log in to the member router containing the new Routing Engine (**trefoil**).

   ```
   {local:member1-re1}

   user@trefoil>
   ```

   Notice that the router name (**trefoil**) now appears in the command prompt.

6. Install the Junos OS release on the new Routing Engine (**member1-re1**) from the Virtual Chassis master router (**member0-re0**).

```
{master:member0-re0}
```

```
user@trefoil> request system software add member member-id re1 no-validate reboot
package-name force
```

For example:

```
{master:member0-re0}
```

```
user@trefoil> request system software add member 1 re1 no-validate reboot
/var/tmp/jinstall-11.4R1-8-domestic-signed.tgz force
Pushing bundle to re1...
```

This command reboots **member1-re1** after the software is added.

Results After the reboot, the new Routing Engine becomes part of the Virtual Chassis, updates its command prompt to display **member1-re1**, and copies the appropriate configuration from the Virtual Chassis.

Verification

To verify that the MX Series Virtual Chassis is operating properly with the new Routing Engine, perform these tasks:

- Verifying the Junos OS Installation on the New Routing Engine on page 106
- Verifying the Junos OS License Installation on the New Routing Engine on page 106
- Switching the Local Mastership in the Member Router to the New Routing Engine on page 107

Verifying the Junos OS Installation on the New Routing Engine

Purpose Verify that you have installed the correct Junos OS release on the new Routing Engine (**member1-re1**).

Action Display the hostname, model name, and version information of the Junos OS release running on the new Routing Engine.

```
{local:member1-re1}
```

```
user@trefoil> show version local
Hostname: trefoil
Model: mx480
. . .
JUNOS Base OS boot [11.4R1-8]
JUNOS Base OS Software Suite [11.4R1-8]
. . .
```

Meaning The relevant portion of the **show version local** command output confirms that Junos OS Release 11.4R1-8 was installed as intended.

Verifying the Junos OS License Installation on the New Routing Engine

Purpose Verify that the MX Virtual Chassis Redundancy Feature Pack and the required Junos OS feature licenses are properly installed on the member router containing the new Routing Engine.

For information about license installation, see:

- Installing Junos OS Licenses on Virtual Chassis Member Routers on page 42
- *Software Features That Require Licenses on MX Series Routers Only*

Action Display the Junos OS licenses installed on the new Routing Engine.

```
{local:member1-re1}

user@trefoil> show system license
License usage:
                                Licenses     Licenses    Licenses    Expiry
  Feature name                       used    installed      needed
  subscriber-accounting                 0            1           0    permanent
  subscriber-authentication             0            1           0    permanent
  subscriber-address-assignment         0            1           0    permanent
  subscriber-vlan                       0            1           0    permanent
  subscriber-ip                         0            1           0    permanent
  scale-subscriber                      0       256000           0    permanent
  scale-l2tp                            0         1000           0    permanent
  scale-mobile-ip                       0         1000           0    permanent
  virtual-chassis                       0            1           0    permanent
```

Meaning The **show system license** command output confirms that the MX Virtual Chassis Redundancy Feature Pack has been installed on this member router. In addition, the necessary Junos OS feature licenses have been installed to enable use of a particular software feature or scaling level.

Switching the Local Mastership in the Member Router to the New Routing Engine

Purpose Verify that the MX Series Virtual Chassis is operating properly with the new Routing Engine by confirming that the new Routing Engine can take over local mastership from the existing Routing Engine in the Virtual Chassis backup router, **trefoil** (member 1).

Action Switch the local mastership of the Routing Engines in **trefoil** from the Routing Engine in slot 0 (**member1-re0**) to the newly installed Routing Engine in slot 1 (**member1-re1**).

```
{backup:member1-re0}

user@trefoil> request chassis routing-engine master switch
```

Wait approximately 1 minute to display the status and roles of the member routers in the Virtual Chassis after the local switchover.

```
{backup:member1-re1}

user@trefoil> show virtual-chassis status
Preprovisioned Virtual Chassis
Virtual Chassis ID: a5b6.be0c.9525
                                                Mastership           Neighbor List
Member ID       Status   Serial No    Model    priority    Role      ID  Interface

0 (FPC   0- 11) Prsnt    JN10C7135AFC mx240          129  Master     1  vcp-2/2/0
                                                                     1  vcp-2/3/0

1 (FPC  12- 23) Prsnt    JN115D117AFB mx480          129  Backup*    0  vcp-2/0/0
                                                                     0  vcp-5/2/0
```

Meaning Issuing the **request chassis routing-engine master switch** command to initiate the local switchover of the Routing Engines in the Virtual Chassis backup router (**trefoil**) affects only the roles of the Routing Engines in that member router (**member1-re0** and **member1-re1**), but does not change the global mastership of the Virtual Chassis. The output of the **show virtual-chassis status** command confirms that after the local switchover, member 0 (**gladius**) is still the Virtual Chassis master router, and member 1 (**trefoil**) is still the Virtual Chassis backup router.

Before the local switchover, **member1-re0** was the master Routing Engine in the Virtual Chassis backup router (VC-Bm), and **member1-re1** (the new Routing Engine) was the standby Routing Engine in the Virtual Chassis backup router (VC-Bs).

After the local switchover, **member1-re0** and **member1-re1** switch roles. The new Routing Engine, **member1-re1**, becomes the master Routing Engine in the Virtual Chassis backup router (VC-Bm), and **member1-re0** becomes the standby Routing Engine in the Virtual Chassis backup router (VC-Bs).

Table 12 on page 109 lists the role transitions that occur for each member router and Routing Engine before and after the local switchover of the Routing Engines in **trefoil**.

NOTE: The role transitions described in Table 12 on page 109 apply only when you initiate the local switchover from the Virtual Chassis backup router (VC-B). For information about the role transitions that occur when you initiate the local switchover from the Virtual Chassis master router (VC-M), see "Switchover Behavior in a Virtual Chassis" on page 18.

Table 12: Virtual Chassis Role Transitions Before and After Local Routing Engine Switchover

Virtual Chassis Component	Role *Before* Local Switchover	Role *After* Local Switchover
gladius (member 0)	Virtual Chassis master router (VC-M)	Virtual Chassis master router (VC-M)
trefoil (member 1)	Virtual Chassis backup router (VC-B)	Virtual Chassis backup router (VC-B)
member0-re0	Master Routing Engine in the Virtual Chassis master router (VC-Mm)	Master Routing Engine in the Virtual Chassis master router (VC-Mm)
member0-re1	Standby Routing Engine in the Virtual Chassis master router (VC-Ms)	Standby Routing Engine in the Virtual Chassis master router (VC-Ms)
member1-re0	Master Routing Engine in the Virtual Chassis backup router (VC-Bm)	Standby Routing Engine in the Virtual Chassis backup router (VC-Bs)
member1-re1 (new Routing Engine)	Standby Routing Engine in the Virtual Chassis backup router (VC-Bs)	Master Routing Engine in the Virtual Chassis backup router (VC-Bm)

BEST PRACTICE: After you switch the local mastership of the Routing Engines, full synchronization of the Routing Engines takes approximately 30 minutes to complete. To prevent possible loss of subscriber state information due to incomplete synchronization, we recommend that you wait at least 30 minutes before performing another local switchover, global switchover, or graceful Routing Engine switchover in an MX Series Virtual Chassis configuration.

Related Documentation

- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5
- Installing Junos OS Licenses on Virtual Chassis Member Routers on page 42
- Switchover Behavior in a Virtual Chassis on page 18
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65
- *Installation and Upgrade Guide*

Example: Configuring Class of Service for Virtual Chassis Ports on MX Series 3D Universal Edge Routers

This example illustrates a typical class of service (CoS) configuration that you might want to use for the Virtual Chassis ports in an MX Series Virtual Chassis.

Requirements

Before you begin:

- Configure a Virtual Chassis consisting of two MX Series routers.

  See "Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis" on page 65

Overview

By default, all Virtual Chassis ports in an MX Series Virtual Chassis use a default CoS configuration specifically tailored for Virtual Chassis ports. The default configuration, which applies to all Virtual Chassis ports in the Virtual Chassis, includes classifiers, forwarding classes, rewrite rules, and schedulers. This default CoS configuration prioritizes internal Virtual Chassis Control Protocol (VCCP) traffic that traverses the Virtual Chassis port interfaces, and prioritizes control traffic over user traffic on the Virtual Chassis ports. In most cases, the default CoS configuration is adequate for your needs without requiring any additional CoS configuration.

In some cases, however, you might want to customize the traffic-control profile configuration on Virtual Chassis ports. For example, you might want to assign different priorities and excess rates to different forwarding classes. To create a nondefault CoS configuration, you can create an output traffic-control profile that defines a set of traffic scheduling resources and references a scheduler map. You then apply the output traffic-control profile to all Virtual Chassis port interfaces at once by using **vcp-*** as the interface name representing all Virtual Chassis ports. You cannot configure CoS for Virtual Chassis ports on an individual basis.

Table 13 on page 110 shows the nondefault CoS scheduler hierarchy configured in this example for the Virtual Chassis ports.

Table 13: Sample CoS Scheduler Hierarchy for Virtual Chassis Ports

Traffic Type	Queue Number	Priority	Transmit Rate/ Excess Rate
Network control (VCCP traffic)	3	Medium	90%

Table 13: Sample CoS Scheduler Hierarchy for Virtual Chassis Ports *(continued)*

Traffic Type	Queue Number	Priority	Transmit Rate/ Excess Rate
Expedited forwarding (voice traffic)	2	High	10%
Assured forwarding (video traffic)	1	Excess Low	99%
Best effort (data traffic)	0	Excess Low	1%

In this example, you create a nondefault CoS configuration for Virtual Chassis ports by completing the following tasks on the Virtual Chassis master router:

- Associate forwarding classes with **queue 0** through **queue 3**, and configure a fabric priority value for each queue.
- Configure an output traffic control profile named **tcp-vcp-ifd** to define traffic scheduling parameters, and associate a scheduler map named **sm-vcp-ifd** with the traffic control profile.
- Apply the output traffic-control profile to the **vcp-*** interface, which represents all Virtual Chassis port interfaces in the Virtual Chassis.
- Associate the **sm-vcp-ifd** scheduler map with the forwarding classes and scheduler configuration.
- Configure the parameters for schedulers **s-medium-priority**, **s-high-priority**, **s-low-priority**, **s-high-weight**, and **s-low-weight**.

Configuration

CLI Quick Configuration

To quickly create a nondefault CoS configuration for Virtual Chassis ports, copy the following commands and paste them into the router terminal window:

```
[edit]
set class-of-service forwarding-classes queue 0 best-effort
set class-of-service forwarding-classes queue 0 priority low
set class-of-service forwarding-classes queue 1 assured-forwarding
set class-of-service forwarding-classes queue 1 priority low
set class-of-service forwarding-classes queue 2 expedited-forwarding
set class-of-service forwarding-classes queue 2 priority high
set class-of-service forwarding-classes queue 3 network-control
set class-of-service forwarding-classes queue 3 priority high
set class-of-service traffic-control-profiles tcp-vcp-ifd scheduler-map sm-vcp-ifd
set class-of-service interfaces vcp-* output-traffic-control-profile tcp-vcp-ifd
set class-of-service scheduler-maps sm-vcp-ifd forwarding-class network-control
    scheduler s-medium-priority
set class-of-service scheduler-maps sm-vcp-ifd forwarding-class expedited-forwarding
    scheduler s-high-priority
set class-of-service scheduler-maps sm-vcp-ifd forwarding-class assured-forwarding
    scheduler s-high-weight
```

```
set class-of-service scheduler-maps sm-vcp-ifd forwarding-class best-effort scheduler
  s-low-weight
set class-of-service schedulers s-medium-priority transmit-rate percent 10
set class-of-service schedulers s-medium-priority priority medium-high
set class-of-service schedulers s-medium-priority excess-priority high
set class-of-service schedulers s-high-priority transmit-rate percent 90
set class-of-service schedulers s-high-priority priority high
set class-of-service schedulers s-high-priority excess-priority high
set class-of-service schedulers s-low-priority priority low
set class-of-service schedulers s-high-weight excess-rate percent 99
set class-of-service schedulers s-low-weight excess-rate percent 1
```

Step-by-Step Procedure

To create a nondefault CoS configuration for Virtual Chassis ports in an MX Series Virtual Chassis:

1. Log in to the console on the master router of the Virtual Chassis.
2. Specify that you want to configure CoS forwarding classes.

   ```
   {master:member0-re0} [edit]
   user@host# edit class-of-service forwarding-classes
   ```

3. Associate a forwarding class with each queue name and number, and configure a fabric priority value for each queue.

   ```
   {master:member0-re0} [edit class-of-service forwarding-classes]
   user@host# set queue 0 best-effort priority low
   user@host# set queue 1 assured-forwarding priority low
   user@host# set queue 2 expedited-forwarding priority high
   user@host# set queue 3 network-control priority high
   ```

4. Return to the **[edit class-of-service]** hierarchy level to configure an output traffic-control profile.

   ```
   {master:member0-re0} [edit class-of-service forwarding-classes]
   user@host# up
   ```

5. Configure an output traffic-control profile and associate it with a scheduler map.

   ```
   {master:member0-re0} [edit class-of-service]
   user@host# set traffic-control-profiles tcp-vcp-ifd scheduler-map sm-vcp-ifd
   ```

6. Apply the output traffic-control profile to all Virtual Chassis port interfaces in the Virtual Chassis.

   ```
   {master:member0-re0} [edit class-of-service]
   user@host# set interfaces vcp-* output-traffic-control-profile tcp-vcp-ifd
   ```

7. Specify that you want to configure the scheduler map.

   ```
   {master:member0-re0} [edit class-of-service]
   user@host# edit scheduler-maps sm-vcp-ifd
   ```

8. Associate the scheduler map with the scheduler configuration and forwarding classes.

   ```
   {master:member0-re0} [edit class-of-service scheduler-maps sm-vcp-ifd]
   user@host# set forwarding-class network-control scheduler s-medium-priority
   user@host# set forwarding-class expedited-forwarding scheduler s-high-priority
   user@host# set forwarding-class assured-forwarding scheduler s-high-weight
   ```

```
user@host# set forwarding-class best-effort scheduler s-low-weight
```

9. Return to the **[edit class-of-service]** hierarchy level to configure the schedulers.

```
{master:member0-re0} [edit class-of-service scheduler-maps sm-vcp-ifd]
user@host# up 2
```

10. Configure parameters for the schedulers.

```
{master:member0-re0} [edit class-of-service]
user@host# set schedulers s-medium-priority priority medium-high excess-priority
  high transmit-rate percent 10
user@host# set schedulers s-high-priority priority high excess-priority high
  transmit-rate percent 90
user@host# set schedulers s-low-priority priority low
user@host# set schedulers s-high-weight excess-rate percent 99
user@host# set schedulers s-low-weight excess-rate percent 1
```

Results From the **[edit class-of-service]** hierarchy level in configuration mode, confirm the results of your configuration by issuing the **show** statement. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
{master:member0-re0} [edit class-of-service]
user@host# show
forwarding-classes {
  queue 0 best-effort priority low;
  queue 1 assured-forwarding priority low;
  queue 2 expedited-forwarding priority high;
  queue 3 network-control priority high;
}
traffic-control-profiles {
  tcp-vcp-ifd {
    scheduler-map sm-vcp-ifd;
  }
}
interfaces {
  vcp-* {
    output-traffic-control-profile tcp-vcp-ifd;
  }
}
scheduler-maps {
  sm-vcp-ifd {
    forwarding-class network-control scheduler s-medium-priority;
    forwarding-class expedited-forwarding scheduler s-high-priority;
    forwarding-class assured-forwarding scheduler s-high-weight;
    forwarding-class best-effort scheduler s-low-weight;
  }
}
schedulers {
  s-medium-priority {
    transmit-rate percent 10;
    priority medium-high;
    excess-priority high;
  }
  s-high-priority {
```

```
        transmit-rate percent 90;
        priority high;
        excess-priority high;
      }
      s-low-priority {
        priority low;
      }
      s-high-weight {
        excess-rate percent 99;
      }
      s-low-weight {
        excess-rate percent 1;
      }
    }
```

If you are done configuring CoS on the master router, enter **commit** from configuration mode.

Related Documentation

- Class of Service Overview for Virtual Chassis Ports on page 27
- Guidelines for Configuring Class of Service for Virtual Chassis Ports on page 32
- *Junos OS Class of Service Library for Routing Devices*

CHAPTER 7

Configuration Statements

aggregated-ether-options

Syntax

```
aggregated-ether-options {
  ethernet-switch-profile {
    ethernet-policer-profile {
      input-priority-map {
        ieee802.1p premium [ values ];
      }
      output-priority-map {
        classifier {
          premium {
            forwarding-class class-name {
              loss-priority (high | low);
            }
          }
        }
      }
      policer cos-policer-name {
        aggregate {
          bandwidth-limit bps;
          burst-size-limit bytes;
        }
        premium {
          bandwidth-limit bps;
          burst-size-limit bytes;
        }
      }
    }
    (mac-learn-enable | no-mac-learn-enable);
  }
  (flow-control | no-flow-control);
  lacp {
    (active | passive);
    link-protection {
      disable;
    (revertive | non-revertive);
    periodic interval;
    system-priority priority;
    system-id system-id;
  }
  link-protection;
  link-speed speed;
  logical-interface-chassis-redundancy;
  logical-interface-fpc-redundancy;
  (loopback | no-loopback);
  minimum-links number;
  rebalance-periodic time hour:minute <interval hours>;
  source-address-filter {
    mac-address;
    (source-filtering | no-source-filtering);
  }
}
```

Hierarchy Level [edit interfaces ae*x*]

Release Information Statement introduced before Junos OS Release 7.4.

Description Configure aggregated Ethernet-specific interface properties.

The statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- *Ethernet Interfaces Overview*

logical-interface-chassis-redundancy (MX Series Virtual Chassis)

Syntax logical-interface-chassis-redundancy;

Hierarchy Level [edit interfaces ae*number* aggregated-ether-options]

Release Information Statement introduced in Junos OS Release 13.2.

Description For member routers in an MX Series Virtual Chassis, provide chassis redundancy for IP demultiplexing (demux) and VLAN demux subscriber interfaces in aggregated Ethernet bundles configured with targeted distribution. With chassis redundancy, the router assigns the backup link in the aggregated Ethernet bundle to an MPC/MIC module in a member router *other* than the router on which the primary link resides.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Configuring Chassis Redundancy for a Virtual Chassis on page 62

logical-interface-fpc-redundancy (Aggregated Ethernet Subscriber Interfaces)

Syntax logical-interface-fpc-redundancy;

Hierarchy Level [edit interfaces ae*number* aggregated-ether-options]

Release Information Statement introduced in Junos OS Release 11.2.

Description Provide module redundancy for demux subscribers on aggregated Ethernet bundles configured with targeted distribution. Backup links for a subscriber are chosen on a different EQ DPC or MPC from the primary link, based on the link with the fewest number of subscribers among the links on different modules. If all links are on a single module when this is configured, backup links are not provisioned.

By default, link redundancy is provided for the aggregated Ethernet bundle.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring Link and Module Redundancy for Demux Subscribers in an Aggregated Ethernet Interface*
- Configuring Module Redundancy for a Virtual Chassis on page 61

member (MX Series Virtual Chassis)

Syntax

```
member member-id {
  role (routing-engine | line-card);
  serial-number serial-number;
}
```

Hierarchy Level [edit virtual-chassis]

Release Information Statement introduced in Junos OS Release 11.2.

Description Configure an MX Series router as a member of a Virtual Chassis configuration. You can configure a maximum of two member routers in an MX Series Virtual Chassis.

Options

member-id—Numeric value that identifies a member router in a Virtual Chassis configuration.

Values: 0 or 1

The remaining statements are explained separately.

Required Privilege Level

routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

network-services

Syntax network-services (ethernet | enhanced-ethernet | ip | enhanced-ip);

Hierarchy Level [edit chassis]

Release Information Statement introduced before Junos OS Release 8.5.
Options **enhanced-ethernet** and **enhanced-ip** introduced in Junos OS Release 11.4.

Description Set the router's network services to a specific mode of operation.

Options

ethernet—Set the router's network services to Ethernet and use standard, compiled firewall filter format.

enhanced-ethernet—Set the router's network services to enhanced Ethernet and use enhanced mode capabilities. Only Trio MPCs and MS-DPCs are powered on in the chassis.

ip—Set the router's network services to Internet Protocol and use standard, compiled firewall filter format.

enhanced-ip—Set the router's network services to enhanced Internet Protocol and use enhanced mode capabilities. Only Trio MPCs and MS-DPCs are powered on in the chassis. Non-service DPCs do not work with enhanced network services mode options.

NOTE: Only Multiservices DPCs (MS-DPCs) are powered on with the enhanced network services mode options. No other DPCs function with the enhanced network services mode options.

NOTE: Whenever tunnel interfaces -pe/-pd are created using the MS-DPC instead of the MPC, the interface will not be able to process register messages. The MS-MPC and the MS-DPC have different multicast architecture and they are incompatible if the chassis is configured to "enhanced-ip" mode.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Network Services Mode Overview*
- *Firewall Filters and Enhanced Network Services Mode Overview*
- *Configuring Junos OS to Run a Specific Network Services Mode in MX Series Routers*
- Configuring Enhanced IP Network Services for a Virtual Chassis on page 48

no-split-detection (MX Series Virtual Chassis)

Syntax no-split-detection;

Hierarchy Level [edit virtual-chassis]

Release Information Statement introduced in Junos OS Release 11.2.

Description As part of the preprovisioned configuration for an MX Series Virtual Chassis, disable detection of a split in the Virtual Chassis configuration. By default, split detection in the Virtual Chassis is enabled. To maintain the Virtual Chassis configuration in the event of a failure of one of the two member routers, we recommend that you use the **no-split-detection** statement to disable split detection in Virtual Chassis configurations in which you think the backup router is more likely to fail than the link to the backup router.

BEST PRACTICE: We recommend that you use the **no-split-detection** statement to disable split detection for a two-member MX Series Virtual Chassis configuration if you think the backup router is more likely to fail than the Virtual Chassis port links to the backup router. Configuring redundant Virtual Chassis ports on different line cards in each member router reduces the likelihood that all Virtual Chassis port interfaces to the backup router can fail.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Disabling Split Detection in a Virtual Chassis Configuration on page 60
- Split Detection Behavior in a Virtual Chassis on page 20
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

preprovisioned (MX Series Virtual Chassis)

Syntax preprovisioned;

Hierarchy Level [edit virtual-chassis]

Release Information Statement introduced in Junos OS Release 11.2.

Description Enable creation of a Virtual Chassis by means of a preprovisioned configuration.

To configure a Virtual Chassis consisting of MX Series routers, you must create a preprovisioned configuration on the master router in the Virtual Chassis by specifying the serial number, member ID, and role for each router (member chassis) in the Virtual Chassis. When a new member router joins the Virtual Chassis, its serial number is compared against the values specified in the preprovisioned configuration. If the serial number of a joining router does not match any of the configured serial numbers, the software prevents that router from becoming a member of the Virtual Chassis.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

role (MX Series Virtual Chassis)

Syntax role (routing-engine | line-card);

Hierarchy Level [edit virtual-chassis member *member-id*]

Release Information Statement introduced in Junos OS Release 11.2.

Description As part of the preprovisioned configuration for an MX Series Virtual Chassis, assign the role to be performed by each member router in the Virtual Chassis. The preprovisioned configuration permanently associates the member ID and role with the member router's chassis serial number.

Options

routing-engine—Enable the member router to function as the master router or backup router of the Virtual Chassis configuration. The master router maintains the global configuration and state information for both members of the Virtual Chassis, and runs the chassis management processes. The backup router synchronizes with the master router and relays chassis control information, such as line-card presence and alarms, to the master router. If the master router is unavailable, the backup router takes mastership of the Virtual Chassis to preserve routing information and maintain network connectivity without disruption. You must assign the **routing-engine** role to both members of the Virtual Chassis. When the Virtual Chassis is formed, the software runs a mastership election algorithm to determine which of the two member routers functions as the master router and which functions as the backup router of the Virtual Chassis.

line-card—Explicitly configuring a member router with the **line-card** role is *not supported* in the current release. However, when split detection is enabled (the default behavior for a Virtual Chassis) and either the Virtual Chassis ports go down or the backup router fails, the master router takes a **line-card** role. The **line-card** role effectively removes the former master router from the Virtual Chassis configuration until connectivity is restored.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65
- Virtual Chassis Components Overview on page 5
- Global Roles and Local Roles in a Virtual Chassis on page 13
- Split Detection Behavior in a Virtual Chassis on page 20

serial-number (MX Series Virtual Chassis)

Syntax serial-number *serial-number*;

Hierarchy Level [edit virtual-chassis member *member-id*]

Release Information Statement introduced in Junos OS Release 11.2.

Description As part of the preprovisioned configuration for an MX Series Virtual Chassis, specify the chassis serial number of each MX Series member router in the Virtual Chassis configuration. If you do not correctly specify a router's serial number in the preprovisioned configuration, the software does not recognize that router as a member of the Virtual Chassis.

Options ***serial-number***—Alphanumeric string that represents the chassis serial number of each member router in the Virtual Chassis configuration. The chassis serial number is located on a label affixed to the side of the MX Series chassis. You can also obtain the router's chassis serial number by issuing the **show chassis hardware** command.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

targeted-distribution (Static Interfaces over Aggregated Ethernet)

Syntax targeted-distribution;

Hierarchy Level [edit interfaces demux0 unit *logical-unit-number*],
[edit interfaces pp0 unit *logical-unit-number*]

Release Information Statement introduced in Junos OS Release 11.2.

Description Configure egress data for a logical interface to be sent across a single member link in an aggregated Ethernet bundle. A backup link is provisioned with CoS scheduling resources in the event that the primary assigned link goes down. The aggregated Ethernet interface must be configured without link protection.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *CoS for PPPoE Subscriber Interfaces Overview*
- *Configuring the Distribution Type for PPPoE Subscribers on Aggregated Ethernet Interfaces*
- *Verifying the Distribution of PPPoE Subscribers in an Aggregated Ethernet Interface*
- Targeted Traffic Distribution on Aggregated Ethernet Interfaces in a Virtual Chassis on page 24
- Configuring Module Redundancy for a Virtual Chassis on page 61
- Configuring Chassis Redundancy for a Virtual Chassis on page 62

traceoptions (MX Series Virtual Chassis)

Syntax

```
traceoptions {
  file filename <files number> <match regular-expression> <no-stamp> <replace> <size
    maximum-file-size> <world-readable | no-world-readable>;
  flag flag <detail> <disable> <receive> <send>;
}
```

Hierarchy Level [edit virtual-chassis]

Release Information Statement introduced in Junos OS Release 11.2.

Description Define tracing operations for the MX Series Virtual Chassis configuration.

Default Tracing operations are disabled.

Options

detail—(Optional) Generate detailed trace information for a flag.

disable—(Optional) Disable a flag.

file *filename*—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory **/var/log**.

files *number*—(Optional) Maximum number of trace files. When a trace file named **trace-file** reaches its maximum size, it is renamed **trace-file.0**, then **trace-file.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size with the **size** option.

Range: 2 through 1000

Default: 3 files

flag *flag*—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. You can include the following flags:

- **all**—All tracing operations.
- **auto-configuration**—Trace Virtual Chassis ports that have been automatically configured.
- **csn**—Trace Virtual Chassis complete sequence number (CSN) packets.
- **error**—Trace Virtual Chassis errored packets.
- **graceful-restart**—Trace Virtual Chassis graceful restart events.
- **hello**—Trace Virtual Chassis hello packets.
- **krt**—Trace Virtual Chassis kernel routing table (KRT) events.
- **lsp**—Trace Virtual Chassis link-state packets.
- **lsp-generation**—Trace Virtual Chassis link-state packet generation.
- **me**—Trace Virtual Chassis mastership election (ME) events.

- **normal**—Trace normal events.
- **packets**—Trace Virtual Chassis packets.
- **parse**—Trace reading of the configuration.
- **psn**—Trace partial sequence number (PSN) packets.
- **route**—Trace Virtual Chassis routing information.
- **spf**—Trace Virtual Chassis shortest-path-first (SPF) events.
- **state**—Trace Virtual Chassis state transitions.
- **task**—Trace Virtual Chassis task operations.

match ***regular-expression***—(Optional) Refine the output to include lines that contain the regular expression.

no-stamp—(Optional) Do not place a timestamp on any trace file.

no-world-readable—(Optional) Restrict file access to the user who created the file.

receive—(Optional) Trace received packets.

replace—(Optional) Replace a trace file instead of appending information to it.

send—(Optional) Trace transmitted packets.

size ***maximum-file-size***—(Optional) Maximum size of each trace file. By default, the number entered is treated as bytes. Alternatively, you can include a suffix to the number to indicate kilobytes (KB), megabytes (MB), or gigabytes (GB). If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option.

Syntax: ***size*****k** to specify KB, ***size*****m** to specify MB, or ***size*****g** to specify GB

Range: 10240 through 1073741824

world-readable—(Optional) Enable unrestricted file access.

Required Privilege Level

routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers on page 196
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

virtual-chassis (MX Series Virtual Chassis)

Syntax

```
virtual-chassis {
  member member-id {
    role (routing-engine | line-card);
    serial-number serial-number;
  }
  no-split-detection;
  preprovisioned;
  traceoptions {
    file filename <files number> <match regular-expression> <no-stamp> <replace> <size
      maximum-file-size> <world-readable | no-world-readable>;
    flag flag <detail> <disable> <receive> <send>;
  }
}
```

Hierarchy Level [edit]

Release Information Statement introduced in Junos OS Release 11.2.

Description Create a Virtual Chassis configuration for MX Series routers.

The remaining statements are explained separately.

Required Privilege Level
routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

PART 3

Administration

CHAPTER 8

Administrative Tasks

Accessing the Virtual Chassis Through the Management Interface

The management Ethernet interface (**fxp0**) on an MX Series router is an out-of-band management interface, also referred to as a management port, that enables you to use Telnet or SSH to access and manage the router remotely. You typically configure the management interface with an IP address and prefix length when you first install Junos OS.

You can configure a management Ethernet interface in one of two ways to access an MX Series Virtual Chassis:

- To access the Virtual Chassis as a whole, configure a consistent IP address for the management interface using the **master-only** option. You can use this management IP address to consistently access the master (primary) Routing Engine in the master router (protocol master) for the Virtual Chassis.
- To access a specific Routing Engine in an individual member router of the Virtual Chassis, configure an IP address for one of the following MX Series Virtual Chassis configuration groups:
  - **member0-re0**
  - **member0-re1**
  - **member1-re0**
  - **member1-re1**

BEST PRACTICE: For most management tasks, we recommend that you access the Virtual Chassis as a whole through a consistent management IP address. For troubleshooting purposes, however, accessing a specific Routing Engine in an individual member router may be useful.

To access an MX Series Virtual Chassis through the management Ethernet interface, do one of the following:

- Configure a consistent management IP address that accesses the entire Virtual Chassis through the master Routing Engine in the Virtual Chassis master router.

  ```
  {master:member0-re0}[edit]
  user@host# set interfaces fxp0 unit 0 family inet address ip-address/prefix-length
    master-only
  ```

  For example, to access the entire Virtual Chassis via management IP address **10.4.5.33/16**:

  ```
  {master:member0-re0}[edit]
  user@host# set interfaces fxp0 unit 0 family inet address 10.4.5.33/16 master-only
  ```

- Configure a management IP address that accesses a specified Routing Engine in an individual member router in the Virtual Chassis.

  ```
  {master:member0-re0}[edit groups]
  ```

```
user@host# set membern-ren interfaces fxp0 unit 0 family inet address
  ip-address/prefix-length
```

For example, to access the Routing Engine installed in slot 1 of member router 1 (**member1-re1**) in the Virtual Chassis:

```
{master:member0-re0}[edit groups]
user@host# set member1-re1 interfaces fxp0 unit 0 family inet address 10.4.3.145/32
```

Related Documentation

- *Configuring a Consistent Management IP Address*

Managing Files on Virtual Chassis Member Routers

In a Virtual Chassis configuration for MX Series 3D Universal Edge Routers, you can manage files on local and remote member routers by including a member specification in the following **file** operational commands:

file archive	**file copy**
file checksum md5	**file delete**
file checksum sha1	**file list**
file checksum sha-256	**file rename**
file compare	**file show**

The member specification identifies the specific Virtual Chassis member router and Routing Engine on which you want to manage files, and includes both of the following elements:

- The Virtual Chassis member ID (**0** or **1**)
- The Routing Engine slot number (**re0** or **re1**)

To manage files on a specific member router and a specific Routing Engine in an MX Series Virtual Chassis:

- From operational mode, issue the **file** command and Virtual Chassis member specification:

  ```
  {master:member0-re0}
  user@host> file option member(0 | 1)-re(0 | 1):command-option
  ```

  For example, the following **file list** command uses the **member1-re0** specification to display a list of the files in the **/config** directory on the Routing Engine in slot 0 (**re0**) in Virtual Chassis **member 1**. The router forwards the command from **member 0**, where it is issued, to **member 1**, and displays the results as if the command were processed on the local router.

  ```
  {master:member0-re0}
  user@host> file list member1-re0:/config
  ```

```
member1-re0:
--------------------------------------------------------------------------

/config:
.snap/
juniper.conf.1.gz
juniper.conf.2.gz
juniper.conf.3.gz
juniper.conf.gz
juniper.conf.md5
license/
license.old/
usage.db
vchassis/
```

Related Documentation

- Interchassis Redundancy and Virtual Chassis Overview on page 3
- Virtual Chassis Components Overview on page 5
- *Format for Specifying Filenames and URLs in Junos OS CLI Commands*

Command Forwarding in a Virtual Chassis

You can run some CLI commands on all member routers, on the local member router, or on a specific member router in an MX Series Virtual Chassis configuration. This feature is referred to as *command forwarding*. With command forwarding, the router sends the command to the specified member router or routers, and displays the results as if the command were processed on the local router.

For example, to collect information about your system prior to contacting Juniper Networks Technical Assistance Center (JTAC), use the command **request support information all-members** to gather data for all the member routers. If you want to gather this data only for a particular member router, use the command **request support information member *member-id***.

Table 14 on page 134 describes the commands that you can run on all (both) member routers (with the **all-members** option), on the local member router (with the **local** option), or on a specific member router (with the **member *member-id*** option) in an MX Series Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis

Command	Purpose	all-members	local	member *member-id*
request chassis fpc	Control the operation of the Flexible PIC Concentrator (FPC).	Change FPC status of all members of the Virtual Chassis configuration.	(Default) Change FPC status of the local Virtual Chassis member.	Change FPC status of the specified member of the Virtual Chassis configuration.
request chassis fpm resync	Resynchronize the craft interface status.	Resynchronize the craft interface status on all members of the Virtual Chassis configuration.	(Default) Resynchronize the craft interface status on the local Virtual Chassis member.	Resynchronize the craft interface status on the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
request chassis routing-engine master	Control which Routing Engine is the master for a router with dual Routing Engines.	Control Routing Engine mastership on the Routing Engines in all member routers of the Virtual Chassis configuration.	(Default) Control Routing Engine mastership on the Routing Engines in the local Virtual Chassis configuration.	Control Routing Engine mastership on the Routing Engines of the specified member in the Virtual Chassis configuration.
request routing-engine login	Specify a **tty** connection for login for a router with two Routing Engines.	Log in to all members of the Virtual Chassis configuration.	(Default) Log in to the local Virtual Chassis member.	Log in to the specified member of the Virtual Chassis configuration.
request support information	Display information about the system.	(Default) Display system information for all members of the Virtual Chassis configuration.	Display system information for the local Virtual Chassis member.	Display system information for the specified member of the Virtual Chassis configuration.
request system halt	Stop the router.	(Default) Halt all members of the Virtual Chassis configuration.	Halt the local Virtual Chassis member.	Halt the specified member of the Virtual Chassis configuration.
request system partition abort	Terminate a previously scheduled storage media partition operation.	(Default) Abort a previously scheduled storage media partition operation for all members of the Virtual Chassis configuration.	Abort a previously scheduled storage media partition operation for the local Virtual Chassis member.	Abort a previously scheduled storage media partition operation for the specified member of the Virtual Chassis member.
request system partition hard-disk	Set up the hard disk for partitioning.	(Default) Schedule a partition of the hard disk for all members of the Virtual Chassis configuration.	Schedule a partition of the hard disk for the local Virtual Chassis member.	Schedule a partition of the hard disk for the specified member of the Virtual Chassis configuration.
request system power-off	Power off the software.	(Default) Power off all members of the Virtual Chassis configuration.	Power off the local Virtual Chassis member.	Power off the specified member of the Virtual Chassis configuration.
request system reboot	Reboot the software.	(Default) Reboot the software on all members of the Virtual Chassis configuration.	Reboot the software on the local Virtual Chassis member.	Reboot the software on the specified member of the Virtual Chassis configuration.
request system snapshot	Back up the currently running and active file system partitions on the router to standby partitions that are not running.	(Default) Archive data and executable areas for all members of the Virtual Chassis configuration.	Archive data and executable areas for the local Virtual Chassis member.	Archive data and executable areas for the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
request system software add	Install a software package or bundle on the router.	(Default if no options specified) Install a software package on all members of the Virtual Chassis configuration.	—	Install a software package on the specified member of the Virtual Chassis configuration.
request system software rollback	Revert to the software that was loaded at the last successful **request system software add** command.	(Default) Attempt to roll back to the previous set of packages on all members of the Virtual Chassis configuration.	Attempt to roll back to the previous set of packages on the local Virtual Chassis member.	Attempt to roll back to the previous set of packages on the specified member of the Virtual Chassis configuration.
request system software validate	Validate candidate software against the current configuration of the router.	—	(Default if no options specified) Validate the software package on the local Virtual Chassis member.	Validate the software bundle or package on the specified member of the Virtual Chassis configuration.
request system storage cleanup	Free storage space on the router or switch by rotating log files and proposing a list of files for deletion.	(Default) Delete files on all members of the Virtual Chassis configuration.	Delete files on the local Virtual Chassis member.	Delete files on the specified member of the Virtual Chassis configuration.
restart	Restart a Junos OS process.	Restart the software process for all members of the Virtual Chassis configuration.	(Default) Restart the software process for the local Virtual Chassis member.	Restart the software process for a specified member of the Virtual Chassis configuration.
show chassis alarms	Display information about the conditions that have been configured to trigger alarms.	(Default) Display information about alarm conditions for all the member routers of the Virtual Chassis configuration.	Display information about alarm conditions for the local Virtual Chassis member.	Display information about alarm conditions for the specified member of the Virtual Chassis configuration.
show chassis craft-interface	View messages currently displayed on the craft interface.	(Default) Display information currently on the craft interface for all members of the Virtual Chassis configuration.	Display information currently on the craft interface for the specified member of the Virtual Chassis configuration.	Display information currently on the craft interface for the specified member of the Virtual Chassis configuration.
show chassis environment	Display environmental information about the router or switch chassis, including the temperature and information about the fans, power supplies, and Routing Engine.	(Default) Display chassis environmental information for all the members of the Virtual Chassis configuration.	Display chassis environmental information for the local Virtual Chassis member.	Display chassis environmental information for the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
show chassis environment cb	Display environmental information about the Control Boards (CBs).	(Default) Display environmental information about the CBs on all the members of the Virtual Chassis configuration.	Display environmental information about the CBs on the local Virtual Chassis member.	Display environmental information about the CBs on the specified member of the Virtual Chassis configuration.
show chassis environment fpc	Display environmental information about Flexible PIC Concentrators (FPCs).	(Default) Display environmental information for the FPCs in all the members of the Virtual Chassis configuration.	Display environmental information for the FPCs in the local Virtual Chassis member.	Display environmental information for the FPCs in the specified member of the Virtual Chassis configuration.
show chassis environment pem	Display Power Entry Module (PEM) environmental status information.	(Default) Display environmental information about the PEMs in all the member routers of the Virtual Chassis configuration.	Display environmental information about the PEMs in the local Virtual Chassis member.	Display environmental information about the PEMs in the specified member of the Virtual Chassis configuration.
show chassis environment routing-engine	Display Routing Engine environmental status information.	(Default) Display environmental information about the Routing Engines in all member routers in the Virtual Chassis configuration.	Display environmental information about the Routing Engines in the local Virtual Chassis member.	Display environmental information about the Routing Engines in the specified member of the Virtual Chassis configuration.
show chassis ethernet-switch	Display information about the ports on the Control Board (CB) Ethernet switch.	(Default) Display information about the ports on the CB Ethernet switch on all the members of the Virtual Chassis configuration.	Display information about the ports on the CB Ethernet switch on the local Virtual Chassis member.	Display information about the ports on the CB Ethernet switch on the specified member of the Virtual Chassis configuration.
show chassis fabric fpcs	Display the state of the electrical and optical switch fabric links between the Flexible PIC Concentrators (FPCs) and the Switch Interface Boards (SIBs).	(Default) Display the switching fabric link states for the FPCs in all members of the Virtual Chassis configuration.	Display the switching fabric link states for the FPCs in the local Virtual Chassis member.	Display the switching fabric link states for the FPCs in the specified member of the Virtual Chassis configuration.
show chassis fabric map	Display the switching fabric map state.	(Default) Display the switching fabric map state for all the members of the Virtual Chassis configuration.	Display the switching fabric map state for the local Virtual Chassis member.	Display the switching fabric map state for the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
show chassis fabric plane	Display the state of all fabric plane connections.	(Default) Display the state of all fabric plane connections on all members of the Virtual Chassis configuration.	Display the state of all fabric plane connections on the local Virtual Chassis member.	Display the state of all fabric plane connections on the specified member of the Virtual Chassis configuration.
show chassis fabric plane-location	Display the Control Board (CB) location of each plane on both the master and backup Routing Engine.	(Default) Display the CB location of each fabric plane on the Routing Engines in all member routers in the Virtual Chassis configuration.	Display the CB location of each fabric plane on the Routing Engines in the local Virtual Chassis member.	Display the CB location of each fabric plane on the Routing Engines in the specified member in the Virtual Chassis configuration.
show chassis fan	Display information about the fan tray and fans.	(Default) Display information about the fan tray and fans for all members of the Virtual Chassis configuration.	Display information about the fan tray and fans for the local Virtual Chassis member.	Display information about the fan tray and fans for the specified member of the Virtual Chassis configuration.
show chassis firmware	Display the version levels of the firmware running on the System Control Board (SCB), Switching and Forwarding Module (SFM), System and Switch Board (SSB), Forwarding Engine Board (FEB), Flexible PIC Concentrators (FPCs), and Routing Engines.	(Default) Display the version levels of the firmware running for all members of the Virtual Chassis configuration.	Display the version levels of the firmware running for the local Virtual Chassis member.	Display the version levels of the firmware running for the specified member of the Virtual Chassis configuration.
show chassis fpc	Display status information about the installed Flexible PIC Concentrators (FPCs) and PICs.	(Default) Display status information for all FPCs on all members of the Virtual Chassis configuration.	Display status information for all FPCs on the local Virtual Chassis member.	Display status information for all FPCs on the specified member of the Virtual Chassis configuration.
show chassis hardware	Display a list of all Flexible PIC Concentrators (FPCs) and PICs installed in the router or switch chassis, including the hardware version level and serial number.	(Default) Display hardware-specific information for all the members of the Virtual Chassis configuration.	Display hardware-specific information for the local Virtual Chassis member.	Display hardware-specific information for the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
show chassis location	Display the physical location of the chassis.	(Default) Display the physical location of the chassis for all the member routers in the Virtual Chassis configuration.	Display the physical location of the chassis for the local Virtual Chassis member.	Display the physical location of the chassis for the specified member of the Virtual Chassis configuration.
show chassis mac-addresses	Display the media access control (MAC) addresses for the router, switch chassis, or switch.	(Default) Display the MAC addresses for all the member routers of the Virtual Chassis configuration.	Display the MAC addresses for the local Virtual Chassis member.	Display the MAC addresses for the specified member of the Virtual Chassis configuration.
show chassis pic	Display status information about the PIC installed in the specified Flexible PIC Concentrator (FPC) and PIC slot.	(Default) Display PIC information for all member routers in the Virtual Chassis configuration.	Display PIC information for the local Virtual Chassis member.	Display PIC information for the specified member of the Virtual Chassis configuration.
show chassis power	Display power limits and usage information for the AC or DC power sources.	(Default) Display power usage information for all members of the Virtual Chassis configuration.	Display power usage information for the local Virtual Chassis member.	Display power usage information for the specified member of the Virtual Chassis configuration.
show chassis routing-engine	Display the status of the Routing Engine.	(Default) Display Routing Engine information for all members of the Virtual Chassis configuration.	Display Routing Engine information for the local Virtual Chassis member.	Display Routing Engine information for the specified member of the Virtual Chassis configuration.
show chassis temperature-thresholds	Display chassis temperature threshold settings, in degrees Celsius.	(Default) Display the chassis temperature threshold settings of all member routers in the Virtual Chassis configuration.	Display the chassis temperature threshold settings of the local Virtual Chassis member.	Display the chassis temperature threshold settings of the specified member of the Virtual Chassis configuration.
show pfe fpc	Display Packet Forwarding Engine statistics for the specified Flexible PIC Concentrator (FPC).	(Default) Display Packet Forwarding Engine statistics for the specified FPC in all members of the Virtual Chassis configuration.	Display Packet Forwarding Engine statistics for the specified FPC in the local Virtual Chassis member.	Display Packet Forwarding Engine statistics for the specified FPC in the specified member of the Virtual Chassis configuration.
show pfe terse	Display Packet Forwarding Engine status information.	(Default) Display Packet Forwarding Engine status information for all members in the Virtual Chassis configuration.	Display Packet Forwarding Engine status information for the local Virtual Chassis member.	Display Packet Forwarding Engine status information for the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
show system audit	Display the state and checksum values for file systems.	(Default) Display file system MD5 hash and permissions information on all members of the Virtual Chassis configuration.	Display file system MD5 hash and permissions information on the local Virtual Chassis member.	Display file system MD5 hash and permissions information on the specified member of the Virtual Chassis configuration.
show system boot-messages	Display initial messages generated by the system kernel upon startup.	(Default) Display boot time messages on all members of the Virtual Chassis configuration.	Display boot time messages on the local Virtual Chassis member.	Display boot time messages on the specified member of the Virtual Chassis configuration.
show system buffers	Display information about the buffer pool that the Routing Engine uses for local traffic.	(Default) Show buffer statistics for all members of the Virtual Chassis configuration.	Show buffer statistics for the local Virtual Chassis member.	Show buffer statistics for the specified member of the Virtual Chassis configuration.
show system connections	Display information about the active IP sockets on the Routing Engine.	(Default) Display system connection activity for all members of the Virtual Chassis configuration.	Display system connection activity for the local Virtual Chassis member.	Display system connection activity for the specified member of the Virtual Chassis configuration.
show system directory-usage	Display directory usage information.	Display directory information for all members of the Virtual Chassis configuration.	(Default) Display directory information for the local Virtual Chassis member.	Display directory information for the specified member of the Virtual Chassis configuration.
show system processes	Display information about software processes that are running on the router and that have controlling terminals.	(Default) Display standard system process information for all members of the Virtual Chassis configuration.	Display standard system process information for the local Virtual Chassis member.	Display standard system process information for the specified member of the Virtual Chassis configuration.
show system queues	Display queue statistics.	(Default) Display system queue statistics for all members of the Virtual Chassis configuration.	Display system queue statistics for the local Virtual Chassis member.	Display system queue statistics for the specified member of the Virtual Chassis configuration.
show system reboot	Display pending system reboots or halts.	(Default) Display halt or reboot request information for all members of the Virtual Chassis configuration.	Display halt or reboot request information for the local Virtual Chassis member.	Display halt or reboot request information for the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
show system statistics	Display system-wide protocol-related statistics.	(Default) Display system statistics for a protocol for all members of the Virtual Chassis configuration.	Display system statistics for a protocol for the local Virtual Chassis member.	Display system statistics for a protocol for the specified member of the Virtual Chassis configuration.
show system storage	Display statistics about the amount of free disk space in the router's file systems.	(Default) Display system storage statistics for all members of the Virtual Chassis configuration.	Display system storage statistics for the local Virtual Chassis member.	Display system storage statistics for the specified member of the Virtual Chassis configuration.
show system switchover	Display whether graceful Routing Engine switchover is configured, the state of the kernel replication (ready or synchronizing), any replication errors, and whether the primary and standby Routing Engines are using compatible versions of the kernel database.	(Default) Display graceful Routing Engine switchover information for all Routing Engines on all members of the Virtual Chassis configuration.	Display graceful Routing Engines switchover information for all Routing Engines on the local Virtual Chassis member.	Display graceful Routing Engine switchover information for all Routing Engines on the specified member of the Virtual Chassis configuration.
show system uptime	Display the current time and information about how long the router or switch, router or switch software, and routing protocols have been running.	(Default) Show time since the system rebooted and processes started on all members of the Virtual Chassis configuration.	Show time since the system rebooted and processes started on the local Virtual Chassis member.	Show time since the system rebooted and processes started on the specified member of the Virtual Chassis configuration.
show system users	List information about the users who are currently logged in to the router.	(Default) Display users currently logged in to all members of the Virtual Chassis configuration.	Display users currently logged in to the local Virtual Chassis member.	Display users currently logged in to the specified member of the Virtual Chassis configuration.
show system virtual-memory	Display the usage of Junos OS kernel memory listed first by size of allocation and then by type of usage.	(Default) Display kernel dynamic memory usage information for all members of the Virtual Chassis configuration.	Display kernel dynamic memory usage information for the local Virtual Chassis member.	Display kernel dynamic memory usage information for the specified member of the Virtual Chassis configuration.
show version	Display the hostname and version information about the software running on the router.	(Default) Display standard information about the hostname and version of the software running on all members of the Virtual Chassis configuration.	Display standard information about the hostname and version of the software running on the local Virtual Chassis member.	Display standard information about the hostname and version of the software running on the specified member of the Virtual Chassis configuration.

Table 14: Commands Available for Command Forwarding in an MX Series Virtual Chassis *(continued)*

Command	Purpose	all-members	local	member *member-id*
show version invoke-on	Display the hostname and version information about the software running on a router with two Routing Engines.	(Default) Display the hostname and version information about the software running on all master and backup Routing Engines on all members of the Virtual Chassis configuration.	Display the hostname and version information about the software running on all master and backup Routing Engines on the local Virtual Chassis member.	Display the hostname and version information about the software running on all master and backup Routing Engines on the specified member of the Virtual Chassis configuration.

Related Documentation

- Virtual Chassis Components Overview on page 5
- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- *Junos OS Operational Mode Commands*

Virtual Chassis Slot Number Mapping for Use with SNMP

Junos OS supports the use of SNMP to monitor the routers and other devices in your network. For example, the Juniper Networks jnxBoxAnatomy enterprise-specific Chassis MIB contains the jnxFruTable object, which shows the status of field-replaceable units (FRUs) in the chassis. Within the jnxFruTable object, the jnxFruSlot object displays the slot number where the FRU is installed.

If you are using the jnxFruSlot object in jnxFruTable to display the slot numbers of line cards installed in a member router of an MX Series Virtual Chassis, keep in mind that the offset used for slot numbering in an MX Series Virtual Chassis affects the value that appears for the jnxFruSlot object.

Table 15 on page 142 lists the jnxFruSlot number that appears in the jnxFruTable of the jnxBoxAnatomy MIB, and the corresponding line card physical slot number in each member router of a two-member MX Series Virtual Chassis. For example, a jnxFruSlot value of 15 corresponds to physical slot 3 in member 0 of an MX Series Virtual Chassis. A jnxFruSlot value of 30 corresponds to physical slot 6 in member 1 of an MX Series Virtual Chassis.

Table 15: jnxFruSlot Numbers and Corresponding Slot Numbers in an MX Series Virtual Chassis

jnxFruSlot Number	Line Card Slot Number	MX Series Virtual Chassis Member ID
Line Cards in MX Series Virtual Chassis Member ID 0 (offset = 12):		
12	0	0
13	1	0
14	2	0

Table 15: jnxFruSlot Numbers and Corresponding Slot Numbers in an MX Series Virtual Chassis *(continued)*

jnxFruSlot Number	Line Card Slot Number	MX Series Virtual Chassis Member ID
15	3	0
16	4	0
17	5	0
18	6	0
19	7	0
20	8	0
21	9	0
22	10	0
23	11	0
Line Cards in MX Series Virtual Chassis Member ID 1 (offset = 24)		
24	0	1
25	1	1
26	2	1
27	3	1
28	4	1
29	5	1
30	6	1
31	7	1
32	8	1
33	9	1
34	10	1
35	11	1

Related Documentation

- Virtual Chassis Components Overview on page 5
- *SNMP MIBs and Traps Reference*

CHAPTER 9

Monitoring Tasks

Verifying the Status of Virtual Chassis Member Routers

Purpose Verify that the member routers in an MX Series Virtual Chassis are properly configured.

Action Display the status of the members of the Virtual Chassis configuration:

```
user@host> show virtual-chassis status
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Verifying the Operation of Virtual Chassis Ports

Purpose Verify that the Virtual Chassis ports in an MX Series Virtual Chassis are properly configured and operational.

Action

- To display the status of the Virtual Chassis ports for both member routers in the Virtual Chassis:

```
user@host> show virtual-chassis vc-port all-members
```

- To display the status of the Virtual Chassis ports for a specified member router in the Virtual Chassis:

```
user@host> show virtual-chassis vc-port member member-id
```

- To display the status of the Virtual Chassis ports for the member router on which you are issuing the command:

```
user@host> show virtual-chassis vc-port local
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Verifying Neighbor Reachability for Member Routers in a Virtual Chassis

Purpose Verify that each member router in an MX Series Virtual Chassis has a path to reach the neighbor routers to which it is connected.

Action

- To display neighbor reachability information for both member routers in the Virtual Chassis:

```
user@host> show virtual-chassis active-topology all-members
```

- To display neighbor reachability information for a specified member router in the Virtual Chassis:

```
user@host> show virtual-chassis active-topology member member-id
```

- To display neighbor reachability information for the member router on which you are issuing the command:

```
user@host> show virtual-chassis active-topology local
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Verifying Neighbor Reachability for Hardware Devices in a Virtual Chassis

Purpose Verify that each hardware device in a member router in an MX Series Virtual Chassis can reach the neighbor routers and devices to which it is connected. On the MX Series routing platform, there is only one active device for each member router.

Action

- To display neighbor reachability information for the devices in both member routers in the Virtual Chassis:

```
user@host> show virtual-chassis device-topology all-members
```

- To display neighbor reachability information for the device in a specified member router in the Virtual Chassis:

```
user@host> show virtual-chassis device-topology member member-id
```

- To display neighbor reachability information for the device in the member router on which you are issuing the command:

```
user@host> show virtual-chassis device-topology local
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Viewing Information in the Virtual Chassis Control Protocol Adjacency Database

Purpose View information about neighbors in the Virtual Chassis Control Protocol (VCCP) adjacency database for an MX Series Virtual Chassis configuration.

Action

- To display VCCP neighbor adjacency information for both member routers in the Virtual Chassis:

```
user@host> show virtual-chassis protocol adjacency all-members
```

- To display VCCP neighbor adjacency information for a specified member router in the Virtual Chassis:

```
user@host> show virtual-chassis protocol adjacency member member-id
```

- To display VCCP neighbor adjacency information for the device with a specified system ID:

```
user@host> show virtual-chassis protocol adjacency system-id
```

- To display VCCP neighbor adjacency information for the device with a specified system ID on the specified member router:

```
user@host> show virtual-chassis protocol adjacency member member-id system-id
```

- To display VCCP neighbor adjacency information for the member router on which you are issuing the command:

```
user@host> show virtual-chassis protocol adjacency local
```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Viewing Information in the Virtual Chassis Control Protocol Link-State Database

Purpose View information about protocol data unit (PDU) packets in the Virtual Chassis Control Protocol (VCCP) link-state database for an MX Series Virtual Chassis configuration.

Action

- To display VCCP PDU information for both member routers in the Virtual Chassis:

```
user@host> show virtual-chassis protocol database all-members
```

- To display VCCP PDU information for a specified member router in the Virtual Chassis:

  ```
  user@host> show virtual-chassis protocol database member member-id
  ```

- To display VCCP PDU information for the device with a specified system ID:

  ```
  user@host> show virtual-chassis protocol database system-id
  ```

- To display VCCP PDU information for the device with a specified system ID on the specified member router:

  ```
  user@host> show virtual-chassis protocol database member member-id system-id
  ```

- To display VCCP PDU information for the member router on which you are issuing the command:

  ```
  user@host> show virtual-chassis protocol database local
  ```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Viewing Information About Virtual Chassis Port Interfaces in the Virtual Chassis Control Protocol Database

Purpose View information in the Virtual Chassis Control Protocol (VCCP) database about Virtual Chassis port interfaces in an MX Series Virtual Chassis.

Action

- To display VCCP information about Virtual Chassis port interfaces for both member routers:

  ```
  user@host> show virtual-chassis protocol interface all-members
  ```

- To display VCCP information about Virtual Chassis port interfaces for a specified member router:

  ```
  user@host> show virtual-chassis protocol interface member member-id
  ```

- To display VCCP information about a specified Virtual Chassis port interface:

  ```
  user@host> show virtual-chassis protocol interface vcp-slot/pic/port.logical-unit-number
  ```

- To display VCCP information about Virtual Chassis port interfaces for the member router on which you are issuing the command:

  ```
  user@host> show virtual-chassis protocol interface local
  ```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Viewing Virtual Chassis Control Protocol Routing Tables

Purpose View Virtual Chassis Control Protocol (VCCP) unicast and multicast routing tables for an MX Series Virtual Chassis configuration.

Action

- To display the VCCP unicast and multicast routing tables for both member routers in the Virtual Chassis:

  ```
  user@host> show virtual-chassis protocol route all-members
  ```

- To display the VCCP unicast and multicast routing tables for a specified member router in the Virtual Chassis:

  ```
  user@host> show virtual-chassis protocol route member member-id
  ```

- To display the VCCP unicast and multicast routing tables to the destination with the specified system ID:

  ```
  user@host> show virtual-chassis protocol route destination-id
  ```

- To display the VCCP unicast and multicast routing tables to the destination with the specified system ID on the specified member router:

  ```
  user@host> show virtual-chassis protocol route member member-id destination-id
  ```

- To display the VCCP unicast and multicast routing tables for the member router on which you are issuing the command:

  ```
  user@host> show virtual-chassis protocol route local
  ```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Viewing Virtual Chassis Control Protocol Statistics for Member Routers and Virtual Chassis Ports

Purpose View Virtual Chassis Control Protocol (VCCP) statistics for one or both member routers, or for a specified Virtual Chassis port interface, in an MX Series Virtual Chassis configuration.

Action

- To display VCCP statistics for both member routers in the Virtual Chassis:

  ```
  user@host> show virtual-chassis protocol statistics all-members
  ```

- To display VCCP statistics for a specified member router in the Virtual Chassis:

  ```
  user@host> show virtual-chassis protocol statistics member member-id
  ```

- To display VCCP statistics for a specified Virtual Chassis port interface:

  ```
  user@host> show virtual-chassis protocol statistics vcp-slot/pic/port.logical-unit-number
  ```

- To display VCCP statistics for the member router on which you are issuing the command:

  ```
  user@host> show virtual-chassis protocol statistics local
  ```

Related Documentation

- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

CHAPTER 10

Administrative Commands

request virtual-chassis member-id delete (MX Series Virtual Chassis)

Syntax request virtual-chassis member-id delete

Release Information Command introduced in Junos OS Release 11.2.

Description Remove (**delete**) the member ID from an MX Series router that you want to remove from a Virtual Chassis configuration.

NOTE: Issuing the command to remove the member ID causes the router to reboot, and requires you to confirm that you want to proceed with this operation. If you do not confirm the operation, the software cancels the command.

Required Privilege Level system-control

Related Documentation

- Deleting Member IDs in a Virtual Chassis Configuration on page 55
- Example: Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 82

List of Sample Output request virtual-chassis member-id delete on page 152

Sample Output

request virtual-chassis member-id delete

```
user@host> request virtual-chassis member-id delete
This command will disable virtual-chassis mode and reboot the system.

 Continue? [yes,no] (no)
```

request virtual-chassis member-id set (MX Series Virtual Chassis)

Syntax request virtual-chassis member-id set member *member-id*

Release Information Command introduced in Junos OS Release 11.2.

Description Assign (**set**) a member ID to an MX Series router that you want to add as a member of a Virtual Chassis configuration.

NOTE: Issuing the command to assign a member ID causes the router to reboot, and requires you to confirm that you want to proceed with this operation. If you do not confirm the operation, the software cancels the command. After the reboot all MPCs remain powered off until the Virtual Chassis port connection is configured.

Options member *member-id*—Numeric value that identifies a member router in a Virtual Chassis configuration. When you assign a member ID to a router, assign the same member ID defined for this router in the MX Series Virtual Chassis preprovisioned configuration. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level system-control

Related Documentation
- Configuring Member IDs for a Virtual Chassis on page 50
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

List of Sample Output request virtual-chassis member-id set on page 153

Sample Output

request virtual-chassis member-id set

```
user@host> request virtual-chassis member-id set member 0
This command will enable virtual-chassis mode and reboot the system.

 Continue? [yes,no] (no)
```

request virtual-chassis routing-engine master switch (MX Series Virtual Chassis)

Syntax request virtual-chassis routing-engine master switch <check>

Release Information Command introduced in Junos OS Release 11.2.
Option **check** introduced in Junos OS Release 12.2.

Description Change the mastership in an MX Series Virtual Chassis by switching the global roles of the master router and backup router in the Virtual Chassis configuration. The **request virtual-chassis routing-engine master switch** command must be issued from the master router (VC-Mm).

For MX Series routers with dual Routing Engines in a Virtual Chassis, the local roles (master and standby) of the Routing Engines in each member router do not change after you issue the **request virtual-chassis routing-engine master switch** command.

NOTE: Before you issue the **request virtual-chassis routing-engine master switch** command from the master router in the Virtual Chassis, make sure that the system configuration is synchronized between the master router and backup router. If the configuration on the master router and backup router is not synchronized, or if you attempt to issue the **request virtual-chassis routing-engine master switch** command from the backup router instead of from the master router, the router displays an error message and rejects the command.

If you issue the **request virtual-chassis routing-engine master switch** command when the Virtual Chassis is in a transition state (for example, the backup router is disconnecting from the Virtual Chassis), the router does not process the command.

Options **check**—(Optional) Perform a check from the master router in an MX Series Virtual Chassis to determine whether the member routers are ready for GRES from a database synchronization perspective, without initiating the GRES operation itself.

Required Privilege Level system-control

Related Documentation
- Switching the Global Master and Backup Roles in a Virtual Chassis Configuration on page 57
- Determining GRES Readiness in a Virtual Chassis Configuration on page 58
- Mastership Election in a Virtual Chassis on page 16

List of Sample Output request virtual-chassis routing-engine master switch (From Master Router) on page 155

request virtual-chassis routing-engine master switch (Error When Configuration Not Synchronized) on page 155
request virtual-chassis routing-engine master switch (Error When Run from Backup Router) on page 155
request virtual-chassis routing-engine master switch check (Ready for GRES) on page 155
request virtual-chassis routing-engine master switch check (Not Ready for GRES) on page 155

Sample Output

request virtual-chassis routing-engine master switch (From Master Router)

```
{master:member0-re0}

user@host> request virtual-chassis routing-engine master switch
Do you want to continue ? [yes,no] (no)
```

request virtual-chassis routing-engine master switch (Error When Configuration Not Synchronized)

```
{master:member0-re0}

user@host> request virtual-chassis routing-engine master switch
Error: mastership switch request NOT honored, backup not ready
```

request virtual-chassis routing-engine master switch (Error When Run from Backup Router)

```
{backup:member1-re0}

user@host1> request virtual-chassis routing-engine master switch
error: Virtual Chassis member is not the protocol master
```

request virtual-chassis routing-engine master switch check (Ready for GRES)

```
{master:member0-re0}

user@host> request virtual-chassis routing-engine master switch check
{master:member0-re0}
```

request virtual-chassis routing-engine master switch check (Not Ready for GRES)

```
{master:member0-re0}

user@host> request virtual-chassis routing-engine master switch check
error: chassisd Not ready for mastership switch, try after 217 secs.
mastership switch request NOT honored, backup not ready
```

request virtual-chassis vc-port delete (MX Series Virtual Chassis)

Syntax request virtual-chassis vc-port delete fpc-slot *fpc-slot-number* pic-slot *pic-slot-number* port *port-number*
<(local | member *member-id*)>

Release Information Command introduced in Junos OS Release 11.2.

Description Remove (**delete**) a Virtual Chassis port from a member router in an MX Series Virtual Chassis configuration. After a Virtual Chassis port is created, it is renamed **vcp-*slot/pic/port***, and is no longer available for configuration as a standard network port. After you remove a Virtual Chassis port, it becomes available to the global configuration and can again function as a standard network port.

NOTE: If the member ID has not been set on the router where you issue the **request virtual-chassis vc-port delete** command, the software prevents the removal of the Virtual Chassis port on the router. To set the member ID, use the request virtual-chassis member-id set command.

Options

fpc-slot *fpc-slot-number*—Number of the Flexible PIC Concentrator (FPC) slot on which the Virtual Chassis port resides. The slot number corresponds to the Modular Port Concentrator (MPC) slot number. Replace ***fpc-slot-number*** with a value appropriate for your router:

- MX960 router—0 through 11.
- MX480 router—0 through 5.
- MX240 router—0 through 2.

pic-slot *pic-slot-number*—Number of the PIC slot on which the Virtual Chassis port resides. Replace ***pic-slot-number*** with a value in the range 0 through 3.

port *port-number*—Number of the port on the PIC on which the Virtual Chassis port resides. Replace ***port-number*** with a value appropriate for your PIC.

local—(Optional) Delete the Virtual Chassis port on the member router on which you are issuing the command. This is the default behavior if you do not specify the **local** or **member** options.

member *member-id*—(Optional) Numeric value that identifies the remote Virtual Chassis member on which you want to delete the Virtual Chassis port. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level system-control

Related Documentation

- Deleting Virtual Chassis Ports in a Virtual Chassis Configuration on page 54
- Example: Deleting a Virtual Chassis Configuration for MX Series 3D Universal Edge Routers on page 82

List of Sample Output request virtual-chassis vc-port delete (Remove vcp-3/2/1) on page 157

Sample Output

request virtual-chassis vc-port delete (Remove vcp-3/2/1)

```
user@host> request virtual-chassis vc-port delete fpc-slot 3 pic-slot 2 port 1
vc-port successfully deleted
```

request virtual-chassis vc-port set (MX Series Virtual Chassis)

Syntax request virtual-chassis vc-port set fpc-slot *fpc-slot-number* pic-slot *pic-slot-number* port *port-number*
<(local | member *member-id*)>

Release Information Command introduced in Junos OS Release 11.2.

Description Create (**set**) a Virtual Chassis port on an MX Series router through which the router connects to other member routers in the Virtual Chassis. You can create Virtual Chassis ports only on Trio Modular Port Concentrator/Modular Interface Card (MPC/MIC) network ports on MX Series routers.

After a Virtual Chassis port is created, it is renamed **vcp-*slot/pic/port***, and is no longer available for configuration as a standard network port. Virtual Chassis ports can be used only to interconnect the MX Series routers in the Virtual Chassis.

NOTE: If the member ID has not been set on the router where you issue the **request virtual-chassis vc-port set** command, the software prevents the creation of the Virtual Chassis port on the router. To set the member ID, use the request virtual-chassis member-id set command.

Options **fpc-slot *fpc-slot-number***—Number of the Flexible PIC Concentrator (FPC) slot on which the Virtual Chassis port resides. The slot number corresponds to the Modular Port Concentrator (MPC) slot number. Replace ***fpc-slot-number*** with a value appropriate for your router:

- MX960 router—0 through 11.
- MX480 router—0 through 5.
- MX240 router—0 through 2.

When you issue the **show interfaces** command on a member router in an MX Series Virtual Chassis, the FPC slot number displayed in the command output reflects the FPC slot numbering and offset used in the Virtual Chassis instead of the physical slot number where the FPC is actually installed. The router with member ID 0 in the Virtual Chassis uses FPC slot numbers 0 through 11 with no offset, and the router with member ID 1 uses FPC slot numbers 12 through 23, with an offset of 12. For example, a 10-Gigabit Ethernet interface that appears as **xe-14/2/2** (FPC slot 14, PIC slot 2, port 2) in the **show interfaces** command is actually interface **xe-2/2/2** (FPC slot 2, PIC slot 2, port 2) on member ID 1 after deducting the FPC slot numbering offset of 12 for member ID 1.

pic-slot *pic-slot-number*—Number of the PIC slot on which the Virtual Chassis port resides. Replace ***pic-slot-number*** with a value in the range 0 through 3.

port *port-number*—Number of the port on the PIC on which the Virtual Chassis port resides. Replace ***port-number*** with a value appropriate for your PIC.

local—(Optional) Set the Virtual Chassis port on the member router on which you are issuing the command. This is the default behavior if you do not specify the **local** or **member** options.

member *member-id*—(Optional) Numeric value that identifies the remote Virtual Chassis member on which you want to create the Virtual Chassis port. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level system-control

Related Documentation

- Configuring Virtual Chassis Ports to Interconnect Member Routers on page 52
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65
- Guidelines for Configuring Virtual Chassis Ports on page 10

List of Sample Output

Sample Output

request virtual-chassis vc-port set (No Existing Network Port)

```
user@host> request virtual-chassis vc-port set fpc-slot 1 pic-slot 1 port 0
vc-port successfully set
```

request virtual-chassis vc-port set (Existing Network Port Converted)

```
user@host> request virtual-chassis vc-port set fpc-slot 2 pic-slot 1 port 1
Port conversion initiated, use “show virtual chassis vc-port” to verify
```

request virtual-chassis vc-port set (On Local Router)

```
user@host> request virtual-chassis vc-port set fpc-slot 2 pic-slot 1 port 3 local
vc-port successfully set
```

request virtual-chassis vc-port set (On Remote Member Router 1)

```
user@host> request virtual-chassis vc-port set fpc-slot 5 pic-slot 3 port 10 member 1
vc-port successfully set
```


CHAPTER 11

Monitoring Commands

show chassis network services

Syntax show chassis network services

Release Information Command introduced in Junos OS Release 9.4.
Command introduced in Junos OS Release 12.3 for MX2010 3D Universal Edge Routers.
Command introduced in Junos OS Release 12.3 for MX2020 3D Universal Edge Routers.
Command introduced in Junos OS Release 13.2 for MX104 3D Universal Edge Routers.

Description Display the network services mode that the router is configured to run in—IP Network Services mode, Ethernet Network Services mode, Enhanced IP Network Services mode, or Enhanced Ethernet Network Services mode.

Options This command has no options.

Required Privilege Level view

List of Sample Output
show chassis network services on page 163
show chassis network services (MX104 Router) on page 163
show chassis network services (MX2010 Router) on page 163
show chassis network services (MX2020 Router) on page 163

Output Fields Table 16 on page 162 lists the output fields for the **show chassis network services** command. Output fields are listed in the approximate order in which they appear.

Table 16: show chassis network services Output Fields

Field Name	Field Description
Network Services Mode	Network services mode configured for the MX Series router: • **IP**—IP Network Services mode. • **Ethernet**—Ethernet Network Services mode. • **enhanced-ip**—Enhanced IP Network Services mode • **enhanced-ethernet**—Enhanced Ethernet Network Services mode

Sample Output

show chassis network services

```
user@host> show chassis network services
Network Services Mode: IP
```

show chassis network services (MX104 Router)

```
user@host> show chassis network services
Network Services Mode: IP
```

show chassis network services (MX2010 Router)

```
user@host> show chassis network services
Network Services Mode: Enhanced-IP
```

show chassis network services (MX2020 Router)

```
user@host> show chassis network services
Network Services Mode: Enhanced-IP
```

show virtual-chassis active-topology (MX Series Virtual Chassis)

Syntax show virtual-chassis active-topology
<(all-members | local | member *member-id*)>

Release Information Command introduced in Junos OS Release 11.2.

Description Display information about neighbor reachability from each member router in an MX Series Virtual Chassis configuration. You can issue the **show virtual-chassis active-topology** command from the console of either member router in the Virtual Chassis.

Options

all-members—(Optional) Display neighbor reachability information for both member routers in a Virtual Chassis configuration. This is the default behavior if no options are specified.

local—(Optional) Display neighbor reachability information for the member router on which you are issuing the command.

member *member-id*—(Optional) Display neighbor reachability information for the specified Virtual Chassis member router. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level view

Related Documentation

- Verifying Neighbor Reachability for Member Routers in a Virtual Chassis on page 146

List of Sample Output

show virtual-chassis active-topology all-members on page 165
show virtual-chassis active-topology local on page 165
show virtual-chassis active-topology member 1 on page 165

Output Fields Table 17 on page 164 lists the output fields for the **show virtual-chassis active-topology** command. Output fields are listed in the approximate order in which they appear.

Table 17: show virtual-chassis active-topology Output Fields

Field Name	Field Description
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.
Destination ID	Member ID of the destination (neighbor) router.
Next-hop	Member ID and Virtual Chassis port interface (in the format **vcp-*slot/pic/port.logical-unit-number***) of the next-hop to which the router forwards packets for the destination ID.

Sample Output

show virtual-chassis active-topology all-members

```
{master:member0-re0}

user@host> show virtual-chassis active-topology all-members
member0:
--------------------------------------------------------------------------
  Destination ID        Next-hop

  1                     1(vcp-5/0/0.32768)

member1:
--------------------------------------------------------------------------
  Destination ID        Next-hop

  0                     0(vcp-1/3/0.32768)
```

show virtual-chassis active-topology local

```
{master:member0-re0}

user@host> show virtual-chassis active-topology local

  Destination ID        Next-hop

  1                     1(vcp-5/0/0.32768)
```

show virtual-chassis active-topology member 1

```
{master:member0-re0}

user@host> show virtual-chassis active-topology member 1
member1:
--------------------------------------------------------------------------
  Destination ID        Next-hop

  0                     0(vcp-1/3/0.32768)
```

show virtual-chassis device-topology (MX Series Virtual Chassis)

Syntax show virtual-chassis device-topology
<(all-members | local | member *member-id*)>

Release Information Command introduced in Junos OS Release 11.2.

Description Display information about neighbor reachability for each hardware device in an MX Series Virtual Chassis configuration. On the MX Series router, there is only one active device for each member router. You can issue the **show virtual-chassis device-topology** command from the console of either member router in the Virtual Chassis.

Options

all-members—(Optional) Display neighbor reachability information for the device in both member routers in a Virtual Chassis configuration.

local—(Optional) Display neighbor reachability information for the device in the member router on which you are issuing the command. This is the default behavior if no options are specified.

member *member-id*—(Optional) Display neighbor reachability information for the device in the specified Virtual Chassis member router. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level view

Related Documentation

- Verifying Neighbor Reachability for Hardware Devices in a Virtual Chassis on page 146

List of Sample Output

show virtual-chassis device-topology all-members on page 167
show virtual-chassis device-topology local on page 167
show virtual-chassis device-topology member 1 on page 167

Output Fields Table 18 on page 166 lists the output fields for the **show virtual-chassis device-topology** command. Output fields are listed in the approximate order in which they appear.

Table 18: show virtual-chassis device-topology Output Fields

Field Name	Field Description
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.
Member	Identifier assigned to the member router in the preprovisioned Virtual Chassis configuration.
Device	Identifier assigned to the device in the member router. Because there is only one active device per member router in an MX Series Virtual Chassis configuration, the values in the Device and Member fields are identical.

Table 18: show virtual-chassis device-topology Output Fields *(continued)*

Field Name	Field Description
Status	Status of the device: • **Prsnt**—Device is currently connected to the Virtual Chassis. • **NotPrsnt**—Device is not currently connected to the Virtual Chassis.
System ID	Unique identifier derived from the device's media access control (MAC) address. The System ID is included in each Virtual Chassis Control Protocol (VCCP) packet to identify the packet owner to all members of the Virtual Chassis.
Neighbor List Member/Device/Interface	Member IDs, Device IDs, and Virtual Chassis port interfaces (in the format **vcp-*slot/pic/port***) to which this device is connected.

Sample Output

show virtual-chassis device-topology all-members

```
{master:member0-re0}

user@host> show virtual-chassis device-topology all-members
member0:
--------------------------------------------------------------------------
                                                Neighbor List
Member  Device  Status   System ID         Member  Device  Interface
   0       0    Prsnt    b0c6.9abf.6800       1       1    vcp-5/0/0
   1       1    Prsnt    001d.b510.0800       0       0    vcp-1/3/0

member1:
--------------------------------------------------------------------------
                                                Neighbor List
Member  Device  Status   System ID         Member  Device  Interface
   0       0    Prsnt    b0c6.9abf.6800       1       1    vcp-5/0/0
   1       1    Prsnt    001d.b510.0800       0       0    vcp-1/3/0
```

show virtual-chassis device-topology local

```
{master:member0-re0}

user@host> show virtual-chassis device-topology local

                                                Neighbor List
Member  Device  Status   System ID         Member  Device  Interface
   0       0    Prsnt    b0c6.9abf.6800       1       1    vcp-5/0/0
   1       1    Prsnt    001d.b510.0800       0       0    vcp-1/3/0
```

show virtual-chassis device-topology member 1

```
{master:member0-re0}

user@host> show virtual-chassis device-topology member 1
member1:
--------------------------------------------------------------------------
                                                Neighbor List
Member  Device  Status   System ID         Member  Device  Interface
   0       0    Prsnt    b0c6.9abf.6800       1       1    vcp-5/0/0
   1       1    Prsnt    001d.b510.0800       0       0    vcp-1/3/0
```

show virtual-chassis protocol adjacency (MX Series Virtual Chassis)

Syntax

show virtual-chassis protocol adjacency
<(brief | detail | extensive)>
<(all-members | local | member *member-id*)>
<*system-id*>

Release Information

Command introduced in Junos OS Release 11.2.

Description

Display the entries (neighbors) in the Virtual Chassis Control Protocol (VCCP) adjacency database for an MX Series Virtual Chassis configuration. You can issue the **show virtual-chassis protocol adjacency** command from the console of either member router in the Virtual Chassis.

Options

brief | detail | extensive—(Optional) Display the specified level of output. Using the **brief** option is equivalent to issuing the command with no options (the default). The **detail** option provides more output than the **brief** option. The **extensive** option provides complete output and is most useful for customer support personnel.

all-members—(Optional) Display the VCCP adjacency database for both member routers in a Virtual Chassis. This is the default behavior if no options are specified.

local—(Optional) Display the VCCP adjacency database for the member router on which you are issuing the command.

member *member-id*—(Optional) Display the VCCP adjacency database for the specified member router. Replace ***member-id*** with the value 0 or 1.

system-id—(Optional) Display the VCCP adjacency database for the device with the specified system ID.

Required Privilege Level

view

Related Documentation

- Viewing Information in the Virtual Chassis Control Protocol Adjacency Database on page 147

List of Sample Output

show virtual-chassis protocol adjacency all-members brief on page 171
show virtual-chassis protocol adjacency member 0 detail on page 171
show virtual-chassis protocol adjacency member 0 detail 001d.b510.0800 on page 171
show virtual-chassis protocol adjacency local extensive on page 171

Output Fields

Table 19 on page 168 lists the output fields for the **show virtual-chassis protocol adjacency** command. Output fields are listed in the approximate order in which they appear.

Table 19: show virtual-chassis protocol adjacency Output Fields

Field Name	Field Description	Level of Output
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.	All levels

Table 19: show virtual-chassis protocol adjacency Output Fields *(continued)*

Field Name	Field Description	Level of Output
Interface	Name of the Virtual Chassis port interface, in the format **vcp-*slot/pic/port.logical-unit-number***.	**brief**
System	System ID of the device associated with the Virtual Chassis port interface. The System ID is derived from the device's media access control (MAC) address.	**brief**
State	State of the adjacency: • **Up**—The adjacency is up. • **Down**—The adjacency is down.	All levels
Hold (secs)	Remaining hold time of the adjacency, in seconds.	**brief**
system-id	System ID of the device associated with the Virtual Chassis port interface. The System ID is derived from the device's media access control (MAC) address.	**detail**, **extensive**
interface-name	Name of the Virtual Chassis port interface, in the format **vcp-*slot/pic/port.logical-unit-number***.	**detail**, **extensive**
Expires in	Number of seconds until the adjacency expires.	**detail**, **extensive**
Priority	Priority to become the designated intermediate system.	**detail**, **extensive**
Up/Down transitions	Count of adjacency status changes from **Up** to **Down** or from **Down** to **Up**.	**detail**, **extensive**
Last transition	Time of the last **Up**/**Down** transition.	**detail**, **extensive**

Table 19: show virtual-chassis protocol adjacency Output Fields *(continued)*

Field Name	Field Description	Level of Output

Transition log	List of recent adjacency transitions, including:
	• **When**—Date and time at which a VCCP adjacency transition occurred.
	• **State**—Current state of the VCCP adjacency:
	  • **Up**—Adjacency is up and operational.
	  • **Down**—Adjacency is down and not available.
	  • **Rejected**—Adjacency has been rejected.
	• **Event**—Type of transition that occurred:
	  • **Seenself**—Possible routing loop has been detected.
	  • **Interface down**—Virtual Chassis port interface has gone down and is no longer available.
	  • **Error**—Adjacency error.
	• **Down reason**—Reason that a VCCP adjacency is down:
	  • **3-Way Handshake Failed**—Connection establishment failed.
	  • **Address Mismatch**—Address mismatch caused link failure.
	  • **Aged Out**—Link expired.
	  • **ISO Area Mismatch**—VCCP area mismatch caused link failure.
	  • **Bad Hello**—Unacceptable hello message caused link failure.
	  • **BFD Session Down**—Bidirectional failure detection caused link failure.
	  • **Interface Disabled**—Virtual Chassis port interface is disabled.
	  • **Interface Down**—Virtual Chassis port interface is unavailable.
	  • **Interface Level Disabled**—VCCP level is disabled.
	  • **Level Changed**—VCCP level has changed on the adjacency.
	  • **Level Mismatch**—Levels on adjacency are not compatible.
	  • **MPLS LSP Down**—Label-switched path (LSP) is unavailable.
	  • **MT Topology Changed**—VCCP topology has changed.
	  • **MT Topology Mismatch**—VCCP topology is mismatched.
	  • **Remote System ID Changed**—Adjacency peer system ID changed.
	  • **Protocol Shutdown**—VCCP is disabled.
	  • **CLI Command**—Adjacency brought down by user.
	  • **Unknown**—Unknown.
		extensive

Sample Output

show virtual-chassis protocol adjacency all-members brief

```
{master:member0-re0}

user@host> show virtual-chassis protocol adjacency all-members brief
member0:
--------------------------------------------------------------------------
Interface             System         State        Hold (secs)
vcp-5/0/0.32768       001d.b510.0800 Up                  57

member1:
--------------------------------------------------------------------------
Interface             System         State        Hold (secs)
vcp-1/3/0.32768       b0c6.9abf.6800 Up                  58
```

show virtual-chassis protocol adjacency member 0 detail

```
{master:member0-re0}

user@host> show virtual-chassis protocol adjacency member 0 detail
member0:
--------------------------------------------------------------------------

001d.b510.0800
  interface-name: vcp-5/0/0.32768, State: Up, Expires in 57 secs
  Priority: 0, Up/Down transitions: 1, Last transition: 18:50:41 ago
```

show virtual-chassis protocol adjacency member 0 detail 001d.b510.0800

```
{master:member0-re0}

user@host> show virtual-chassis protocol adjacency member 0 detail 001d.b510.0800
member0:
--------------------------------------------------------------------------

001d.b510.0800
  interface-name: vcp-5/0/0.32768, State: Up, Expires in 58 secs
  Priority: 0, Up/Down transitions: 1, Last transition: 18:52:08 ago
```

show virtual-chassis protocol adjacency local extensive

```
{master:member0-re0}

user@host> show virtual-chassis protocol adjacency local extensive


001d.b510.0800
  interface-name: vcp-5/0/0.32768, State: Up, Expires in 59 secs
  Priority: 0, Up/Down transitions: 1, Last transition: 18:52:40 ago
  Transition log:
  When                  State        Event           Down reason
  Mon Sep 20 17:26:44   Up           Seenself
```

show virtual-chassis protocol database (MX Series Virtual Chassis)

Syntax

show virtual-chassis protocol database
<(brief | detail | extensive)>
<(all-members | local | member *member-id*)>
<*system-id*>

Release Information

Command introduced in Junos OS Release 11.2.

Description

Display the entries in the Virtual Chassis Control Protocol (VCCP) link-state database for an MX Series Virtual Chassis configuration. The VCCP link-state database contains information about protocol data unit (PDU) packets. You can issue the **show virtual-chassis protocol database** command from the console of either member router in the Virtual Chassis.

Options

brief | detail | extensive—(Optional) Display the specified level of output. Using the **brief** option is equivalent to issuing the command with no options (the default). The **detail** option provides more output than the **brief** option. The **extensive** option provides complete output and is most useful for customer support personnel.

all-members—(Optional) Display the VCCP link-state database for both member routers in a Virtual Chassis. This is the default behavior if no options are specified.

local—(Optional) Display the VCCP link-state database for the member router on which you are issuing the command.

member *member-id*—(Optional) Display the VCCP link-state database for the specified member router. Replace ***member-id*** with the value 0 or 1.

system-id—(Optional) Display the VCCP link-state database for the neighbor with the specified system ID.

Required Privilege Level

view

Related Documentation

- Viewing Information in the Virtual Chassis Control Protocol Link-State Database on page 147

List of Sample Output

show virtual-chassis protocol database all-members brief on page 175
show virtual-chassis protocol database member 0 detail on page 175
show virtual-chassis protocol database member 0 b0c6.9abf.6800 detail on page 175
show virtual-chassis protocol database member 0 extensive on page 176

Output Fields

Table 20 on page 172 lists the output fields for the **show virtual-chassis protocol database** command. Output fields are listed in the approximate order in which they appear.

Table 20: show virtual-chassis protocol database Output Fields

Field Name	Field Description	Level of Output
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.	All levels

Table 20: show virtual-chassis protocol database Output Fields *(continued)*

Field Name	Field Description	Level of Output
LSP ID	Link-state PDU (LSP) identifier.	All levels
Sequence	Sequence number of the link-state PDU.	All levels
Checksum	Checksum value of the link-state PDU.	All levels
Lifetime	Remaining lifetime of the link-state PDU, in seconds.	All levels
***number* LSPs**	Total number of link-state PDUs in the specified link-state database.	none, **brief**
Neighbor, Neighbor Info	Media access control (MAC) address of the neighbor on the advertising system.	**detail**, **extensive**
Interface	Name of the Virtual Chassis port interface, in the format **vcp-*slot/pic/port.logical-unit-number***.	**detail**, **extensive**
Metric	Metric value of the prefix or neighbor.	**detail**, **extensive**
Header	Link-state PDU (LSP) packet header: • **LSP ID**—LSP identifier in the header. • **Length**—Header length, in bytes. • **Allocated length**—Length available for the header, in bytes. • **Remaining lifetime**—Remaining lifetime of the link-state PDU, in seconds. • **Interface**—The interface from which the LSP is received. • **Estimated free bytes**—Estimated number of available bytes in the LSP. • **Actual free bytes**—Actual number of available bytes in the LSP. • **Aging timer expires in**—Remaining lifetime of the LSP, in seconds.	**extensive**
Packet	Link-state PDU (LSP) packet: • **LSP ID**—Identifier for the link-state packet. • **Length**—Packet length, in bytes. • **Lifetime**—Remaining lifetime, in seconds. • **Checksum**—Checksum of the link-state PDU. • **Sequence**—Sequence number of the link-state PDU. This number increments whenever the link-state PDU is updated. • **Fixed length**—Set length for the packet, in bytes. • **Version**—Protocol version. • **Sysid length**—Length of the system ID, in bytes. The value 0 represents 6 bytes. • **Packet type**—Protocol data unit (PDU) type of the LSP. • **SW version**—Junos OS Release number.	**extensive**

Table 20: show virtual-chassis protocol database Output Fields *(continued)*

Field Name	Field Description	Level of Output
TLVs	Link-state PDU (LSP) type, length, and value (TLV): • **Member ID**—Identifier configured for the Virtual Chassis member router. • **VC ID**—Identifier assigned to the Virtual Chassis member router. • **Flags**—Internal flags that keep track of the member state for the purpose of mastership election in the Virtual Chassis. • **Priority**—Priority value associated with the role assigned to a member router in the preprovisioned Virtual Chassis configuration. For example, the priority value for the **routing-engine** role is 129. The priority value is used for mastership election in the Virtual Chassis. • **System ID**—System ID of the device associated with the Virtual Chassis port interface. The System ID is derived from the device's media access control (MAC) address. • **Device ID**—Identifier for the device; usually the same as the Member ID. • **Neighbor Info**—System ID, Virtual Chassis port interface, and metric value for VCCP neighbor. • **Topology Info**—System ID of the VCCP neighbor. • **IRI Addr Info**—Internal routing interface (IRI) IP address, which is reserved for internal communication. • **Master Info**—System ID of the master router in the Virtual Chassis. • **Backup Info**—System ID of the backup router in the Virtual Chassis. • **Stable State Info**—Internal state information used for mastership election in the Virtual Chassis. • **Member Info**—System ID, Member ID, and role of each member router in the Virtual Chassis. • **Provision Info**—Member ID and chassis serial number specified for each member router in the preprovisioned configuration for an MX Series Virtual Chassis. • **Unknown TLV**—Type and length of TLVs with unsupported content received on this device.	**extensive**
***number* queued**	Number of link-state PDUs queued on the specified Virtual Chassis port interface.	**extensive**

Sample Output

show virtual-chassis protocol database all-members brief

```
{master:member1-re0}

user@host> show virtual-chassis protocol database all-members brief
member0:
--------------------------------------------------------------------------
LSP ID                      Sequence Checksum Lifetime
001d.b510.0800.00-00           0x9eb   0xb8f1      115
b0c6.9abf.6800.00-00           0x9ee   0x8f35      116
  2 LSPs

member1:
--------------------------------------------------------------------------
LSP ID                      Sequence Checksum Lifetime
001d.b510.0800.00-00           0x9eb   0xb8f1      117
b0c6.9abf.6800.00-00           0x9ee   0x8f35      114
  2 LSPs
```

show virtual-chassis protocol database member 0 detail

```
{master:member1-re0}

user@host> show virtual-chassis protocol database member 0 detail
member0:
--------------------------------------------------------------------------

001d.b510.0800.00-00 Sequence: 0x9f5, Checksum: 0x5b2b, Lifetime: 116 secs
   Neighbor: b0c6.9abf.6800.00  Interface: vcp-1/3/0.32768 Metric:      15

b0c6.9abf.6800.00-00 Sequence: 0x9f8, Checksum: 0x326e, Lifetime: 117 secs
   Neighbor: 001d.b510.0800.00  Interface: vcp-5/0/0.32768 Metric:      15
```

show virtual-chassis protocol database

```
{master:member1-re0}

user@host> show virtual-chassis protocol database member 0 b0c6.9abf.6800 detail
member0:
--------------------------------------------------------------------------
```

member 0 b0c6.9abf.6800 detail

```
b0c6.9abf.6800.00-00 Sequence: 0xa06, Checksum: 0x925b, Lifetime: 117 secs
   Neighbor: 001d.b510.0800.00  Interface: vcp-5/0/0.32768 Metric:      15
```

show virtual-chassis protocol database member 0 extensive

```
{master:member1-re0}

user@host> show virtual-chassis protocol database member 0 extensive
member0:
--------------------------------------------------------------------------

001d.b510.0800.00-00 Sequence: 0xa09, Checksum: 0xa696, Lifetime: 116 secs
   Neighbor: b0c6.9abf.6800.00  Interface: vcp-1/3/0.32768 Metric:      15

  Header: LSP ID: 001d.b510.0800.00-00, Length: 804 bytes
    Allocated length: 804 bytes,
    Remaining lifetime: 116 secs, Interface: 64
    Estimated free bytes: 0, Actual free bytes: 0
    Aging timer expires in: 116 secs

  Packet: LSP ID: 001d.b510.0800.00-00, Length: 804 bytes, Lifetime : 118 secs
    Checksum: 0xa696, Sequence: 0xa09,
    Fixed length: 27 bytes, Version: 1, Sysid length: 0 bytes
    Packet type: 18, SW version: 11.1

  TLVs:
    Node Info: Member ID: 1, VC ID: 5a6a.e747.8511, Flags: 3, Priority: 129
       System ID: 001d.b510.0800, Device ID: 1
    Unknown TLV, Type: 0, Length: 0
    ...
    Unknown TLV, Type: 0, Length: 0
    Unknown TLV, Type: 1, Length: 1
    Neighbor Info: b0c6.9abf.6800.00, Interface: vcp-1/3/0.32768, Metric: 15
    Topology Info: System ID: 001d.b510.0800,
    Topology Info: System ID: b0c6.9abf.6800,
    IRI Addr Info: IP Address: 128.0.0.1,
    IRI Addr Info: IP Address: 128.0.0.4,
    IRI Addr Info: IP Address: 128.0.0.5,
    IRI Addr Info: IP Address: 128.0.0.6,
    IRI Addr Info: IP Address: 128.0.0.17,
    Master Info: System ID: 001d.b510.0800
    Backup Info: System ID: b0c6.9abf.6800
    Stable State Info: Master ID: 001d.b510.0800, Backup ID: b0c6.9abf.6800
    Member Info: System ID: b0c6.9abf.6800, Member ID: 0 Member role: Backup
       System ID: b0c6.9abf.6800, Device ID: 0
    Member Info: System ID: 001d.b510.0800, Member ID: 1 Member role: Master
       System ID: 001d.b510.0800, Device ID: 1
    Provision Info: Member ID: 1 Serial Number: JN10C78D1AFC,
    Provision Info: Member ID: 0 Serial Number: JN115FDADAFB,
    Unknown TLV, Type: 24, Length: 1
    Unknown TLV, Type: 28, Length: 56

  1 queued :
  Send PSN on vcp-5/0/0.32768 for 00:00:01

b0c6.9abf.6800.00-00 Sequence: 0xa0d, Checksum: 0x82d2, Lifetime: 118 secs
   Neighbor: 001d.b510.0800.00  Interface: vcp-5/0/0.32768 Metric:      15

  Header: LSP ID: b0c6.9abf.6800.00-00, Length: 808 bytes
    Allocated length: 1400 bytes,
    Remaining lifetime: 118 secs, Interface: 0
    Estimated free bytes: 546, Actual free bytes: 592
```

```
  Aging timer expires in: 118 secs

Packet: LSP ID: b0c6.9abf.6800.00-00, Length: 808 bytes, Lifetime : 118 secs
  Checksum: 0x82d2, Sequence: 0xa0d,
  Fixed length: 27 bytes, Version: 1, Sysid length: 0 bytes
  Packet type: 18, SW version: 11.1

TLVs:
  Node Info: Member ID: 0, VC ID: 5a6a.e747.8511, Flags: 5, Priority: 129
     System ID: b0c6.9abf.6800, Device ID: 0
  Unknown TLV, Type: 0, Length: 0
  ...
  Unknown TLV, Type: 0, Length: 0
  Unknown TLV, Type: 1, Length: 1
  Neighbor Info: 001d.b510.0800.00, Interface: vcp-5/0/0.32768, Metric: 15
  Topology Info: System ID: 001d.b510.0800,
  Topology Info: System ID: b0c6.9abf.6800,
  IRI Addr Info: IP Address: 128.0.0.1,
  IRI Addr Info: IP Address: 128.0.0.4,
  IRI Addr Info: IP Address: 128.0.0.5,
  IRI Addr Info: IP Address: 128.0.0.6,
  IRI Addr Info: IP Address: 128.0.0.17,
  IRI Addr Info: IP Address: 128.0.0.21,
  Master Info: System ID: 001d.b510.0800
  Backup Info: System ID: b0c6.9abf.6800
  Stable State Info: Master ID: 001d.b510.0800, Backup ID: b0c6.9abf.6800
  Member Info: System ID: b0c6.9abf.6800, Member ID: 0 Member role: Backup
     System ID: b0c6.9abf.6800, Device ID: 0
  Member Info: System ID: 001d.b510.0800, Member ID: 1 Member role: Master
     System ID: 001d.b510.0800, Device ID: 1
  Provision Info: Member ID: 1 Serial Number: JN10C78D1AFC,
  Provision Info: Member ID: 0 Serial Number: JN115FDADAFB,
  Unknown TLV, Type: 24, Length: 1
  Unknown TLV, Type: 28, Length: 56

1 queued :
Retransmit on vcp-5/0/0.32768 for 00:00:01
```

show virtual-chassis protocol interface (MX Series Virtual Chassis)

Syntax

show virtual-chassis protocol interface
<(brief | detail)>
<*interface-name*>
<(all-members | local | member *member-id*)>

Release Information

Command introduced in Junos OS Release 11.2.

Description

Display Virtual Chassis Control Protocol (VCCP) information about Virtual Chassis port interfaces in an MX Series Virtual Chassis. You can issue the **show virtual-chassis protocol interface** command from the console of either member router in the Virtual Chassis.

Options

brief | detail—(Optional) Display the specified level of output. Using the **brief** option is equivalent to issuing the command with no options (the default). The **detail** option provides more output than the **brief** option.

all-members—(Optional) Display VCCP information about Virtual Chassis port interfaces for both member routers in a Virtual Chassis. This is the default behavior if no options are specified.

interface-name—(Optional) Display VCCP information about Virtual Chassis port interfaces for the specified Virtual Chassis port, in the format **vcp-*slot/pic/port.logical-unit-number***.

local—(Optional) Display VCCP information about Virtual Chassis port interfaces for the member router on which you are issuing the command.

member *member-id*—(Optional) Display VCCP information about Virtual Chassis port interfaces for the specified member router. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level

view

Related Documentation

- Viewing Information About Virtual Chassis Port Interfaces in the Virtual Chassis Control Protocol Database on page 148

List of Sample Output

show virtual-chassis protocol interface brief all-members on page 180
show virtual-chassis protocol interface detail all-members on page 180
show virtual-chassis protocol interface detail local on page 180

Output Fields

Table 21 on page 178 lists the output fields for the **show virtual-chassis protocol interface** command. Output fields are listed in the approximate order in which they appear.

Table 21: show virtual-chassis protocol interface Output Fields

Field Name	Field Description	Level of Output
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.	All levels

Table 21: show virtual-chassis protocol interface Output Fields *(continued)*

Field Name	Field Description	Level of Output
Interface	Name of the Virtual Chassis port interface, in the format **vcp-*slot/pic/port.logical-unit-number***.	**brief**
State	State of the Virtual Chassis port interface: • **Up**—The interface is up. • **Down**—The interface is down.	**brief**
Metric	Metric value for this Virtual Chassis port interface.	All levels
vcp-*slot/pic/port.logical-unit-number*	Name of the Virtual Chassis port interface.	**detail**
Index	Interface index number assigned by the Junos OS software.	**detail**
State	Internal implementation information.	**detail**
LSP interval	Interval, in milliseconds, between link-state protocol data units (PDUs) sent from the interface.	**detail**
***type* Hello padding**	Type of hello padding: • **Adaptive**—On point-to-point connections, the hello packets are padded from the initial detection of a new neighbor until the neighbor verifies the adjacency as Up in the adjacency state type, length, and value (TLV). If the neighbor does not support the adjacency state TLV, then padding continues. On LAN connections, padding starts from the initial detection of a new neighbor until there is at least one active adjacency on the interface. • **Loose**—(Default) The hello packet is padded from the initial detection of a new neighbor until the adjacency transitions to the Up state. • **Strict**—Padding is performed on all interface types and for all adjacency states, and is continuous.	**detail**
Adjacencies	Number of adjacencies established on this Virtual Chassis port interface.	**detail**
Hello(s)	Hello interval for the Virtual Chassis port interface.	**detail**
Hold(s)	Hold time for the Virtual Chassis port interface.	**detail**

Sample Output

show virtual-chassis protocol interface brief all-members

```
{master:member1-re0}

user@host> show virtual-chassis protocol interface brief all-members
member0:
--------------------------------------------------------------------------
IS-IS interface database:
Interface             State         Metric
vcp-5/0/0.32768       Up             15

member1:
--------------------------------------------------------------------------
IS-IS interface database:
Interface             State         Metric
vcp-1/3/0.32768       Up             15
```

show virtual-chassis protocol interface detail all-members

```
{master:member1-re0}

user@host> show virtual-chassis protocol interface detail all-members
member0:
--------------------------------------------------------------------------

IS-IS interface database:
vcp-5/0/0.32768
  Index: 64, State: 0x46
  LSP interval: 100 ms, Loose Hello padding
  Adjacencies Metric Hello (s) Hold (s)n           1     15         3     60

member1:
--------------------------------------------------------------------------

IS-IS interface database:
vcp-1/3/0.32768
  Index: 64, State: 0x86
  LSP interval: 100 ms, Loose Hello padding
  Adjacencies Metric Hello (s) Hold (s)n           1     15         3     60
```

show virtual-chassis protocol interface detail local

```
{master:member1-re0}

user@host> show virtual-chassis protocol interface detail local


IS-IS interface database:
vcp-1/3/0.32768
  Index: 64, State: 0x46
  LSP interval: 100 ms, Loose Hello padding
  Adjacencies Metric Hello (s) Hold (s)n           1     15         3     60
```

show virtual-chassis protocol route (MX Series Virtual Chassis)

Syntax

show virtual-chassis protocol route
<*destination-id*>
<(all-members | local | member *member-id*)>

Release Information

Command introduced in Junos OS Release 11.2.

Description

Display the Virtual Chassis Control Protocol (VCCP) unicast and multicast routing tables for an MX Series Virtual Chassis. You can issue the **show virtual-chassis protocol route** command from the console of either member router in the Virtual Chassis.

Options

all-members—(Optional) Display the VCCP unicast and multicast routing tables for both member routers in a Virtual Chassis configuration. This is the default behavior if no options are specified.

destination-id—(Optional) Display the VCCP unicast and multicast routing tables to the destination with the specified system ID.

local—(Optional) Display the VCCP unicast and multicast routing tables for the member router on which you are issuing the command.

member *member-id*—(Optional) Display the VCCP unicast and multicast routing tables for the specified member router. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level

view

Related Documentation

- Viewing Virtual Chassis Control Protocol Routing Tables on page 148

List of Sample Output

show virtual-chassis protocol route all-members on page 183
show virtual-chassis protocol route member 0 001d.b510.0800 (For Specific Member ID and Destination ID) on page 183

Output Fields

Table 22 on page 181 lists the output fields for the **show virtual-chassis protocol route** command. Output fields are listed in the approximate order in which they appear.

Table 22: show virtual-chassis protocol route Output Fields

Field Name	Field Description
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.
Dev	System ID of the device (member router) that stores the VCCP routing tables. The System ID is derived from the router's media access control (MAC) address.
ucast routing table	VCCP unicast routing table.
mcast routing table	VCCP multicast routing table.

Table 22: show virtual-chassis protocol route Output Fields *(continued)*

Field Name	Field Description
Current version	Version of the shortest-path-first (SPF) algorithm that generated the VCCP unicast or multicast routing table.
System ID	System ID of the device, derived from the device's MAC address.
Version	Version of the SPF algorithm that generated this route in the VCCP unicast or multicast routing table.
Metric	Metric value required to reach this device.
Interface	Name of the Virtual Chassis port interface (in the format **vcp-*slot/pic/port.logical-unit-number***) that interconnects the devices.
Via	MAC address of the next-hop device, if applicable.

Sample Output

show virtual-chassis protocol route all-members

```
{master:member1-re0}

user@host> show virtual-chassis protocol route all-members
member0:
--------------------------------------------------------------------------

Dev b0c6.9abf.6800 ucast routing table             Current version: 17
----------------
System ID          Version   Metric Interface     Via
001d.b510.0800          17       15 vcp-5/0/0.32768 001d.b510.0800
b0c6.9abf.6800          17        0

Dev b0c6.9abf.6800 mcast routing table             Current version: 17
----------------
System ID          Version   Metric Interface     Via
001d.b510.0800          17
b0c6.9abf.6800          17          vcp-5/0/0.32768

member1:
--------------------------------------------------------------------------

Dev 001d.b510.0800 ucast routing table             Current version: 17
----------------
System ID          Version   Metric Interface     Via
001d.b510.0800          17        0
b0c6.9abf.6800          17       15 vcp-1/3/0.32768 b0c6.9abf.6800

Dev 001d.b510.0800 mcast routing table             Current version: 17
----------------
System ID          Version   Metric Interface     Via
001d.b510.0800          17          vcp-1/3/0.32768
b0c6.9abf.6800          17
```

show virtual-chassis protocol route member 0 001d.b510.0800 (For Specific Member ID and Destination ID)

```
{master:member1-re0}

user@host> show virtual-chassis protocol route member 0 001d.b510.0800
member0:
--------------------------------------------------------------------------

Dev b0c6.9abf.6800 ucast routing table             Current version: 17
----------------
System ID          Version   Metric Interface     Via
001d.b510.0800          17       15 vcp-5/0/0.32768 001d.b510.0800
b0c6.9abf.6800          17        0

Dev b0c6.9abf.6800 mcast routing table             Current version: 17
----------------
System ID          Version   Metric Interface     Via
001d.b510.0800          17
b0c6.9abf.6800          17          vcp-5/0/0.32768
```

show virtual-chassis protocol statistics (MX Series Virtual Chassis)

Syntax
show virtual-chassis protocol statistics
<*interface-name*>
<(all-members | local | member *member-id*)>

Release Information
Command introduced in Junos OS Release 11.2.

Description
Display Virtual Chassis Control Protocol (VCCP) statistics for one or both member routers, or for a specified Virtual Chassis port interface, in an MX Series Virtual Chassis. You can issue the **show virtual-chassis protocol statistics** command from the console of either member router in the Virtual Chassis.

Options
all-members—(Optional) Display VCCP statistics for both member routers in a Virtual Chassis configuration. This is the default behavior if no options are specified.

interface-name—(Optional) Display VCCP statistics for the specified Virtual Chassis port interface, in the format **vcp-*slot/pic/port.logical-unit-number***.

local—(Optional) Display VCCP statistics for the member router on which you are issuing the command.

member *member-id*—(Optional) Display VCCP statistics for the specified member router. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level
view

Related Documentation
- Viewing Virtual Chassis Control Protocol Statistics for Member Routers and Virtual Chassis Ports on page 149

List of Sample Output
show virtual-chassis protocol statistics all-members on page 186
show virtual-chassis protocol statistics vcp-1/3/0.32768 member 1 (For Specific Virtual Chassis Port Interface and Member ID) on page 186

Output Fields
Table 23 on page 184 lists the output fields for the **show virtual-chassis protocol statistics** command. Output fields are listed in the approximate order in which they appear.

Table 23: show virtual-chassis protocol statistics Output Fields

Field Name	Field Description
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.
PDU type	Type of protocol data unit (PDU).
Received	Number of PDUs received since VCCP started or since the statistics were set to zero.
Processed	Number of PDUs received minus the number of PDUs dropped.
Drops	Number of PDUs dropped.

Table 23: show virtual-chassis protocol statistics Output Fields *(continued)*

Field Name	Field Description
Sent	Number of PDUs transmitted since VCCP started or since the statistics were set to zero.
Rexmit	Number of PDUs retransmitted since VCCP started or since the statistics were set to zero.
Total packets received	Total number of PDUs received since VCCP started or since the statistics were set to zero.
Sent	Total number of PDUs transmitted since VCCP started or since the statistics were set to zero.
LSP queue length	Number of link-state PDUs waiting in the queue to be processed.
Drops	Number of link-state PDUs dropped.
SPF runs	Number of shortest-path-first (SPF) calculations performed.
Fragments rebuilt	Number of link-state PDU fragments computed by the local system.
LSP regenerations	Number of regenerated link-state PDUs. A link-state PDU is regenerated when the PDU nears the end of its lifetime and has not changed.
Purges initiated	Number of purges initiated by the software. A purge is initiated when the software determines that it must remove a link-state PDU from the network.

Sample Output

show virtual-chassis protocol statistics all-members

```
{master:member1-re0}

user@host> show virtual-chassis protocol statistics all-members
member0:
--------------------------------------------------------------------------

IS-IS statistics for b0c6.9abf.6800:
PDU type       Received    Processed        Drops         Sent       Rexmit
LSP                2937         2937            0         2934            0
HELLO              2913         2913            0         2922            0
CSNP                  1            1            0            1            0
PSNP               2916         2916            0         2925            0
Unknown               0            0            0            0            0
Totals             8767         8767            0         8782            0

Total packets received: 8767 Sent: 8782

LSP queue length: 0 Drops: 0
SPF runs: 17
Fragments rebuilt: 2955
LSP regenerations: 14
Purges initiated: 0

member1:
--------------------------------------------------------------------------

IS-IS statistics for 001d.b510.0800:
PDU type       Received    Processed        Drops         Sent       Rexmit
LSP                2934         2934            0         2937            0
HELLO              2922         2922            0         2914            0
CSNP                  1            1            0            1            0
PSNP               2925         2925            0         2916            0
Unknown               0            0            0            0            0
Totals             8782         8782            0         8768            0

Total packets received: 8782 Sent: 8768

LSP queue length: 0 Drops: 0
SPF runs: 17
Fragments rebuilt: 2953
LSP regenerations: 11
Purges initiated: 0
```

show virtual-chassis protocol statistics vcp-1/3/0.32768 member 1 (For Specific Virtual Chassis Port

```
{master:member1-re0}

user@host> show virtual-chassis protocol statistics vcp-1/3/0.32768 member 1
member1:
--------------------------------------------------------------------------
vcp-1/3/0.32768
```

Interface and Member ID)

```
IS-IS statistics for 001d.b510.0800:
PDU type       Received    Processed        Drops         Sent       Rexmit
LSP                3013         3013            0         3016            0
HELLO              3001         3001            0         2993            0
CSNP                  1            1            0            1            0
PSNP               3003         3003            0         2994            0
Unknown               0            0            0            0            0
Totals             9018         9018            0         9004            0

Total packets received: 9018 Sent: 9004
```

show virtual-chassis status (MX Series Virtual Chassis)

Syntax show virtual-chassis status

Release Information Command introduced in Junos OS Release 11.2.

Description Display information about the status of both member routers in an MX Series Virtual Chassis configuration. You can issue the **show virtual-chassis status** command from the console of either member router in the Virtual Chassis.

Required Privilege Level view

Related Documentation

- Verifying the Status of Virtual Chassis Member Routers on page 145
- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

List of Sample Output show virtual-chassis status on page 189

Output Fields Table 24 on page 188 lists the output fields for the **show virtual-chassis status** command. Output fields are listed in the approximate order in which they appear.

Table 24: show virtual-chassis status Output Fields

Field Name	Field Description
Virtual Chassis ID	Assigned ID that applies to the entire Virtual Chassis configuration.
Member ID	Member ID assigned in the preprovisioned Virtual Chassis configuration, and the Flexible PIC Concentrator (FPC) slot range, including offset, for each member router in the Virtual Chassis.
Status	State of the member router: • **Prsnt**—Router is currently connected to the Virtual Chassis. • **NotPrsnt**—Router is not currently connected to the Virtual Chassis.
Serial No	Serial number of the member router.
Model	Model number of the member router.
Mastership priority	Metric used by the Virtual Chassis software for the mastership election algorithm. This value is assigned by the software and is not configurable in the current release.
Role	Role of the member router in the Virtual Chassis: **Master** or **Backup**. The asterisk (*) following the Role denotes the router on which the **show virtual-chassis status** command was issued.

Table 24: show virtual-chassis status Output Fields *(continued)*

Field Name	Field Description
Neighbor List ID Interface	Member IDs and Virtual Chassis port interfaces (in the format **vcp-*slot/pic/port***) to which this member router is connected.

Sample Output

show virtual-chassis status

```
{master:member1-re0}

user@host> show virtual-chassis status
Preprovisioned Virtual Chassis
Virtual Chassis ID: 5a6a.e747.8511
                                                    Mastership          Neighbor List
Member ID       Status   Serial No    Model    priority    Role      ID  Interface
0 (FPC   0- 11) Prsnt    JN115FDADAFB mx480          129  Backup     1  vcp-5/0/0
1 (FPC  12- 23) Prsnt    JN10C78D1AFC mx240          129  Master*    0  vcp-1/3/0
```

show virtual-chassis vc-port (MX Series Virtual Chassis)

Syntax

show virtual-chassis vc-port
<(all-members | local | member *member-id*)>

Release Information

Command introduced in Junos OS Release 11.2.

Description

Display the operational status of the Virtual Chassis ports for both member routers or for a specified member router in an MX Series Virtual Chassis configuration. You can issue the **show virtual-chassis vc-port** command from the console of either member router in the Virtual Chassis.

Options

all-members—(Optional) Display the operational status of the Virtual Chassis ports for both member routers in a Virtual Chassis configuration.

local—(Optional) Display the operational status of the Virtual Chassis ports on the member router on which you are issuing the command. This is the default behavior if no options are specified.

member *member-id*—(Optional) Display the operational status of the Virtual Chassis ports on the specified member router. Replace ***member-id*** with the value 0 or 1.

Required Privilege Level

view

Related Documentation

- Verifying the Operation of Virtual Chassis Ports on page 145
- Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 35
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

List of Sample Output

show virtual-chassis vc-port all-members on page 191
show virtual-chassis vc-port local on page 191
show virtual-chassis vc-port member 0 on page 191

Output Fields

Table 25 on page 190 lists the output fields for the **show virtual-chassis vc-port** command. Output fields are listed in the approximate order in which they appear.

Table 25: show virtual-chassis vc-port Output Fields

Field Name	Field Description
member*n*	Member ID of the Virtual Chassis member router for which output is displayed.
Interface or Slot/PIC/Port	Location, in the format ***slot/pic/port***, of the Virtual Chassis ports configured on the member router.
Type	Type of Virtual Chassis port. **Configured** indicates that the Virtual Chassis port is properly configured.

Table 25: show virtual-chassis vc-port Output Fields *(continued)*

Field Name	Field Description
Trunk ID	Trunk ID value assigned to a link aggregation group (LAG) formed by the Virtual Chassis. A positive number indicates that a trunk exists. The value **-1** indicates that a trunk is not present.
Status	State of the Virtual Chassis port interface: **Up**, **Down**, or **Absent**.
Speed (mbps)	Speed, in megabits per second, of the Virtual Chassis port interface.
Neighbor ID Interface	Member IDs and Virtual Chassis port interfaces (in **vcp-*slot/pic/port*** format) that are connected to this member router.

Sample Output

show virtual-chassis vc-port all-members

```
{master:member1-re0}

user@host> show virtual-chassis vc-port all-members
member0:
--------------------------------------------------------------------------
Interface       Type              Trunk  Status       Speed        Neighbor
or                                 ID                (mbps)       ID  Interface
Slot/PIC/Port
5/0/0           Configured         -1    Up           10000        1   vcp-1/3/0


member1:
--------------------------------------------------------------------------
Interface       Type              Trunk  Status       Speed        Neighbor
or                                 ID                (mbps)       ID  Interface
Slot/PIC/Port
1/3/0           Configured         -1    Up           10000        0   vcp-5/0/0
```

show virtual-chassis vc-port local

```
{master:member1-re0}

user@host> show virtual-chassis vc-port local

Interface       Type              Trunk  Status       Speed        Neighbor
or                                 ID                (mbps)       ID  Interface
Slot/PIC/Port
1/3/0           Configured         -1    Up           10000        0   vcp-5/0/0
```

show virtual-chassis vc-port member 0

```
{master:member1-re0}

user@host> show virtual-chassis vc-port member 0
member0:
--------------------------------------------------------------------------
Interface       Type              Trunk  Status       Speed        Neighbor
or                                 ID                (mbps)       ID  Interface
Slot/PIC/Port
5/0/0           Configured         -1    Up           10000        1   vcp-1/3/0
```


PART 4

Troubleshooting

CHAPTER 12

Acquiring Troubleshooting Information

Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers

The Junos OS trace feature tracks Virtual Chassis operations and records events in a log file. The error descriptions captured in the log file provide detailed information to help you solve problems.

By default, tracing is disabled. When you enable the tracing operation on the router to be configured as the master (also referred to as the *protocol master*) of an MX Series Virtual Chassis, the default tracing behavior is as follows:

1. Important events are logged in a file with the name you specify in the **/var/log** directory. You cannot change the directory (**/var/log**) in which trace files are located.
2. When a trace file named ***trace-file*** reaches its maximum size, it is renamed ***trace-file*.0**, then ***trace-file*.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

   You can optionally specify the maximum number of trace files to be from 2 through 1000. You can also configure the maximum file size to be from 10 KB through 1 gigabyte (GB). (For more information about how log files are created, see the *Junos OS System Log Messages Reference*.)

   By default, only the user who configures the tracing operation can access log files. You can optionally configure read-only access for all users.

To configure tracing of MX Series Virtual Chassis operations:

1. Configure a filename for the trace log.

   See "Configuring the Name of the Virtual Chassis Trace Log File" on page 197.
2. (Optional) Configure characteristics of the trace log file.

   See "Configuring Characteristics of the Virtual Chassis Trace Log File" on page 197.
3. (Optional) Configure user access to the trace log file.

   See "Configuring Access to the Virtual Chassis Trace Log File" on page 198.
4. (Optional) Refine the output of the trace log file.

   See "Using Regular Expressions to Refine the Output of the Virtual Chassis Trace Log File" on page 199.
5. Configure flags to specify the Virtual Chassis operations that you want to trace.

   See "Configuring the Virtual Chassis Operations to Trace" on page 200.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Configuring the Name of the Virtual Chassis Trace Log File

To trace operations for an MX Series Virtual Chassis, you must configure the name of the trace log file that the software saves in the **/var/log** directory.

To configure the filename for tracing MX Series Virtual Chassis operations:

- On the router to be designated as the master of the Virtual Chassis, specify the name of the trace log file.

  ```
  [edit virtual-chassis]
  user@host# set traceoptions file filename
  ```

Related Documentation

- Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers on page 196
- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Configuring Characteristics of the Virtual Chassis Trace Log File

You can optionally configure the following characteristics of the trace log file for an MX Series Virtual Chassis:

- Maximum number of trace files—When a trace file named ***trace-file*** reaches its maximum size, it is renamed ***trace-file*.0**, then ***trace-file*.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. You can optionally specify the maximum number of trace files to be from 2 through 1000. If you specify a maximum number of files with the **files** option, you must also specify a maximum file size with the **size** option.
- Maximum trace file size—You can configure the maximum trace file size to be from 10 KB through 1 gigabyte (GB) If you specify a maximum file size with the **size** option, you must also specify a maximum number of files with the **files** option.
- Timestamp—By default, timestamp information is placed at the beginning of each line of trace output. You can optionally prevent placement of a timestamp on any trace log file.
- Appending or replacing the trace file—By default, the router appends new information to an existing trace file. You can optionally specify that the router replace an exisiting trace file instead of appending information to it.

To configure the maximum number and maximum size of trace files:

- On the router to be designated as the master of the MX Series Virtual Chassis, specify the maximum number and maximum size of the trace file.

  ```
  [edit virtual-chassis]
  user@host# set traceoptions file filename files number size maximum-file-size
  ```

For example, to set the maximum number of files to 20 and the maximum file size to 2 MB for a trace file named **vccp**:

```
[edit virtual-chassis]
user@host# set traceoptions file vccp files 20 size 2097152
```

When the **vccp** trace file for this example reaches 2 MB, **vccp** is renamed **vccp.0**, and a new file named **vccp** is created. When the new **vccp** file reaches 2 MB, **vccp.0** is renamed **vccp.1** and **vccp** is renamed **vccp.0**. This process repeats until there are 20 trace files. Then the oldest file (**vccp.19**) is overwritten by the newest file (**vccp.0**).

To prevent the router from the placing a timestamp on the trace log file:

- On the router to be designated as the master of the MX Series Virtual Chassis, specify that a timestamp not appear on the trace log file:

```
[edit virtual-chassis]
user@host# set traceoptions file filename no-stamp
```

To replace an exisiting trace file instead of appending information to it:

- On the router to be designated as the master of the MX Series Virtual Chassis, specify that the router replaces an existing trace file:

```
[edit virtual-chassis]
user@host# set traceoptions file filename replace
```

Related Documentation

- Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers on page 196
- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Configuring Access to the Virtual Chassis Trace Log File

By default, only the user who configures the tracing operation can access the log files. You can enable all users to read the log file, and you can explicitly set the default behavior of the log file.

To configure access to the trace log file for all users:

- On the router to be designated as the master of the Virtual Chassis, specify that all users can read the trace log file.

```
[edit virtual-chassis]
user@host# set traceoptions file filename world-readable
```

To explicitly set the default behavior to enable access to the trace log file only for the user who configured tracing:

- On the router to be designated as the master of the Virtual Chassis, specify that only the user who configured tracing can read the trace log file.

```
[edit virtual-chassis]
```

```
user@host# set traceoptions file filename no-world-readable
```

Related Documentation

- Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers on page 196
- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Using Regular Expressions to Refine the Output of the Virtual Chassis Trace Log File

By default, the trace operation output includes all lines relevant to the logged events. You can refine the output of the trace log file for an MX Series Virtual Chassis by including regular expressions to be matched.

To refine the output of the trace log file:

- On the router to be designated as the master of the Virtual Chassis, configure a regular expression to be matched.

```
[edit virtual-chassis]
user@host# set traceoptions file filename match regular-expression
```

Related Documentation

- Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers on page 196
- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

Configuring the Virtual Chassis Operations to Trace

By default, the router logs only important events. You can specify which operations to trace for an MX Series Virtual Chassis by including specific tracing flags when you configure tracing. Table 26 on page 200 describes the flags that you can include.

Table 26: Tracing Flags for MX Series Virtual Chassis

Flag	Description
all	Trace all operations.
auto-configuration	Trace Virtual Chassis ports that have been automatically configured.
csn	Trace Virtual Chassis complete sequence number (CSN) packets.
error	Trace Virtual Chassis errored packets.
graceful-restart	Trace Virtual Chassis graceful restart events.
hello	Trace Virtual Chassis hello packets.
krt	Trace Virtual Chassis kernel routing table (KRT) events.
lsp	Trace Virtual Chassis link-state packets.
lsp-generation	Trace Virtual Chassis link-state packet generation.
me	Trace Virtual Chassis mastership election (ME) events.
normal	Trace normal events.
packets	Trace Virtual Chassis packets.
parse	Trace reading of the configuration.
psn	Trace partial sequence number (PSN) packets.
route	Trace Virtual Chassis routing information.
spf	Trace Virtual Chassis shortest-path-first (SPF) events.
state	Trace Virtual Chassis state transitions.
task	Trace Virtual Chassis task operations.

To configure the flags for the Virtual Chassis operations to be logged:

1. Specify the tracing flag that represents the operation you want to trace.

   ```
   [edit virtual-chassis]
   user@host# set traceoptions flag flag
   ```

2. (Optional) Specify one or more of the following additional tracing options for the specified flag:

   - To generate detailed trace output, use the **detail** option.
   - To disable a particular flag, use the **disable** option.
   - To trace received packets, use the **receive** option.
   - To trace transmitted packets, use the **send** option.

   For example, to generate detailed trace output for Virtual Chassis mastership election events in received packets:

   ```
   [edit virtual-chassis]
   user@host# set traceoptions flag me detail receive
   ```

Related Documentation

- Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers on page 196
- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

CHAPTER 13

Troubleshooting Configuration Statements

traceoptions (MX Series Virtual Chassis)

Syntax

```
traceoptions {
  file filename <files number> <match regular-expression> <no-stamp> <replace> <size
    maximum-file-size> <world-readable | no-world-readable>;
  flag flag <detail> <disable> <receive> <send>;
}
```

Hierarchy Level [edit virtual-chassis]

Release Information Statement introduced in Junos OS Release 11.2.

Description Define tracing operations for the MX Series Virtual Chassis configuration.

Default Tracing operations are disabled.

Options

detail—(Optional) Generate detailed trace information for a flag.

disable—(Optional) Disable a flag.

file *filename*—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory **/var/log**.

files *number*—(Optional) Maximum number of trace files. When a trace file named **trace-file** reaches its maximum size, it is renamed **trace-file.0**, then **trace-file.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size with the **size** option.

Range: 2 through 1000

Default: 3 files

flag *flag*—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. You can include the following flags:

- **all**—All tracing operations.
- **auto-configuration**—Trace Virtual Chassis ports that have been automatically configured.
- **csn**—Trace Virtual Chassis complete sequence number (CSN) packets.
- **error**—Trace Virtual Chassis errored packets.
- **graceful-restart**—Trace Virtual Chassis graceful restart events.
- **hello**—Trace Virtual Chassis hello packets.
- **krt**—Trace Virtual Chassis kernel routing table (KRT) events.
- **lsp**—Trace Virtual Chassis link-state packets.
- **lsp-generation**—Trace Virtual Chassis link-state packet generation.
- **me**—Trace Virtual Chassis mastership election (ME) events.

- **normal**—Trace normal events.
- **packets**—Trace Virtual Chassis packets.
- **parse**—Trace reading of the configuration.
- **psn**—Trace partial sequence number (PSN) packets.
- **route**—Trace Virtual Chassis routing information.
- **spf**—Trace Virtual Chassis shortest-path-first (SPF) events.
- **state**—Trace Virtual Chassis state transitions.
- **task**—Trace Virtual Chassis task operations.

match ***regular-expression***—(Optional) Refine the output to include lines that contain the regular expression.

no-stamp—(Optional) Do not place a timestamp on any trace file.

no-world-readable—(Optional) Restrict file access to the user who created the file.

receive—(Optional) Trace received packets.

replace—(Optional) Replace a trace file instead of appending information to it.

send—(Optional) Trace transmitted packets.

size ***maximum-file-size***—(Optional) Maximum size of each trace file. By default, the number entered is treated as bytes. Alternatively, you can include a suffix to the number to indicate kilobytes (KB), megabytes (MB), or gigabytes (GB). If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option.

Syntax: ***size*****k** to specify KB, ***size*****m** to specify MB, or ***size*****g** to specify GB

Range: 10240 through 1073741824

world-readable—(Optional) Enable unrestricted file access.

Required Privilege Level

routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

- Configuring Preprovisioned Member Information for a Virtual Chassis on page 46
- Tracing Virtual Chassis Operations for MX Series 3D Universal Edge Routers on page 196
- Example: Configuring Interchassis Redundancy for MX Series 3D Universal Edge Routers Using a Virtual Chassis on page 65

PART 5

Index

Index

Symbols

A

B

C

D

E

F

G

L

M

N

P

R

