Network Configuration Example

Enabling Junos Fusion Enterprise on an Enterprise Campus Network
Network Configuration Example Enabling Junos Fusion Enterprise on an Enterprise Campus Network

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About This Network Configuration Example

This network configuration example shows how to configure a Junos Fusion Enterprise with a complex topology that includes dual aggregation devices and satellite device clustering. This document also provides instructions for enabling commonly-used Enterprise campus networking features on the Junos Fusion Enterprise.

Junos Fusion Enterprise is optimized to support large-scale Enterprise campus networks that provide network access for hundreds or thousands of end-user devices. One Junos Fusion Enterprise can support up to 6,000 access interfaces. The topology used in this network configuration example is valid but is also intentionally down-scaled for illustrative purposes. A typical Junos Fusion Enterprise supports more end-user devices than the topology presented in this network configuration example.

Use Case Overview

Large-scale Enterprise campus networks are notoriously difficult to install and maintain. IT departments often have to wrestle with a variety of networking equipment that was purchased incrementally over several years and frequently from different vendors, creating a network that is difficult to manage because each device has its own hardware and software requirements as well as its own management point. Complexity is also a problem, since the large number of devices in the Enterprise campus network can increase hop counts and management overhead. Enterprise campus network behavior can also be unpredictable, since interconnecting devices running different software from different vendors often introduces unforeseen consequences. As an Enterprise campus network
grows, the issues around installing and maintaining the Enterprise campus network only continue to compound.

Junos Fusion Enterprise addresses the installation and maintenance needs of the next-generation large-scale Enterprise campus network.

Junos Fusion Enterprise provides an architecture that simplifies Enterprise network management and topologies by allowing a large number of switches—one Junos Fusion Enterprise can support up to 6,000 access interfaces—to interconnect and be managed as a single device. The single device—the Junos Fusion Enterprise—simplifies the network topology by functioning as one large, port-dense device that supports up to 6,000 access interfaces, runs Junos OS, appears to the larger network as a single switch, and is managed from a single point using as few as one management IP address.

Other advantages of Junos Fusion Enterprise include investment protection because you can build a Junos Fusion Enterprise with equipment that you may have previously purchased for other networking purposes, enhanced scalability because switches providing additional access ports can be easily added to the Junos Fusion Enterprise as your Enterprise campus network grows, and preservation of address space since you can assign one management IP address to the entire Junos Fusion Enterprise instead of assigning management IP addresses to multiple standalone switches.

In this network configuration example, an Enterprise network with two large campus buildings and one remote branch office uses a Junos Fusion Enterprise to unite the enterprise network architecture into a single, easy-to-manage topology that appears to the larger network as one device. The Junos Fusion Enterprise topology includes a dual aggregation device setup that uses satellite device clustering in the two main campus buildings to provide an illustration of how to configure dual aggregation devices and satellite device clusters in a Junos Fusion Enterprise. A branch office that is not participating in the Junos Fusion Enterprise is also included in the Enterprise campus topology, to show how a device not participating in the Junos Fusion Enterprise topology can still participate as an access switch in an Enterprise campus network.

Junos Fusion Enterprise is typically used in large-scale Enterprise campus networks that support a large number of networking devices. The topology used in this network configuration example would only support a limited number of networking devices and would be smaller in scale than a typical Junos Fusion Enterprise setup. This smaller-scale topology was designed intentionally for readability purposes; we felt we could best exemplify the configuration concepts and procedures of a sample Junos Fusion Enterprise in a smaller-scale topology.

Related Documentation

- Junos Fusion Enterprise Feature Guide
- Junos Fusion Enterprise Day One Poster
- Technical Overview on page 7
- Example: Enabling Junos Fusion Enterprise on an Enterprise Campus Network on page 13
Technical Overview

This section of the network configuration example provides an overview of the major components of a Junos Fusion Enterprise, and a brief description of how each component is applied in this network configuration example.

Aggregation and Satellite Devices

The two primary building blocks of any Junos Fusion topology are aggregation devices and satellite devices.

Aggregation devices:

- provide the point of management for all interfaces and devices in the Junos Fusion Enterprise. All configuration in a Junos Fusion Enterprise is done from the aggregation device.
- run Junos OS software.
- are one or two EX9200 switches in a Junos Fusion Enterprise.
- have at least one connection to each satellite device.
- are able to simultaneously provide ports to devices that are and are not participating in the Junos Fusion Enterprise.

In this network configuration example, two EX9208 switches act as aggregation devices in the Junos Fusion Enterprise topology.

Satellite devices:

- provide access interfaces in a Junos Fusion Enterprise.
- run satellite software that has the built-in intelligence to extend features on the Junos OS software running on the aggregation device onto the satellite device interfaces.
- have at least one connection to each aggregation device.

*Figure 1 on page 7* provides an illustration of a basic Junos Fusion Enterprise topology.

*Figure 1: Basic Junos Fusion Enterprise Topology*
In this network configuration example, EX4300-48T and EX4300-48P switches are used as satellite devices to provide access interfaces to the various buildings.

See Understanding Junos Fusion Enterprise Components for additional information on aggregation and satellite devices.

**Dual Aggregation Device Topology**

Junos Fusion Enterprise supports dual aggregation device topologies.

The advantages of a dual aggregation device topology include:

- **Load balancing.** Traffic traversing the Junos Fusion Enterprise can be load balanced across both aggregation devices.
- **Redundancy.** The Junos Fusion Enterprise can pass traffic even in the unexpected event of an aggregation device failure.

A Junos Fusion Enterprise supports multiple aggregation devices using Multichassis Link Aggregation (MC-LAG) groups and the Inter-Chassis Control Protocol (ICCP). A Junos Fusion Enterprise with dual aggregation devices is configured as an MC-LAG with one redundancy group. The redundancy group includes two peer chassis IDs—the aggregation devices—and all satellite devices in the Junos Fusion Enterprise. The aggregation devices are connected using an interchassis link (ICL) and an ICCP link in the MC-LAG topology.

Junos Fusion Enterprise supports automatic ICCP provisioning, which automatically configures ICCP in a dual aggregation device setup without any user action. Automatic ICCP provisioning is enabled by default and is often the preferred method of enabling ICCP for a Junos Fusion in greenfield deployments that are not being integrated into an existing network. Automatic ICCP provisioning is described in more detail in Understanding Automatic ICCP Provisioning and Automatic VLAN Provisioning of an Interchassis Link.

Many Junos Fusion Enterprise installations occur in brownfield deployments and the Junos Fusion Enterprise has to be integrated within an existing campus network. Brownfield deployments often have a need to maintain existing ICCP settings, in particular in scenarios where a Junos Fusion Enterprise is replacing an MC-LAG topology or is supporting a campus network that includes other MC-LAG topologies. This document provides a section on manual ICCP configuration for environments that require it.

**Figure 2 on page 9** provides an illustration of a complex Junos Fusion Enterprise setup that uses a dual aggregation device topology.

The topology provided in this network configuration example is a dual aggregation device topology, using two EX9208 switches as aggregation devices.

See Understanding Junos Fusion Enterprise Components for additional information on dual aggregation device topologies.

**Satellite Device Clusters**

Satellite device clustering allows you to connect up to ten satellite devices into a single cluster, and connect the satellite device cluster to the aggregation device as a single group instead of as individual satellite devices.
Satellite device clustering is particularly useful in scenarios where optical cabling options between buildings are limited and in scenarios where you want to preserve optical interfaces for other purposes. If you have, for instance, two buildings that have limited optical interfaces between each other and you want to put an aggregation device in one building and ten satellite devices in the other building, you can group the ten satellite devices into a cluster and connect the cluster to the aggregation device with a single cable.

Figure 2 on page 9 provides an illustration of a more complex Junos Fusion Enterprise topology that is using satellite device clustering and dual aggregation devices.

Satellite device clusters include uplink ports—ports that connect a satellite device in a cluster to an aggregation device—and clustering ports—ports that interconnect two satellite devices in a cluster.

Cluster interfaces are typically 10-Gbps SFP+ interfaces. 10-Gbps SFP+ and 40-Gbps QSFP+ interfaces can be used as default cluster interfaces. Other interfaces can be used as cluster interfaces but require additional configuration because they are not usable as cluster interfaces by default. See the Default Uplink Interfaces for Junos Fusion Enterprise Satellite Devices table for a full list of 10-Gbps SFP+ and 40-Gbps QSFP+ interfaces on satellite devices that are default cluster interfaces. See Configuring Uplink Port Policies for additional information on configuring a non-default cluster interface into a cluster interface.

In this network configuration example, building 1 uses a satellite device cluster with six member satellite devices and building 2 uses a satellite device cluster with three member satellite devices. The building 1 satellite device cluster has two member satellite devices with uplinks to both aggregation devices; the building 2 satellite device cluster has one member satellite device with uplinks to both aggregation devices. Only default clustering policies are used in this network configuration example.
See Understanding Satellite Device Clustering in a Junos Fusion for additional information on satellite device clustering.

FPC Identifiers in a Junos Fusion

In a Junos Fusion, each satellite device—including each member satellite device in a satellite device cluster—must have a Flexible PIC Concentrator identifier (FPC ID). The FPC ID is in the range of 65-254, and is used for Junos Fusion configuration, monitoring, and maintenance. Interface names—which are identified using the type-fpc / pic / port format—use the FPC ID as the fpc variable when the satellite device is participating in a Junos Fusion. For instance, built-in port 2 on PIC 0 of a satellite device—a Gigabit Ethernet interface on a satellite device that is using 101 as its FPC ID—uses ge-101/0/2 as its interface name.

See Understanding Junos Fusion Enterprise Components for additional information on FPC ID numbers in a Junos Fusion Enterprise.

Satellite Software Upgrade Groups

A satellite software upgrade group is a group of satellite devices that are designated to upgrade to the same satellite software version using the same satellite software package. The two most common methods of installing satellite software—autoconverting a device into a satellite device when it is cabled to an aggregation device and manually converting a device that is cabled into an aggregation device into a satellite device—require the presence of a configured satellite software upgrade group.

For standalone satellite devices—satellite devices that are not part of a satellite device cluster—you must configure a satellite software upgrade group and add the standalone satellite device or devices to the satellite software upgrade group.

For satellite devices in satellite device clusters, a software upgrade group matching the name of the satellite device cluster is automatically created.

In this network configuration example, the two satellite device clusters each have their own automatically-created satellite device software upgrade group while a user-created satellite software upgrade group is created for the satellite device in branch office 1. Autoconversion—which installs satellite software onto a satellite device when it is connected into the Junos Fusion using a properly-enabled cascade port—is used to install satellite software in this network configuration example.

See Understanding Software in a Junos Fusion Enterprise for additional information for satellite software upgrade groups.

Software Requirements

Both aggregation devices in this network configuration example run Junos OS Release 17.2R1, and all satellite devices run satellite software version 3.1R1. We strongly recommend that both aggregation devices in a Junos Fusion Enterprise run the same version of Junos OS.

You can see software version compatibility information for any Junos Fusion Enterprise using the Junos Fusion Hardware and Software Compatibility Matrices.
You can see detailed information regarding hardware and software support for any Junos Fusion Enterprise in the Understanding Junos Fusion Enterprise Software and Hardware Requirements document.

This network configuration example walks users through the satellite software installation process as part of the Junos Fusion Enterprise setup. An appendix is also provided that provides software upgrade instructions for various software upgrades—including Junos OS upgrades on aggregation devices and converting a satellite switch running satellite software into a standalone switch running Junos OS—in a Junos Fusion Enterprise. See “Appendix: Software Conversion and Upgrades in a Junos Fusion Enterprise” on page 68.

Cascade, Uplink, and Extended Ports

A cascade port is a port on an aggregation device that sends and receives control and network traffic from an attached satellite device or satellite device cluster. All traffic passed between a satellite device or cluster and the aggregation device in a Junos Fusion traverses the cascade port.

An uplink port is a port on a satellite device that connects a satellite device or a satellite device cluster to an aggregation device. Uplink ports have to carry large amounts of traffic between endpoint devices and the aggregation device and are typically 10-Gbps or 40-Gbps interfaces. Any interface on a satellite device, however, can be used as an uplink port.

An extended port in a Junos Fusion Enterprise is an access port—a port that connects an end user device such as a PC, phone, wireless access point (WAP or other endpoint device)—on a satellite device. Any port on a satellite device can be used as an extended port.

Figure 3 on page 11 illustrates the location of these ports in a Junos Fusion Enterprise.

Figure 3: Junos Fusion Enterprise Ports

In this network configuration example, an EX9200-6QS line card (6-port 40-Gigabit Ethernet QSFP+, 24-port 10-Gigabit Ethernet SFP+ line card) is installed in slot 0 of each aggregation device. All of the cascade ports on both aggregation devices are on this line card. The uplink ports for satellite device cluster building 1 are on the satellite devices using FPC 102 and 105. The uplink ports for satellite device cluster building 2 are on FPC 112. FPC 121 is a standalone satellite device that has its own uplink port to the aggregation devices.
See Understanding Junos Fusion Enterprise Components for additional information on cascade, uplink, and extended ports.

Configuration Synchronization on Aggregation Devices

In a Junos Fusion Enterprise using a dual aggregation device topology, either aggregation device can be used to configure features on extended ports.

The configuration of extended ports in a Junos Fusion Enterprise should always match between aggregation devices in order to prevent unpredictable or unwanted network behavior on an extended port.

You can ensure configuration synchronization between aggregation devices by manually entering each extended port configuration command identically on each aggregation device. In this network configuration example, Power over Ethernet (PoE), Link Layer Discovery Protocol (LLDP), and Link Layer Discovery Protocol–Media Endpoint Discovery (LLDP-MED) are all configured manually on each aggregation device.

A more efficient method of ensuring extended port configuration synchronization is through the use of commitment synchronization and configuration groups. You can configure the aggregation devices as commit peers and synchronize all configurations in groups to both aggregation devices, which allows you to configure the extended port configuration once instead of manually repeating the configuration on each aggregation device.

The available group configuration options are beyond the scope of this document; see Understanding MC-LAG Configuration Synchronization and Synchronizing and Committing MC-LAG Configurations for additional information on using group configurations in an MC-LAG topology and Network Configuration Example: Configuring MC-LAG on EX9200 Switches in the Core for Campus Networks for a detailed example of an MC-LAG topology that uses group configurations. This network configuration example provides one method of using groups to synchronize configuration between aggregation devices. See Configuring Aggregation Devices as Peers for Configuration Synchronization, and also note that the VLAN configuration in this network configuration example uses the configuration group to synchronize VLAN configuration to both aggregation devices.

Many features in this guide are configured in groups and shared between aggregation devices using commitment synchronization.

Understanding Local Switching On a Satellite Device in a Junos Fusion Enterprise

All traffic originating from an endpoint device in a Junos Fusion Enterprise is sent to the aggregation devices for forwarding. Local switching from a satellite device—the ability for a satellite device to recognize that it has received traffic destined for one of its extended ports and forwarding it onward without passing the traffic to the aggregation device—is not currently supported in Junos Fusion Enterprise.

Understanding Routing Protocols in a Junos Fusion Enterprise

The network ports on an EX9200 switch acting as an aggregation device in a Junos Fusion Enterprise support the same routing protocols as any other EX9200 switch. See the Layer 3 protocols section on the Junos OS for EX9200 Switches portal.
Traffic is moved between Layer 2 and Layer 3 in this network configuration example using integrated routing and bridging (IRB) interfaces on aggregation devices. See the Adding Layer 3 Support to a Junos Fusion Enterprise section of this network configuration example.

Extended ports in a Junos Fusion Enterprise cannot be configured as Layer 3 ports and cannot, therefore, send or receive Layer 3 traffic.

Junos Fusion Enterprise Hardware and Software Support

A Junos Fusion Enterprise runs Junos OS software on the aggregation devices and satellite software on the satellite devices. The Junos OS and satellite software must be compatible for the Junos Fusion Enterprise to operate.

Additionally, a switch acting as a satellite device must be running a minimum version of Junos OS software before it can be converted into a satellite device.

See Junos Fusion Hardware and Software Compatibility Matrices for software version compatibility information for any Junos Fusion Enterprise.

See Understanding Junos Fusion Enterprise Software and Hardware Requirements for detailed information regarding hardware and software support for any Junos Fusion Enterprise.

Junos Fusion Enterprise Feature Support

A list of available features for Junos Fusion Enterprise is available using the Feature Explorer tool.

To view the list of features supported on Junos Fusion Enterprise in Junos OS Release 17.2R1, see Features Supported in Junos OS 17.2R1 on Junos Fusion Enterprise.

To search the features available in other versions of Junos Fusion Enterprise, select Junos Fusion Enterprise from the Switching products page in Feature Explorer. Select your desired Junos OS Release from the Supported Releases menu.

Related Documentation

- Junos Fusion Enterprise Feature Guide
- About This Network Configuration Example on page 5
- Use Case Overview on page 5
- Example: Enabling Junos Fusion Enterprise on an Enterprise Campus Network on page 13

Example: Enabling Junos Fusion Enterprise on an Enterprise Campus Network

This network configuration example illustrates how to:

- Configure a complex Junos Fusion Enterprise for an Enterprise network with satellite devices that provide access interfaces at multiple sites and branch offices.
- Configure commonly-used features for the Enterprise network—VLANs, Power over Ethernet, and LLDP—in the Junos Fusion Enterprise.
This topic covers:

- Requirements on page 14
- Overview and Topology on page 14
- Configuring the Junos Fusion Enterprise on page 20
- Connecting the EX9200 Switch to the EX3300 Access Switch That Is Not Participating in the Junos Fusion Enterprise on page 41
- Configuring Features on the Junos Fusion Enterprise on page 44
- Verification on page 65

Requirements

This example uses the following hardware and software components for the Junos Fusion Enterprise:

- Two EX9208 switches as aggregation devices, each running Junos OS Release 17.2R1.
- Ten total satellite devices in three different buildings, all running satellite software version 3.1R1.
  - Building 1: satellite device cluster with six member satellite devices.
  - Building 2: satellite device cluster with three member satellite devices.
  - Branch office 1: a single standalone satellite device.
- One EX3300 switch in branch office 2, running Junos OS Release 12.3R2 and connected to one of the EX9208 aggregation device switches without participating in the Junos Fusion Enterprise topology.

Overview and Topology

In this example, a Junos Fusion Enterprise is used to provide access ports for a campus network that includes two main buildings—one main building with six total switches and a second main building with three total switches—and a small branch office location that supports a single switch. All switches in the Junos Fusion Enterprise are dual-homed to two EX9208 switches acting as aggregation devices.

The enterprise network topology includes a second branch office that uses an EX3300 switch that isn't participating in the Junos Fusion Enterprise—the EX3300 switch runs Junos OS software, not satellite software—to connect its users to the network. The EX3300 switch supports a limited number of users in branch office 2, and connects to aggregation device 2 only to simplify the network and save on cabling costs. The EX3300 switch can connect to this EX9200 switch because EX9200 switches are able to simultaneously provide ports to devices that are and are not part of a Junos Fusion.

The Junos Fusion Enterprise topology provides redundancy through a dual aggregation device topology where both aggregation devices are in separate off-campus buildings. Satellite device clusters are used for the satellite devices in the two main campus buildings to minimize cabling requirements and costs for aggregation device to satellite device connections.
The EX4300-48P and EX4300-48T switches in building 1, building 2, and branch office 1 provide access interfaces for users in those buildings. The topology includes an IRB interface on both aggregation devices that provides Layer 3 connectivity. Other commonly used campus networking features—VLANs, 802.1X, Power over Ethernet, LLDP, and other features—are enabled in the campus network that the Junos Fusion Enterprise is supporting.

Figure 4 on page 15 shows a high-level overview of the topology used in this example.

Both aggregation devices in this topology are EX9208 switches with an EX9200-6QS (6-port 40-Gigabit Ethernet QSFP+, 24-port 10-Gigabit Ethernet SFP+) line card installed in slot 0. The aggregation devices are interconnected using an interchassis link (ICL) and a dedicated ICCP link. Both aggregation devices are running Junos OS Release 17.2R1.
**Table 1: Aggregation Devices**

<table>
<thead>
<tr>
<th>Hostname</th>
<th>Switch Model</th>
<th>Line Cards</th>
<th>Cascade Ports</th>
<th>Interchassis link (ICL) Ports</th>
<th>ICCP Link Ports</th>
<th>Junos OS version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ad1-ex9208</td>
<td>EX9208</td>
<td>Slot 0: EX9200-6QS (6-port 40-Gigabit Ethernet QSFP+, 24-port 10-Gigabit Ethernet SFP+ line card)</td>
<td>et-0/2/0: FPC 102 (building1 cluster)</td>
<td>et-0/3/1: Aggregation Device 2</td>
<td>et-0/3/0: Aggregation Device 2</td>
<td>17.2R1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1: FPC 105 (building1 cluster)</td>
<td>et-0/3/2: Aggregation Device 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/2: FPC 112 (building2 cluster)</td>
<td>et-0/3/1 and et-0/3/2 are the member links in ae100.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>xe-0/0/0: FPC 121</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ad2-ex9208</td>
<td>EX9208</td>
<td>Slot 0: EX9200-6QS (6-port 40-Gigabit Ethernet QSFP+, 24-port 10-Gigabit Ethernet SFP+ line card)</td>
<td>et-0/2/0: FPC 102 (building1 cluster)</td>
<td>et-0/3/1: Aggregation Device 1</td>
<td>et-0/3/0: Aggregation Device 1</td>
<td>17.2R1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1: FPC 105 (building1 cluster)</td>
<td>et-0/3/2: Aggregation Device 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/2: FPC 112 (building2 cluster)</td>
<td>et-0/3/1 and et-0/3/2 are the member links in ae100.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>xe-0/0/0: FPC 121</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Junos Fusion Enterprise topology includes three sites—building 1, building 2, and branch office 1—with satellite devices that provide access ports to end users. Building 1 includes six total satellite devices interconnected into a satellite device cluster. Two satellite devices in the cluster—FPC ID 102 and 105—use 40-Gbps+ QSFP connections to connect to each aggregation device. Building 2 includes three satellite devices interconnected into a satellite device cluster that connect to the aggregation devices through FPC ID 112. Branch office 1 includes one satellite device—FPC ID 121—configured as a standalone satellite device.

The satellite device connections are presented in Figure 5 on page 17 and Figure 6 on page 17. Figure 6 on page 17 also shows the connections that connect the EX3300 switch running Junos OS in branch office 2 to the EX9208 switch that also functions as aggregation device 2, although the EX3300 switch is not a satellite device in the Junos Fusion Enterprise.
The satellite devices in the Junos Fusion topology are all in building 1, building 2, or branch office 1. All satellite devices in the topology are EX4300-48P or EX4300-48T switches running satellite software version 3.1R1. In building 1, all satellite devices in the satellite device cluster pass traffic to the aggregation device through FPC 102 or FPC 105, which are the two switches with uplink port connections to the aggregation devices. In building 2, all traffic is passed to the aggregation devices through FPC 112, which is the only device in the cluster with uplink port connections to the aggregation devices. FPC 121 is a standalone satellite device to provide access ports to branch office 1.

**Table 2: Satellite Devices**

<table>
<thead>
<tr>
<th>FPC ID</th>
<th>Switch Model</th>
<th>System ID</th>
<th>Uplink Ports</th>
<th>Clustering Ports</th>
<th>Satellite Software Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>EX4300-48P</td>
<td>00:00:5E:00:53:A1</td>
<td>No uplink ports</td>
<td>xe-0/1/2: FPC 106, xe-0/1/3: FPC 102</td>
<td>3.1R1</td>
</tr>
<tr>
<td>102</td>
<td>EX4300-48P</td>
<td>00:00:5E:00:53:A2</td>
<td>et-0/1/0: Aggregation Device 1, et-0/1/1: Aggregation Device 2.</td>
<td>xe-0/1/2: FPC 101, xe-0/1/3: FPC 103</td>
<td>3.1R1</td>
</tr>
<tr>
<td>103</td>
<td>EX4300-48P</td>
<td>00:00:5E:00:53:A3</td>
<td>No uplink ports</td>
<td>xe-0/1/2: FPC 102, xe-0/1/3: FPC 104</td>
<td>3.1R1</td>
</tr>
<tr>
<td>104</td>
<td>EX4300-48T</td>
<td>00:00:5E:00:53:A4</td>
<td>No uplink ports</td>
<td>xe-0/1/2: FPC 103, xe-0/1/3: FPC 105</td>
<td>3.1R1</td>
</tr>
<tr>
<td>105</td>
<td>EX4300-48T</td>
<td>00:00:5E:00:53:A5</td>
<td>et-0/1/0: Aggregation Device 1, et-0/1/1: Aggregation Device 2.</td>
<td>xe-0/1/2: FPC 104, xe-0/1/3: FPC 106</td>
<td>3.1R1</td>
</tr>
<tr>
<td>106</td>
<td>EX4300-48T</td>
<td>00:00:5E:00:53:A6</td>
<td>No uplink ports</td>
<td>xe-0/1/2: FPC 105, xe-0/1/3: FPC 101</td>
<td>3.1R1</td>
</tr>
<tr>
<td>111</td>
<td>EX4300-48P</td>
<td>00:00:5E:00:53:B1</td>
<td>No uplink ports</td>
<td>xe-0/1/2: FPC 113, xe-0/1/3: FPC 112</td>
<td>3.1R1</td>
</tr>
</tbody>
</table>
Table 2: Satellite Devices (continued)

<table>
<thead>
<tr>
<th>SD Cluster</th>
<th>SW Model</th>
<th>MAC Address</th>
<th>Uplink Ports</th>
<th>E-Series Ports</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>112</td>
<td>EX4300-48P</td>
<td>00:00:5E:00:53:B2</td>
<td>et-0/1/0: Aggregation Device 1</td>
<td>xe-0/1/2: FPC 111, xe-0/1/3: FPC 112</td>
<td>3.1R1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/1/1: Aggregation Device 2.</td>
<td>xE-0/1/3: FPC 113</td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>EX4300-48P</td>
<td>00:00:5E:00:53:B3</td>
<td>No uplink ports</td>
<td>xe-0/1/2: FPC 112, xe-0/1/3: FPC 111</td>
<td>3.1R1</td>
</tr>
</tbody>
</table>

Branch Office 1: Standalone Satellite Device

<table>
<thead>
<tr>
<th>SD Cluster</th>
<th>SW Model</th>
<th>MAC Address</th>
<th>E-Series Ports</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>121</td>
<td>EX4300-48P</td>
<td>00:00:5E:00:53:C1</td>
<td>xe-0/1/0: Aggregation Device 1</td>
<td>Not applicable 3.1R1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>xe-0/1/1: Aggregation Device 2.</td>
<td></td>
</tr>
</tbody>
</table>

The satellite device clusters are shown in Figure 7 on page 19.

Figure 7: Building 1 and 2 Satellite Device Clusters

The Enterprise campus topology also includes one standalone switch that is not participating in the Junos Fusion Enterprise, an EX3300 switch running Junos OS Release 12.3R2 that provides access ports to branch office 2. The EX3300 is connected to the EX9208 switch acting as aggregation device 2 using an aggregated Ethernet bundle.
**Table 3: Standalone Switches**

<table>
<thead>
<tr>
<th>Hostname</th>
<th>Switch Model</th>
<th>Interface connections</th>
<th>Junos OS Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>branch-office2-ex3300</td>
<td>EX3300</td>
<td>Aggregated ethernet bundle connection to aggregation device 2:</td>
<td>12.3R2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ae0:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• xe-0/1/0 (member link 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• xe-0/1/1 (member link 2)</td>
<td></td>
</tr>
</tbody>
</table>

**Configuring the Junos Fusion Enterprise**

This section provides the steps for configuring the Junos Fusion Enterprise on both aggregation devices.

It includes the following sections:

- Assigning FPC ID Numbers to Satellite Devices, Configuring the Satellite Device Clusters, and Enabling Automatic Satellite Conversion on page 20
- Creating the Cascade Ports on page 25
- Managing the Satellite Software Upgrade Groups on page 26
- Configuring Dual Aggregation Device Support on page 29
- Configuring the Interchassis Link (ICL) on page 32
- Configuring the Inter-Chassis Control Protocol (ICCP) Link on page 35
- Configuring the Inter-Chassis Control Protocol (ICCP) on page 36
- Preparing the Satellite Devices on page 39

**Assigning FPC ID Numbers to Satellite Devices, Configuring the Satellite Device Clusters, and Enabling Automatic Satellite Conversion**

**CLI Quick Configuration**

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level of the specified aggregation device, and then enter commit from configuration mode.

**Aggregation device 1:**

```
[edit]
set chassis satellite-management cluster building1 cluster-id 1
set chassis satellite-management cluster building2 cluster-id 2
set chassis satellite-management cluster building1 fpc 101 member-id 1 system-id 00:00:5E:00:53:A1
set chassis satellite-management cluster building1 fpc 102 member-id 2 system-id 00:00:5E:00:53:A2
set chassis satellite-management cluster building1 fpc 103 member-id 3 system-id 00:00:5E:00:53:A3
set chassis satellite-management cluster building1 fpc 104 member-id 4 system-id 00:00:5E:00:53:A4
set chassis satellite-management cluster building1 fpc 105 member-id 5 system-id 00:00:5E:00:53:A5
```
set chassis satellite-management cluster building1 fpc 106 member-id 6 system-id 00:00:5E:00:53:A6
set chassis satellite-management cluster building2 fpc 111 member-id 1 system-id 00:00:5E:00:53:B1
set chassis satellite-management cluster building2 fpc 112 member-id 2 system-id 00:00:5E:00:53:B2
set chassis satellite-management cluster building2 fpc 113 member-id 3 system-id 00:00:5E:00:53:B3
set chassis satellite-management fpc 121 system-id 00:00:5E:00:53:C1
set chassis satellite-management cluster building1 cascade-ports [et-0/2/0 et-0/2/1]
set chassis satellite-management cluster building2 cascade-ports et-0/2/2
set chassis satellite-management fpc 121 cascade-ports xe-0/0/0
set chassis satellite-management auto-satellite-conversion satellite 101-121

Aggregation device 2:

[edit]
set chassis satellite-management cluster building1 cluster-id 1
set chassis satellite-management cluster building2 cluster-id 2
set chassis satellite-management cluster building1 fpc 101 member-id 1 system-id 00:00:5E:00:53:A1
set chassis satellite-management cluster building1 fpc 102 member-id 2 system-id 00:00:5E:00:53:A2
set chassis satellite-management cluster building1 fpc 103 member-id 3 system-id 00:00:5E:00:53:A3
set chassis satellite-management cluster building1 fpc 104 member-id 4 system-id 00:00:5E:00:53:A4
set chassis satellite-management cluster building1 fpc 105 member-id 5 system-id 00:00:5E:00:53:A5
set chassis satellite-management cluster building1 fpc 106 member-id 6 system-id 00:00:5E:00:53:A6
set chassis satellite-management cluster building2 fpc 111 member-id 1 system-id 00:00:5E:00:53:B1
set chassis satellite-management cluster building2 fpc 112 member-id 2 system-id 00:00:5E:00:53:B2
set chassis satellite-management cluster building2 fpc 113 member-id 3 system-id 00:00:5E:00:53:B3
set chassis satellite-management fpc 121 system-id 00:00:5E:00:53:C1
set chassis satellite-management cluster building1 cascade-ports [et-0/2/0 et-0/2/1]
set chassis satellite-management cluster building2 cascade-ports et-0/2/2
set chassis satellite-management fpc 121 cascade-ports xe-0/0/0
set chassis satellite-management auto-satellite-conversion satellite 101-121
Step-by-Step Procedure

To assign FPC ID numbers to satellite devices, configure the satellite device clusters, and enable automatic satellite conversion:

1. Create the satellite device clusters, and associate each satellite device cluster with a cluster ID:

   **Aggregation device 1:**
   
   [edit chassis satellite-management]
   user@ad1-ex9208# set cluster building1 cluster-id 1
   user@ad1-ex9208# set cluster building2 cluster-id 2

   **Aggregation device 2:**
   
   [edit chassis satellite-management]
   user@ad2-ex9208# set cluster building1 cluster-id 1
   user@ad2-ex9208# set cluster building2 cluster-id 2

2. Associate each satellite device in the building1 cluster with a cluster member ID number and an FPC ID:

   **Aggregation device 1:**
   
   [edit chassis satellite-management]
   user@ad1-ex9208# set cluster building1 fpc 101 member-id 1 system-id 00:00:5E:00:53:A1
   user@ad1-ex9208# set cluster building1 fpc 102 member-id 2 system-id 00:00:5E:00:53:A2
   user@ad1-ex9208# set cluster building1 fpc 103 member-id 3 system-id 00:00:5E:00:53:A3
   user@ad1-ex9208# set cluster building1 fpc 104 member-id 4 system-id 00:00:5E:00:53:A4
   user@ad1-ex9208# set cluster building1 fpc 105 member-id 5 system-id 00:00:5E:00:53:A5
   user@ad1-ex9208# set cluster building1 fpc 106 member-id 6 system-id 00:00:5E:00:53:A6

   **Aggregation device 2:**
   
   [edit chassis satellite-management]
   user@ad2-ex9208# set cluster building1 fpc 101 member-id 1 system-id 00:00:5E:00:53:A1
   user@ad2-ex9208# set cluster building1 fpc 102 member-id 2 system-id 00:00:5E:00:53:A2
   user@ad2-ex9208# set cluster building1 fpc 103 member-id 3 system-id 00:00:5E:00:53:A3
   user@ad2-ex9208# set cluster building1 fpc 104 member-id 4 system-id 00:00:5E:00:53:A4
   user@ad2-ex9208# set cluster building1 fpc 105 member-id 5 system-id 00:00:5E:00:53:A5
   user@ad2-ex9208# set cluster building1 fpc 106 member-id 6 system-id 00:00:5E:00:53:A6

3. Associate each satellite device in the building2 cluster with a cluster member ID number and an FPC ID:

   **Aggregation device 1:**
   
   [edit chassis satellite-management]
   user@ad1-ex9208# set cluster building2 fpc 111 member-id 1 system-id 00:00:5E:00:53:B1
   user@ad1-ex9208# set cluster building2 fpc 112 member-id 2 system-id 00:00:5E:00:53:B2
   user@ad1-ex9208# set cluster building2 fpc 113 member-id 3 system-id 00:00:5E:00:53:B3

   **Aggregation device 2:**
   
   [edit chassis satellite-management]
   user@ad2-ex9208# set cluster building2 fpc 111 member-id 1 system-id 00:00:5E:00:53:B1
   user@ad2-ex9208# set cluster building2 fpc 112 member-id 2 system-id 00:00:5E:00:53:B2
   user@ad2-ex9208# set cluster building2 fpc 113 member-id 3 system-id 00:00:5E:00:53:B3
4. Create an FPC ID for the standalone satellite switch in branch office 1:

   **Aggregation device 1:**

   [edit chassis satellite-management]
   user@ad1-ex9208# set fpc 121 system-id 00:00:5E:00:53:C1

   **Aggregation device 2:**

   [edit chassis satellite-management]
   user@ad2-ex9208# set fpc 121 system-id 00:00:5E:00:53:C1

5. Associate each satellite device cluster or standalone satellite device with a cascade port or ports.

   **Aggregation device 1:**

   [edit chassis satellite-management]
   user@ad1-ex9208# set cluster building1 cascade-ports [et-0/2/0 et-0/2/1]
   user@ad1-ex9208# set cluster building2 cascade-ports et-0/2/2
   user@ad1-ex9208# set fpc 121 cascade-ports xe-0/0/0

   **Aggregation device 2:**

   [edit chassis satellite-management]
   user@ad2-ex9208# set cluster building1 cascade-ports [et-0/2/0 et-0/2/1]
   user@ad2-ex9208# set cluster building2 cascade-ports et-0/2/2
   user@ad2-ex9208# set fpc 121 cascade-ports xe-0/0/0

   **NOTE:** This step associates standalone satellite devices or satellite device clusters with cascade ports. The procedure for configuring interfaces into cascade ports is provided later in this network configuration example.

6. Enable automatic satellite conversion for all configured satellite devices:

   **Aggregation device 1:**

   [edit chassis satellite-management]
   user@ad1-ex9208# set auto-satellite-conversion satellite 101-121

   **Aggregation device 2:**

   [edit chassis satellite-management]
   user@ad2-ex9208# set auto-satellite-conversion satellite 101-121

**Results**

From configuration mode, confirm your configuration by entering the `show chassis satellite-management` command individually on each aggregation device.
Output for aggregation device 1 only is provided below. The `show chassis satellite-management` output on aggregation device 2 should match this output.

```
user@ad1-ex9208# show chassis satellite-management
cluster building1 {
    cluster-id 1;
    cascade-ports [ et-0/2/0 et-0/2/1 ];
    fpc 101 {
        member-id 1;
        system-id 00:00:5e:00:53:a1;
    }
    fpc 102 {
        member-id 2;
        system-id 00:00:5e:00:53:a2;
    }
    fpc 103 {
        member-id 3;
        system-id 00:00:5e:00:53:a3;
    }
    fpc 104 {
        member-id 4;
        system-id 00:00:5e:00:53:a4;
    }
    fpc 105 {
        member-id 5;
        system-id 00:00:5e:00:53:a5;
    }
    fpc 106 {
        member-id 6;
        system-id 00:00:5e:00:53:a6;
    }
}
cluster building2 {
    cluster-id 2;
    cascade-ports et-0/2/2;
    fpc 111 {
        member-id 1;
        system-id 00:00:5e:00:53:b1;
    }
    fpc 112 {
        member-id 2;
        system-id 00:00:5e:00:53:b2;
    }
    fpc 113 {
        member-id 3;
        system-id 00:00:5e:00:53:b3;
    }
    fpc 121 {
        system-id 00:00:5e:00:53:c1;
        cascade-ports xe-0/0/0;
    }
} auto-satellite-conversion {
    satellite [ 101-121 ];
}
```

Enter `show chassis satellite-management` on aggregation device 2 to confirm the configuration on aggregation device 2.
Creating the Cascade Ports

**CLI Quick Configuration**

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

**Aggregation device 1:**

```
[edit]
set interfaces et-0/2/0 cascade-port description cascade-to-building1-fpc102
set interfaces et-0/2/1 cascade-port description cascade-to-building1-fpc105
set interfaces et-0/2/2 cascade-port description cascade-to-building2-fpc112
set interfaces xe-0/0/0 cascade-port description cascade-to-branch-office1-fpc121
```

**Aggregation device 2:**

```
[edit]
set interfaces et-0/2/0 cascade-port description cascade-to-building1-fpc102
set interfaces et-0/2/1 cascade-port description cascade-to-building1-fpc105
set interfaces et-0/2/2 cascade-port description cascade-to-building2-fpc112
set interfaces xe-0/0/0 cascade-port description cascade-to-branch-office1-fpc121
```

**Step-by-Step Procedure**

To create the cascade ports:

1. Configure the cascade ports.

   **Aggregation device 1:**

   ```
   [edit interfaces]
   user@ad1-ex9208# set et-0/2/0 cascade-port description cascade-to-building1-fpc102
   user@ad1-ex9208# set et-0/2/1 cascade-port description cascade-to-building1-fpc105
   user@ad1-ex9208# set et-0/2/2 cascade-port description cascade-to-building2-fpc112
   user@ad1-ex9208# set xe-0/0/0 cascade-port description cascade-to-branch-office1-fpc121
   ```

   **Aggregation device 2:**

   ```
   [edit interfaces]
   user@ad2-ex9208# set et-0/2/0 cascade-port description cascade-to-building1-fpc102
   user@ad2-ex9208# set et-0/2/1 cascade-port description cascade-to-building1-fpc105
   user@ad2-ex9208# set et-0/2/2 cascade-port description cascade-to-building2-fpc112
   user@ad2-ex9208# set xe-0/0/0 cascade-port description cascade-to-branch-office1-fpc121
   ```

**Results**

From configuration mode, confirm your configuration by entering the `show interfaces` command individually on each aggregation device.
Output for aggregation device 1 only is provided below. The `show interfaces` output on aggregation device 2 should match this output.

```
user@ad1-ex9208# show interfaces
xe-0/0/0 {
    description cascade-to-branch-office1-fpc121;
    cascade-port;
}
et-0/2/0 {
    description cascade-to-building1-fpc102;
    cascade-port;
}
et-0/2/1 {
    description cascade-to-building1-fpc105;
    cascade-port;
}
et-0/2/2 {
    description cascade-to-building2-fpc112;
    cascade-port;
}
```

Managing the Satellite Software Upgrade Groups

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level:

**Aggregation device 1:**

```
[edit]
set chassis satellite-management upgrade-groups standalone-satellite-devices satellite 121
commit and-quit synchronize
```

**Aggregation device 2:**

```
[edit]
set chassis satellite-management upgrade-groups standalone-satellite-devices satellite 121
commit and-quit synchronize
```

To complete this quick configuration, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the operational mode prompt (>):

**Aggregation device 1:**

```
request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group building1
request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group building2
```
Satellite software upgrade groups that inherit the name of the satellite device cluster are automatically created for satellite device clusters. Satellite software upgrade groups must be created for standalone satellite devices.

This procedure associates satellite software with the automatically-created software upgrade groups for the satellite device clusters, and creates a new satellite software upgrade group for all standalone satellite devices in the topology.

Before you begin:

- Copy the satellite software 3.1R1 image onto the EX9208 switches. You can navigate to the satellite software starting from the Junos Fusion Hardware and Software Compatibility Matrices.

File copying options are beyond the scope of this network configuration example. These instructions assume a satellite software image has been installed to the var/tmp directory on each aggregation device.

1. Create a satellite software upgrade group named `standalone-satellite-devices` and associate FPC ID 121—the only standalone satellite device in the topology—with the satellite software upgrade group:

   **Aggregation device 1:**

   ```
   [edit chassis satellite-management]
   user@ad1-ex9208# set upgrade-groups standalone-satellite-devices satellite 121
   ```

   **Aggregation device 2:**

   ```
   [edit chassis satellite-management]
   user@ad2-ex9208# set upgrade-groups standalone-satellite-devices satellite 121
   ```

2. Commit the configuration to both Routing Engines:

   **Aggregation device 1:**

   ```
   [edit]
   user@ad1-ex9208# commit and-quit synchronize
   ```

   **Aggregation device 2:**

   ```
   [edit]
   ```
user@ad2-ex9208# commit and-quit synchronize

3. Start the upgrade by associating all satellite software upgrade groups with the satellite software version 3.1R1 image:

NOTE: These instructions assume the satellite software has already been downloaded to the /var/tmp folder on each EX9208 switch.

Aggregation device 1:

user@ad1-ex9208> request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group building1
user@ad1-ex9208> request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group building2
user@ad1-ex9208> request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group standalone-satellite-devices

Aggregation device 2:

user@ad2-ex9208> request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group building1
user@ad2-ex9208> request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group building2
user@ad2-ex9208> request system software add /var/tmp/satellite-3.1R1.4-signed.tgz upgrade-group standalone-satellite-devices

Results

From configuration mode, confirm the user-configured satellite software upgrade group is configured by entering the `show chassis satellite-management upgrade-groups` command individually on each aggregation device.

user@ad1-ex9208# show chassis satellite-management upgrade-groups
standalone-satellite-devices {
    satellite 121;
}

user@ad2-ex9208# show chassis satellite-management upgrade-groups
standalone-satellite-devices {
    satellite 121;
}

Verify that the satellite software installation was successful for each software upgrade group by entering the `show chassis satellite software` command to confirm the running satellite software versions:
NOTE: The `show chassis satellite software` command generates output only after the satellite software upgrades are complete. If you enter the `show chassis satellite software` command and no output is generated, consider re-entering the command in a few minutes.

```
user@ad1-ex9208> show chassis satellite software
Version                         Platforms           Group
3.1R1.4                         i386 ppc            building1
building2
standalone-satellite-devices

user@ad2-ex9208> show chassis satellite software
Version                         Platforms           Group
3.1R1.4                         i386 ppc            building1
building2
standalone-satellite-devices
```

Configuring Dual Aggregation Device Support

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

**Aggregation device 1:**
```
[edit]
delete chassis satellite-management single-home
set chassis satellite-management redundancy-groups chassis-id 1
set chassis satellite-management redundancy-groups enterprise-campus-network redundancy-group-id 1
set chassis satellite-management redundancy-groups enterprise-campus-network cluster building1
set chassis satellite-management redundancy-groups enterprise-campus-network cluster building2
set chassis satellite-management redundancy-groups enterprise-campus-network satellite 121
set interfaces ae100 unit 0 family ethernet-switching interface-mode trunk
set interfaces ae100 unit 0 family ethernet-switching vlan members v10
```

**Aggregation device 2:**
```
[edit]
delete chassis satellite-management single-home
set chassis satellite-management redundancy-groups chassis-id 2
set chassis satellite-management redundancy-groups enterprise-campus-network redundancy-group-id 1
set chassis satellite-management redundancy-groups enterprise-campus-network satellite 121
```
To configure dual aggregation device support:

1. (Optional unless single-home was previously configured) Delete single home configuration mode on each EX9208 switch to ensure single-home configuration is disabled:

   **Aggregation device 1:**
   ```
   [edit chassis satellite-management]
   user@ad1-ex9208# delete single-home
   ```

   **Aggregation device 2:**
   ```
   [edit chassis satellite-management]
   user@ad2-ex9208# delete single-home
   ```

2. Define the chassis ID number of each aggregation device:

   **Aggregation device 1:**
   ```
   [edit chassis satellite-management redundancy-groups]
   user@ad1-ex9208# set chassis-id 1
   ```

   **Aggregation device 2:**
   ```
   [edit chassis satellite-management redundancy-groups]
   user@ad2-ex9208# set chassis-id 2
   ```

3. Create the satellite management redundancy group:

   **Aggregation device 1:**
   ```
   [edit chassis satellite-management redundancy-groups]
   user@ad1-ex9208# set enterprise-campus-network redundancy-group-id 1
   ```

   **Aggregation device 2:**
   ```
   [edit chassis satellite-management redundancy-groups]
   user@ad2-ex9208# set enterprise-campus-network redundancy-group-id 1
   ```

4. Define the satellite devices and satellite device clusters that are part of the redundancy group.

   **Aggregation device 1:**
   ```
   [edit chassis satellite-management redundancy-groups]
   user@ad1-ex9208# set enterprise-campus-network cluster building1
   user@ad1-ex9208# set enterprise-campus-network cluster building2
   user@ad1-ex9208# set enterprise-campus-network satellite 121
   ```
Aggregation device 2:

```
[edit chassis satellite-management redundancy-groups]
user@ad2-ex9208# set enterprise-campus-network cluster building1
user@ad2-ex9208# set enterprise-campus-network cluster building2
user@ad2-ex9208# set enterprise-campus-network satellite 121
```

5. Configure the interface on each side of the ICL as a trunk interface, and make each interface a member of at least one VLAN.

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set interfaces ae100 unit 0 family ethernet-switching interface-mode trunk
user@ad1-ex9208# set interfaces ae100 unit 0 family ethernet-switching vlan members v10
```

Aggregation device 2:

```
[edit]
user@ad2-ex9208# set interfaces ae100 unit 0 family ethernet-switching interface-mode trunk
user@ad2-ex9208# set interfaces ae100 unit 0 family ethernet-switching vlan members v10
```

**Results**  
From configuration mode, confirm your configuration by entering the `show chassis satellite-management redundancy-groups` command on each aggregation device.

Aggregation device 1:

```
user@ad1-ex9208# show chassis satellite-management redundancy-groups
chassis-id 1;
enterprise-campus-network {
    redundancy-group-id 1;
satellite 121;
    cluster building1;
    cluster building2;
}
```

Aggregation device 2:

```
user@ad2-ex9208# show chassis satellite-management redundancy-groups
chassis-id 2;
enterprise-campus-network {
    redundancy-group-id 1;
satellite 121;
    cluster building1;
    cluster building2;
}
```

Confirm the trunk mode interface configuration by entering the `show interfaces ae100` command on each aggregation device.
Aggregation device 1:

```
user@ad1-ex9208# show interfaces ae100
unit 0 {
    family ethernet-switching {
        interface-mode trunk;
        vlan {
            members all;
        }
    }
}
```

Aggregation device 2:

```
user@ad2-ex9208# show interfaces ae100
unit 0 {
    family ethernet-switching {
        interface-mode trunk;
        vlan {
            members all;
        }
    }
}
```

### Configuring the Interchassis Link (ICL)

**CLI Quick Configuration**

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

**Aggregation device 1:**

```
[edit]
set groups ICL-CONFIG when peers [ad1-ex9208 ad2-ex9208]
set apply-groups ICL-CONFIG
set groups ICL-CONFIG chassis aggregated-devices ethernet device-count 2
set groups ICL-CONFIG interfaces ae100 description icl-link
set groups ICL-CONFIG interfaces et-0/3/1 ether-options 802.3ad ae100
set groups ICL-CONFIG interfaces et-0/3/2 ether-options 802.3ad ae100
set groups ICL-CONFIG interfaces ae100 aggregated-ether-options lacp active
set groups ICL-CONFIG interfaces ae100 aggregated-ether-options lacp periodic fast
set chassis satellite-management redundancy-groups enterprise-campus-network peer-chassis-id 2 inter-chassis-link ae100
```

**Aggregation device 2:**

```
[edit]
set apply-groups ICL-CONFIG
set chassis satellite-management redundancy-groups enterprise-campus-network peer-chassis-id 1 inter-chassis-link ae100
```
Step-by-Step Procedure

An interchassis link (ICL), also known as the interchassis link-protection link (ICL-PL), is used to forward data traffic across MC-LAG peers. In a Junos Fusion Enterprise, the MC-LAG peers are the aggregation devices.

An ICL provides redundancy when a link failure occurs. We recommend that the ICL be an aggregated Ethernet interface in most environments deploying a Junos Fusion Enterprise, but the ICL can be a single physical Ethernet interface in some smaller-scale setups.

This section illustrates how to configure an aggregated ethernet interface composed of two 40-Gbps interfaces into an ICL. The configuration uses the same interfaces on both aggregation devices and is therefore configured using configuration groups that are synchronized between aggregation devices.

To configure the ICL:

1. Create the configuration groups for the ICL:

   **Aggregation device 1:**
   ```
   user@ad1-ex9208# set groups ICL-CONFIG when peers [ad1-ex9208 ad2-ex9208]
   user@ad1-ex9208# set apply-groups ICL-CONFIG
   ```

   **Aggregation device 2:**
   ```
   user@ad2-ex9208# set apply-groups ICL-CONFIG
   ```

2. Configure the two 40-Gbps interfaces that will be used as the ICL into an aggregated ethernet interface:

   - Configure the number of aggregated ethernet interfaces on the device:
     ```
     user@ad1-ex9208# set groups ICL-CONFIG chassis aggregated-devices ethernet device-count 2
     ```

     **NOTE:** The device count is a global parameter that applies to all aggregated ethernet interfaces on the EX9200 switch acting as the aggregation device, including aggregated ethernet interfaces that are not part of the Junos Fusion Enterprise topology. Configure the aggregated ethernet device count that is appropriate for your EX9200 switch.

   - Create and name the aggregated ethernet interface. Add an optional description for the aggregated ethernet interface:
     ```
     user@ad1-ex9208# set groups ICL-CONFIG interfaces ae100 description icl-link
     ```
• Add the member links to the aggregated ethernet interface.

Because both aggregation devices use the same member interfaces to form the same aggregated ethernet interface, this configuration can be performed within the configuration group.

```plaintext
user@ad1-ex9208# set groups ICL-CONFIG interfaces et-0/3/1 ether-options 802.3ad ae100
user@ad1-ex9208# set groups ICL-CONFIG interfaces et-0/3/2 ether-options 802.3ad ae100
```

• Enable LACP:

```plaintext
user@ad1-ex9208# set groups ICL-CONFIG interfaces ae100 aggregated-ether-options lacp active
user@ad1-ex9208# set groups ICL-CONFIG interfaces ae100 aggregated-ether-options lacp periodic fast
```

3. Configure the aggregated ethernet interface as the ICL.

The peer chassis ID variable is a unique value on each aggregation device, so this step is performed outside the configuration group on each aggregation device.

This step assumes that the redundancy groups used to create dual aggregation device support have already been configured. See "Configuring Dual Aggregation Device Support" on page 29.

**Aggregation device 1:**

```plaintext
user@ad1-ex9208# set chassis satellite-management redundancy-groups enterprise-campus-network peer-chassis-id 2 inter-chassis-link ae100
```

**Aggregation device 2:**

```plaintext
user@ad2-ex9208# set chassis satellite-management redundancy-groups enterprise-campus-network peer-chassis-id 1 inter-chassis-link ae100
```

4. Commit the configuration on each aggregation device, starting with aggregation device 1.

**Aggregation device 1:**

```plaintext
user@ad1-ex9208# commit synchronize
```

**Aggregation device 2:**

```plaintext
user@ad2-ex9208# commit synchronize
```
Configuring the Inter-Chassis Control Protocol (ICCP) Link

CLl Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

Aggregation device 1:

```
set interfaces et-0/3/0 description iccp-link
set interfaces et-0/3/0 unit 0 family inet address 172.16.32.5/16
```

Aggregation device 2:

```
set interfaces et-0/3/0 description iccp-link
set interfaces et-0/3/0 unit 0 family inet address 172.16.32.6/16
```

Step-by-Step Procedure

Inter-Chassis Control Protocol (ICCP) is used in MC-LAG topologies to exchange control information between the devices in the topology. A Junos Fusion Enterprise with two aggregation devices is an MC-LAG topology, and is therefore always running ICCP. See Multichassis Link Aggregation Features, Terms, and Best Practices for additional information on ICCP.

A dedicated ICCP link is highly recommended in a Junos Fusion Enterprise deployment, but is not required. ICCP traffic is transmitted across the ICL when an ICCP link is not configured.

The MC-LAG configuration used in this network configuration example includes a dedicated ICCP link between the aggregation devices. The instructions for configuring the ICCP link are provided in this procedure.

An ICCP link can be one link or an aggregated ethernet interface. In most Junos Fusion Enterprise deployments, we recommend using a 40-Gbps link—which is used in this procedure—or an aggregated ethernet interface as the ICCP link.

To manually configure a dedicated ICCP link:

1. (Optional. Recommended) Create a description for the ICCP link interface.
   
   **Aggregation device 1:**
   
   ```
   user@ad1-ex9208# set interfaces et-0/3/0 description iccp-link
   ```

   **Aggregation device 2:**
   
   ```
   user@ad2-ex9208# set interfaces et-0/3/0 description iccp-link
   ```

2. Configure the IP address of the interface at each end of the ICCP link.
   
   **Aggregation device 1:**
   
   ```
   ```

   **Aggregation device 2:**
   
   ```
   ```
Enabling Junos Fusion Enterprise on an Enterprise Campus Network

---

**CLI Quick Configuration**

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

**Aggregation device 1:**

```
set protocols iccp local-ip-addr 172.16.32.5
set protocols iccp peer 172.16.32.6 backup-liveness-detection backup-peer-ip 10.105.5.132
set protocols iccp peer 172.16.32.6 redundancy-group-id-list 2
set protocols iccp peer 172.16.32.6 session-establishment-hold-time 50
set protocols iccp peer 172.16.32.6 liveness-detection minimum-interval 2000
set protocols iccp peer 172.16.32.6 liveness-detection multiplier 4
```

**Aggregation device 2:**

```
set protocols iccp local-ip-addr 172.16.32.6
set protocols iccp peer 172.16.32.5 backup-liveness-detection backup-peer-ip 10.105.5.131
set protocols iccp peer 172.16.32.5 redundancy-group-id-list 2
set protocols iccp peer 172.16.32.5 session-establishment-hold-time 50
set protocols iccp peer 172.16.32.5 liveness-detection minimum-interval 2000
set protocols iccp peer 172.16.32.5 liveness-detection multiplier 4
```
Step-by-Step Procedure

Inter-Chassis Control Protocol (ICCP) is used in MC-LAG topologies to exchange control information between the devices in the topology. A Junos Fusion Enterprise with two aggregation devices is an MC-LAG topology, and is therefore always running ICCP. See Multichassis Link Aggregation Features, Terms, and Best Practices for additional information on ICCP.

Junos Fusion Enterprise supports automatic ICCP provisioning, which automatically configures ICCP in a dual aggregation device setup without any user action. Automatic ICCP provisioning is enabled by default and is often the preferred method of enabling ICCP for a Junos Fusion in greenfield deployments that are not being integrated into an existing network. If you are installing your Junos Fusion Enterprise in an environment that doesn’t have to integrate into an existing campus network, you can usually ignore the instructions in this section. Automatic ICCP provisioning is described in more detail in Understanding Automatic ICCP Provisioning and Automatic VLAN Provisioning of an Interchassis Link.

Many Junos Fusion Enterprise installations occur in brownfield deployments and the Junos Fusion Enterprise has to be integrated within an existing campus network. Brownfield deployments often have a need to maintain existing ICCP settings, in particular in scenarios where a Junos Fusion Enterprise is replacing an MC-LAG topology or is supporting a campus network that includes other MC-LAG topologies.

In this network configuration example, some ICCP parameters—the session establishment hold time, backup peer IP, and some BFD intervals—are modified to ensure ICCP can function properly in a Junos Fusion Enterprise that is being installed into an existing campus network.

To manually configure ICCP in this example:

1. Configure the local IP address on each end of the ICCP link.

   **Aggregation device 1:**

   ```
   user@ad1-ex9208# set protocols iccp local-ip-addr 172.16.32.5
   ```

   **Aggregation device 2:**

   ```
   user@ad2-ex9208# set protocols iccp local-ip-addr 172.16.32.6
   ```

2. Configure the backup peer IP address on each aggregation device. The backup peer IP address is the management IP address of the other aggregation device. These instructions assume the management IP addresses of each aggregation device are reachable from one another over a Layer 3 management network.

   **Aggregation device 1:**

   ```
   user@ad1-ex9208# set protocols iccp peer 172.16.32.6 backup-liveness-detection backup-peer-ip 10.105.5.132
   ```

   **Aggregation device 2:**
3. Define the redundancy group ID number for the redundancy group. The redundancy group is both aggregation devices.

   **Aggregation device 1:**
   ```
   user@ad1-ex9208# set protocols iccp peer 172.16.32.6 redundancy-group-id-list 2
   ```

   **Aggregation device 2:**
   ```
   user@ad2-ex9208# set protocols iccp peer 172.16.32.5 redundancy-group-id-list 2
   ```

4. Configure the session establishment hold timer. The session establishment hold timer defines the maximum amount of time, in seconds, that can be taken for an Inter-Chassis Control Protocol (ICCP) connection to establish between peers.

   **Aggregation device 1:**
   ```
   user@ad1-ex9208# set protocols iccp peer 172.16.32.6 session-establishment-hold-time 50
   ```

   **Aggregation device 2:**
   ```
   user@ad2-ex9208# set protocols iccp peer 172.16.32.5 session-establishment-hold-time 50
   ```

5. Configure the Bidirectional Forwarding Detection (BFD) parameters. The BFD minimum interval is the interval at which the peer transmits liveness detection requests and the minimum interval at which the peer expects to receive a reply from a peer. The multiplier is the number of liveness detection requests not received by the peer before Bidirectional Forwarding Detection (BFD) declares the peer as down.

   **Aggregation device 1:**
   ```
   user@ad1-ex9208# set protocols iccp peer 172.16.32.6 liveness-detection minimum-interval 2000
   user@ad1-ex9208# set protocols iccp peer 172.16.32.6 liveness-detection multiplier 4
   ```

   **Aggregation device 2:**
   ```
   user@ad2-ex9208# set protocols iccp peer 172.16.32.5 liveness-detection minimum-interval 2000
   user@ad2-ex9208# set protocols iccp peer 172.16.32.5 liveness-detection multiplier 4
   ```
## Preparing the Satellite Devices

**CLI Quick Configuration**

To complete this quick configuration, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the operational mode prompt (>) of each individual satellite device:

```bash
request system zeroize
```

After the switch reboots:

```bash
request virtual-chassis vc-port delete pic-slot 1 port 0
request virtual-chassis vc-port delete pic-slot 1 port 1
request virtual-chassis vc-port delete pic-slot 1 port 2
request virtual-chassis vc-port delete pic-slot 1 port 3
```
To prepare the EX4300-48T and EX4300-48P switches to become satellite devices, perform the following steps:

**NOTE:** These instructions assume each EX4300-48T and EX4300-48P switch is already running Junos OS Release 14.1X53-D35. See [Installing Software on an EX Series Switch with a Single Routing Engine (CLI Procedure)](#) for instructions on upgrading Junos OS software.

1. If you plan on using the satellite device interfaces to provide PoE, check the satellite device’s PoE firmware version:
   - Enter the `show chassis firmware detail` command to learn the PoE firmware version running on the device.
     
     ```
     user@sd1-ex4300> show chassis firmware detail
     FPC 0
     Boot SYSPLD             10
     PoE firmware            2.6.3.92.1
     (additional output omitted)
     ```
   - The satellite device must have the following minimum PoE versions to support PoE in a Junos Fusion Enterprise.

     | Satellite Device Platform | Minimum PoE Firmware Version |
     |---------------------------|-----------------------------|
     | EX2300                    | 1.6.1.9                     |
     | EX3400                    | 1.6.1.9                     |
     | EX4300                    | 2.6.3.92.1                  |
     | QFX5100                   | No minimum version requirement |

     See [Minimum Satellite Device Firmware Version Requirements table](#) for additional information on firmware version requirements for devices in a Junos Fusion Enterprise.
   - If your device meets the minimum PoE firmware requirement, proceed to the next step.
     - If a PoE firmware update is required, upgrade the PoE firmware. See [Upgrading the PoE Controller Software](#).

2. Log into each switch’s console port, and zeroize it.

   **NOTE:** Perform this procedure from the console port connection. A management connection will be lost when the switch is rebooted to complete the zeroizing procedure.
The following sample output shows how to perform this procedure on the satellite device using FPC ID 101. Repeat this procedure for each satellite device.

```
user@sd101-con> request system zeroize
```

NOTE: The devices reboot to complete the zeroizing procedure.

3. (EX3400 and EX4300 satellite devices only) After the switches reboot, convert the built-in 40-Gbps interfaces with QSFP+ transceivers from Virtual Chassis ports (VCPs) into network ports on each switch:

The following sample output shows how to perform this procedure on the satellite device using FPC ID 101. Repeat this procedure for each satellite device.

```
user@sd101-con> request virtual-chassis vc-port delete pic-slot 1 port 0
user@sd101-con> request virtual-chassis vc-port delete pic-slot 1 port 1
user@sd101-con> request virtual-chassis vc-port delete pic-slot 1 port 2
user@sd101-con> request virtual-chassis vc-port delete pic-slot 1 port 3
```

NOTE: This step is required for EX3400 and EX4300 switch uplink ports only because uplink ports on these switches are VCPs by default.

You can skip this step if you are converting other switches into satellite devices.

4. Cable each switch into the Junos Fusion Enterprise, if you haven’t already done so.

Because automatic satellite conversion is enabled and the satellite software upgrade groups have been configured, the satellite software installation process starts for each satellite device when it is cabled into the Junos Fusion Enterprise.

NOTE: If the satellite software installation does not begin, log onto the aggregation devices and ensure the configurations added in previous steps have been committed.

Connecting the EX9200 Switch to the EX3300 Access Switch That is Not Participating in the Junos Fusion Enterprise

<table>
<thead>
<tr>
<th>CLI Quick Configuration</th>
</tr>
</thead>
</table>

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.
**Aggregation device 2:**

```superuser
[edit]
set interfaces ae0 aggregated-ether-options minimum-links 1
set interfaces ae0 aggregated-ether-options link-speed 10g
set interfaces xe-0/0/1 ether-options 802.3ad ae0
set interfaces xe-0/0/2 ether-options 802.3ad ae0
set interfaces ae0 unit 0 family ethernet-switching interface-mode trunk vlan members all
set interfaces ae0 aggregated-ether-options lacp active
set chassis aggregated-devices ethernet device-count 10
```

**Branch office switch 2:**

```superuser
[edit]
set interfaces ae0 aggregated-ether-options minimum-links 1
set interfaces ae0 aggregated-ether-options link-speed 10g
set interfaces xe-0/1/0 ether-options 802.3ad ae0
set interfaces xe-0/1/1 ether-options 802.3ad ae0
set interfaces ae0 unit 0 family ethernet-switching interface-mode trunk vlan members all
set interfaces ae0 aggregated-ether-options lacp active
set chassis aggregated-devices ethernet device-count 3
```

**Step-by-Step Procedure**

To connect the EX3300 access switch in branch office 2 that is not participating in the Junos Fusion Enterprise to the EX9208 switch acting as aggregation device 2:

1. Configure the aggregated Ethernet interface on the EX9208 switch side of the connection:

   ```superuser
   [edit interfaces]
   user@ad2-ex9208# set ae0 aggregated-ether-options minimum-links 1
   user@ad2-ex9208# set ae0 aggregated-ether-options link-speed 10g
   ```

2. Specify the aggregated Ethernet bundle member interfaces on the EX9208 switch side of the connection:

   ```superuser
   [edit interfaces]
   user@ad2-ex9208# set xe-0/0/1 ether-options 802.3ad ae0
   user@ad2-ex9208# set xe-0/0/2 ether-options 802.3ad ae0
   ```

3. Specify the bundle into the ethernet switching family, set the interface mode to trunk, and configure it to be a member of all VLANs:

   ```superuser
   [edit interfaces]
   user@ad2-ex9208# set ae0 unit 0 family ethernet-switching interface-mode trunk vlan members all
   ```

4. Enable LACP:

   ```superuser
   [edit interfaces]
   user@ad2-ex9208# set ae0 aggregated-ether-options lacp active
   ```

5. Specify the maximum number of aggregated Ethernet interfaces that can be created on the switch:
6. Perform the same procedure for the EX3300 switch side of the connection:

   [edit]
   user@branch-office2-ex3300# set interfaces ae0 aggregated-ether-options minimum-links 1
   user@branch-office2-ex3300# set interfaces ae0 aggregated-ether-options link-speed 10g
   user@branch-office2-ex3300# set interfaces xe-0/1/0 ether-options 802.3ad ae0
   user@branch-office2-ex3300# set interfaces xe-0/1/1 ether-options 802.3ad ae0
   user@branch-office2-ex3300# set interfaces ae0 unit 0 family ethernet-switching
   interface-mode trunk
   vlan members all
   user@branch-office2-ex3300# set chassis aggregated-devices ethernet device-count 3

Results

From configuration mode, confirm your aggregated ethernet interface settings by entering the `show interfaces` statement and the `show chassis aggregated-devices` from aggregation device 2 and the EX3300 switch.

Aggregation device 2:

   user@ad2-ex9208# show interfaces
   xe-0/0/1 {
       ether-options {
           802.3ad ae0;
       }
   }
   xe-0/0/2 {
       ether-options {
           802.3ad ae0;
       }
   }
   ae0 {
       aggregated-ether-options {
           minimum-links 1;
           link-speed 10g;
           lACP {
               active;
           }
       }
   }
   unit 0 {
       family ethernet-switching {
           interface-mode trunk;
           vlan {
               members all;
           }
       }
   }
   <some show interfaces output removed for brevity>

   user@ad2-ex9208# show chassis aggregated-devices
   ethernet {
       device-count 10;
   }
Branch office 2:

```
user@branch-office2-ex3300# show interfaces
xe-0/1/0 {
  ether-options {
    802.3ad ae0;
  }
}
xe-0/1/1 {
  ether-options {
    802.3ad ae0;
  }
}
ae0 {
  aggregated-ether-options {
    minimum-links 1;
    link-speed 10g;
    lacp {
      active;
    }
  }
  unit 0 {
    family ethernet-switching {
      interface-mode trunk;
      vlan {
        members all;
      }
    }
  }
}<some show interfaces output removed for brevity>
```

```
user@branch-office2-ex3300# show chassis aggregated-devices
ethernet {
  device-count 3;
}
```

### Configuring Features on the Junos Fusion Enterprise

This section provides the steps for configuring some commonly-used features on the Junos Fusion Enterprise.

It includes the following sections:

- Configuring Commit Synchronization Between Aggregation Devices on page 45
- Configuring VLANs on page 49
- Adding Layer 3 Support to a Junos Fusion Enterprise on page 52
- Enabling 802.1X on page 56
- Enabling Loop Detection and Prevention on page 59
- Enabling Power over Ethernet, LLDP, and LLDP-MED on page 62
Configuring Commit Synchronization Between Aggregation Devices

A Junos Fusion Enterprise using dual aggregation devices often requires matching configuration of a feature on both aggregation devices. Configuration synchronization can be used to ensure that configuration done in a configuration group is applied on both aggregation devices when committed. Configuration synchronization simplifies administration of a Junos Fusion Enterprise by allowing users to enter commands once in a configuration group and apply the configuration group to both aggregation devices rather than repeating a configuration procedure manually on each aggregation device.

The available group configuration options are beyond the scope of this document; see Understanding MC-LAG Configuration Synchronization and Synchronizing and Committing MC-LAG Configurations for additional information on using group configurations in an MC-LAG topology and Network Configuration Example: Configuring MC-LAG on EX9200 Switches in the Core for Campus Networks for a detailed example of an MC-LAG topology that uses group configurations.

This network configuration example provides one method of using groups to synchronize configuration between aggregation devices. See Configuring Aggregation Devices as Peers for Configuration Synchronization.

Many features in this document—including VLANs, 802.1X, and manual ICCP configuration—assume that commit synchronization is enabled and are mostly or completely configured in groups to ensure expedient and consistent configuration. See those configuration procedures for illustrations of configurations done using commit synchronization.

To enable commit synchronization:
1. Ensure the aggregation devices are reachable from one another:

   **Aggregation device 1:**

   ```
   user@ad1-ex9208> ping ad2-ex9208 rapid
   PING ad2-ex9208.host.example.net (192.168.255.41): 56 data bytes
   !!!!!
   mostly o--- ad2-ex9208.example.net ping statistics ---
   5 packets transmitted, 5 packets received, 0% packet loss
   round-trip min/avg/max/stddev = 0.317/0.331/0.378/0.024 ms
   ```

   **Aggregation device 2:**

   ```
   user@ad2-ex9208> ping ad1-ex9208 rapid
   PING ad1-ex9208.host.example.net (192.168.255.40): 56 data bytes
   !!!!!
   --- ad1-ex9208.example.net ping statistics ---
   5 packets transmitted, 5 packets received, 0% packet loss
   round-trip min/avg/max/stddev = 0.317/0.331/0.378/0.024 ms
   ```

   If the devices cannot ping one another, try statically mapping the hostnames of each device's management IP address and retry the ping.

   **Aggregation device 1:**

   ```
   user@ad1-ex9208# set system static-host-mapping ad2-ex9208 inet 192.168.255.41
   user@ad1-ex9208# commit
   user@ad1-ex9208# run ping ad2-ex9208 rapid
   ```

   **Aggregation device 2:**

   ```
   user@ad2-ex9208# set system static-host-mapping ad1-ex9208 inet 192.168.255.40
   user@ad2-ex9208# commit
   user@ad2-ex9208# run ping ad1-ex9208 rapid
   ```

   If the devices cannot ping one another after the hostnames are statically mapped, see Connecting and Configuring an EX9200 Switch (CLI Procedure) or the Installation and Upgrade Guide for EX9200 Switches.

2. Enable commit synchronization:

   **Aggregation device 1:**

   ```
   user@ad1-ex9208# set system commit peers-synchronize
   ```

   **Aggregation device 2:**

   ```
   user@ad2-ex9208# set system commit peers-synchronize
   ```
3. Configure each aggregation device so that the other aggregation device is identified as a commit peer. Enter the authentication credentials of each peer aggregation device to ensure group configurations on one aggregation device are committed to the other aggregation device.

**WARNING:** The password `password` is used in this configuration step for illustrative purposes only. Use a more secure password in your device configuration.

**NOTE:** This step assumes a user with an authentication password has already been created on each EX9208 switch acting as an aggregation device. For instructions on configuring username and password combinations, see Connecting and Configuring an EX9200 Switch (CLI Procedure).

*Aggregation device 1:*

```
user@ad1-ex9208# set system commit peers ad2-ex9208 user root authentication password
```

*Aggregation device 2:*

```
user@ad2-ex9208# set system commit peers ad1-ex9208 user root authentication password
```

4. Enable the Network Configuration (NETCONF) protocol over SSH:

*Aggregation device 1:*

```
user@ad1-ex9208# set system services netconf ssh
```

*Aggregation device 2:*

```
user@ad2-ex9208# set system services netconf ssh
```

5. Commit the configuration:

*Aggregation device 1:*

```
user@ad1-ex9208# commit
```

*Aggregation device 2:*

```
user@ad2-ex9208# commit
```
6. (Optional) Create a configuration group for testing to ensure configuration synchronization is working:

*Aggregation Device 1:*

```
user@ad1-ex9208# set groups TEST when peers [ad1-ex9208 ad2-ex9208]
user@ad1-ex9208# set apply-groups TEST
```

*Aggregation Device 2:*

```
user@ad2-ex9208# set apply-groups TEST
```

7. (Optional) Configure and commit a group on aggregation device 1, and confirm it is implemented on aggregation device 2:

```
NOTE: This step shows how to change one interface configuration using groups. Interface ranges cannot be specified within groups and synchronized between commit peers in a Junos Fusion Enterprise to configure multiple interfaces simultaneously.
```

*Aggregation device 1:*

```
user@ad1-ex9208# set groups TEST interfaces ge-0/0/1 description testing123
user@ad1-ex9208# commit
```

*Aggregation device 2:*

```
user@ad2-ex9208# show groups TEST
when {
    peers [ ad1-ex9208 ad2-ex9208 ];
}
interfaces {
    ge-0/0/1 {
        description testing123;
    }
}
user@ad2-ex9208# run show interfaces ge-0/0/1
Physical interface: ge-0/0/1, Enabled, Physical link is Down
    Interface index: 235, SNMP ifIndex: 743
    Description: testing123
    (additional output removed for brevity)
```

Perform the same procedure to verify configuration synchronization from aggregation device 2 to aggregation device 1, if desired.

Delete the test configuration group on each aggregation device.

*Aggregation device 1:*
NOTE: All subsequent procedures in this network configuration example assume that commit synchronization is enabled on both EX9208 switches acting as aggregation devices, and that the aggregation devices are configured as peers in each configuration group.

Configuring VLANs

CLI Quick Configuration
To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

Aggregation device 1:

```
[edit]
set groups vlans-config when peers [ad1-ex9208 ad2-ex9208]
set groups vlans-config vlans v10 vlan-id 10
set groups vlans-config interfaces ge-101/0/0 unit 0 family ethernet-switching
interface-mode access vlan members v10
set groups vlans-config interfaces ge-111/0/0 unit 0 family ethernet-switching
interface-mode access vlan members v10
set groups vlans-config interfaces ge-121/0/0 unit 0 family ethernet-switching
interface-mode access vlan members v10
set apply-groups vlans-config
commit
```

Step-by-Step Procedure
To configure VLANs on both aggregation devices on the Junos Fusion topology using configuration groups:

1. Create and name the configuration group, and configure the group to apply to the peer aggregation devices:

   ```
   [edit]
   user@ad1-ex9208# set groups vlans-config when peers [ad1-ex9208 ad2-ex9208]
   ```

2. Create a VLAN—VLAN ID 10—by assigning it a name and a VLAN ID:

   ```
   [edit]
   user@ad1-ex9208# set groups vlans-config vlans v10 vlan-id 10
   ```
3. Configure three extended port interfaces—ge-101/0/0, ge-111/0/0, and ge-121/0/0—into vlan v10.

[edit]
user@ad1-ex9208# set groups vlans-config interfaces ge-101/0/0 unit 0 family ethernet-switching interface-mode access vlan members v10
user@ad1-ex9208# set groups vlans-config interfaces ge-111/0/0 unit 0 family ethernet-switching interface-mode access vlan members v10
user@ad1-ex9208# set groups vlans-config interfaces ge-121/0/0 unit 0 family ethernet-switching interface-mode access vlan members v10

4. Apply the configuration group:

[edit]
user@ad1-ex9208# set apply-groups vlans-config

5. Commit the configuration:

[edit]
user@ad1-ex9208# commit

The configuration commits to both aggregation devices, because automatic peer synchronization is enabled.

Results  Confirm the VLANs are configured by entering the `show groups vlans-config` command in configuration mode and are operational by entering the `show vlans` command in operational mode. The commands must be entered on both aggregation devices in order to confirm the group configuration applied the VLAN configuration to both aggregation devices.

Aggregation device 1:

```
user@ad1-ex9208# show groups vlans-config
when {
  peers [ ad1-ex9208 ad2-ex9208 ];
}
interfaces {
  ge-101/0/0 {
    unit 0 {
      family ethernet-switching {
        interface-mode access;
        vlan {
          members v10;
        }
      }
    }
  }
  ge-111/0/0 {
    unit 0 {
      family ethernet-switching {
        interface-mode access;
        vlan {
          members v10;
        }
      }
    }
  }
}
Chapter 1: Enabling Junos Fusion Enterprise on an Enterprise Campus Network

Aggregation device 2:

```
user@ad2-ex9208# show groups vlans-config
when {
    peers [ ad1-ex9208 ad2-ex9208 ];
} interfaces {
    ge-101/0/0 {
        unit 0 {
            family ethernet-switching {
                interface-mode access;
                vlan {
                    members v10;
                }
            }
        }
    } ge-111/0/0 {
        unit 0 {
            family ethernet-switching {
                interface-mode access;
                vlan {
                    members v10;
                }
            }
        }
    } ge-121/0/0 {
        unit 0 {
            family ethernet-switching {
                interface-mode access;
                vlan {
                    members v10;
                }
            }
        }
    }
```

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Adding Layer 3 Support to a Junos Fusion Enterprise

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

**Aggregation device 1:**

```plaintext
user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24
     arp 192.168.42.3 12-interface ae100
user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24
     arp 192.168.42.3 mac f4:b5:2f:f3:fb:f0
user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24
     vrrp-group 10 virtual-address 192.168.42.1
user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24
     vrrp-group 10 priority 200
user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24
     vrrp-group 10 accept-data
user@ad1-ex9208# set vlans v10 l3-interface irb.10
user@ad1-ex9208# set forwarding-options dhcp-relay forward-snooped-clients all-interfaces
user@ad1-ex9208# set forwarding-options dhcp-relay server-group sp-1
     192.168.70.202
user@ad1-ex9208# set forwarding-options dhcp-relay active-server-group sp-1
user@ad1-ex9208# set forwarding-options dhcp-relay group DHCP-Client overrides allow-snooped-clients
user@ad1-ex9208# set forwarding-options dhcp-relay group DHCP-Client interface irb.10
```

**Aggregation device 2:**

```plaintext
user@ad2-ex9208# set interfaces irb unit 10 family inet address 192.168.42.3/24
     arp 192.168.42.2 12-interface ae100
```
user@ad2-ex9208# set interfaces irb unit 10 family inet address 192.168.42.3/24
  arp 192.168.42.2 mac f4:b5:2f:f4:fb:f0
user@ad2-ex9208# set interfaces irb unit 10 family inet address 192.168.42.3/24
  vrrp-group 10 virtual-address 192.168.42.1
user@ad2-ex9208# set interfaces irb unit 10 family inet address 192.168.42.3/24
  vrrp-group 10 priority 150
user@ad2-ex9208# set interfaces irb unit 10 family inet address 192.168.42.3/24
  vrrp-group 10 accept-data

user@ad2-ex9208# set vlans v10 l3-interface irb.10
user@ad2-ex9208# set forwarding-options dhcp-relay forward-snooped-clients
  all-interfaces
user@ad2-ex9208# set forwarding-options dhcp-relay server-group sp-1
  192.168.70.202
user@ad2-ex9208# set forwarding-options dhcp-relay active-server-group sp-1
user@ad2-ex9208# set forwarding-options dhcp-relay group DHCP-Client overrides
  allow-snooped-clients
user@ad2-ex9208# set forwarding-options dhcp-relay group DHCP-Client interface
  irb.10
In most campus networking environments, endpoint devices must have a path to send and receive Layer 3 traffic.

In a Junos Fusion Enterprise, integrated routing and bridging (IRB) interfaces are configured on aggregation devices to move traffic between Layer 2 and Layer 3.

DHCP relay is configured in this procedure to move DHCP packets through the Junos Fusion Enterprise. A VRRP group that includes both aggregation devices is also established.

This section provides the configuration instructions for configuring an IRB interface that moves the Layer 2 traffic in VLAN 10 into and out of Layer 3.

To configure IRB interfaces on the aggregation devices to move traffic between Layer 2 and Layer 3:

1. **Enable the IRB interface to respond to ARP requests between aggregation devices.** The IRB interface number and IP address are configured as part of this process.

   In this procedure, the IRB interface on aggregation device 1 is assigned 192.168.42.2/24 and the IRB interface on aggregation device 2 is assigned 192.168.42.3/24. MAC addresses are assigned to each IRB interface. ARP requests are sent between the aggregation devices to share the MAC address to IP address bindings of the IRB interfaces on each aggregation device.

   **Aggregation device 1:**

   ```
   user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24 arp
   192.168.42.3 l2-interface ae100
   user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24 arp
   192.168.42.3 mac f4:b5:2f:f3:fb:f0
   ```

   **Aggregation device 2:**

   ```
   user@ad2-ex9208# set interfaces irb unit 10 family inet address 192.168.42.3/24 arp
   192.168.42.2 l2-interface ae100
   user@ad2-ex9208# set interfaces irb unit 10 family inet address 192.168.42.3/24 arp
   192.168.42.2 mac f4:b5:2f:f4:fb:f0
   ```

2. **Configure Virtual Router Redundancy Protocol (VRRP) to group both aggregation devices into one virtual device.**

   The aggregation devices in this configuration are logically grouped into virtual address 192.168.42.1 using VRRP. Aggregation device 1 is the master device in the VRRP group because it has the higher priority setting.

   **Aggregation device 1:**

   ```
   user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24 vrrp-group 10 virtual-address 192.168.42.1
   user@ad1-ex9208# set interfaces irb unit 10 family inet address 192.168.42.2/24 vrrp-group 10 priority 200
   ```
3. Bind the IRB interface to VLAN 10:

NOTE: This configuration assumes that VLAN 10 is already configured. See the Configuring VLANs section of this guide for information on configuring VLANs.

Aggregation device 1:

```
user@ad1-ex9208# set vlans v10 l3-interface irb.10
```

Aggregation device 2:

```
user@ad2-ex9208# set vlans v10 l3-interface irb.10
```

4. Enable DHCP Relay on the IRB interfaces.

The DHCP Relay configurations must match on both aggregation devices to ensure consistent handling of DHCP packets throughout the Junos Fusion Enterprise. The IRB interfaces are grouped into the same DHCP relay group.

Aggregation device 1:

```
user@ad1-ex9208# set forwarding-options dhcp-relay forward-snooped-clients all-interfaces
user@ad1-ex9208# set forwarding-options dhcp-relay server-group sp-1 192.168.70.202
user@ad1-ex9208# set forwarding-options dhcp-relay active-server-group sp-1 allow-snooped-clients
user@ad1-ex9208# set forwarding-options dhcp-relay group DHCP-Client overrides
user@ad1-ex9208# set forwarding-options dhcp-relay group DHCP-Client interface irb.10
```

Aggregation device 2:

```
user@ad2-ex9208# set forwarding-options dhcp-relay forward-snooped-clients all-interfaces
user@ad2-ex9208# set forwarding-options dhcp-relay server-group sp-1 192.168.70.202
user@ad2-ex9208# set forwarding-options dhcp-relay active-server-group sp-1
```
Enabling 802.1X

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

Aggregation device 1:

```plaintext
set groups dot1x-CONFIG when peers [ad1-ex9208 ad2-ex9208]
set apply-groups dot1x-CONFIG
set groups dot1x-CONFIG protocols dot1x authenticator authentication-profile-name AUTH-PROFILE-1
set groups dot1x-CONFIG protocols dot1x authenticator no-mac-table-binding
set groups dot1x-CONFIG protocols dot1x authenticator interface ge-101/0/0 supplicant multiple
set groups dot1x-CONFIG protocols dot1x authenticator interface ge-101/0/0 retries 1
set groups dot1x-CONFIG protocols dot1x authenticator interface ge-101/0/0 transmit-period 2
set groups dot1x-CONFIG protocols dot1x authenticator interface ge-101/0/0 server-timeout 5
set groups dot1x-CONFIG protocols dot1x authenticator interface ge-101/0/0 guest-vlan DEFAULT_USERS
set groups dot1x-CONFIG protocols dot1x authenticator interface ge-101/0/0 server-reject-vlan FAIL_AUT
```

Aggregation device 2:

```plaintext
set apply-groups dot1x-CONFIG
```
Step-by-Step Procedure

802.1X is an IEEE standard for port-based network access control (PNAC). It provides an authentication mechanism for devices seeking to access a LAN. The 802.1X authentication feature is based upon the IEEE 802.1X standard Port-Based Network Access Control.

A simple 802.1X configuration is enabled in this configuration to illustrate how 802.1X can be enabled on one extended port in a Junos Fusion Enterprise.

The range of 802.1X configuration options are beyond the scope of this document. For additional information on 802.1X, see 802.1X for Switches Overview and the Access Control Feature Guide for EX9200 Switches.

The following requirements should be understood when configuring 802.1X for a Junos Fusion Enterprise:

• The authentication server cannot connect to the Junos Fusion Enterprise through an extended port.

• 802.1X configuration must match on both aggregation devices in a Junos Fusion Enterprise. 802.1X, therefore, is configured using configuration groups that are applied to both aggregation devices using commit synchronization in this example.

• 802.1X control is handled by either aggregation device on a per-session basis. Either aggregation device can act as the primary device for 802.1X control for any 802.1X session. If traffic flow through one aggregation device is disrupted during an 802.1X session, the 802.1X session may be interrupted and control could be transferred to the other aggregation device.

• A captive portal cannot be configured on an extended port.

To enable 802.1X:

1. Create the configuration groups for 802.1X configuration:

   Aggregation device 1:

   [edit]
   user@ad1-ex9208# set groups dot1X-CONFIG when peers [ad1-ex9208 ad2-ex9208]
   user@ad1-ex9208# set apply-groups dot1X-CONFIG

   Aggregation device 2:

   [edit]
   user@ad2-ex9208# set apply-groups dot1X-CONFIG

2. Specify the name of the access profile to use for 802.1X authentication. The access profile contains the RADIUS server IP address and other information used for authentication.
NOTE: This configuration procedure does not cover access profile configuration. For information on configuring an access profile, see Connecting a RADIUS Server for 802.1X to an EX Series Switch.

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator authentication-profile-name AUTH-PROFILE-1
```

3. Disable MAC table binding. By default, an 802.1X session is removed from the authentication session table when a MAC address is aged out of the Ethernet switching table. When MAC table binding is disabled, the 802.1X session remains active in the authentication table after a MAC address is aged out of the Ethernet switching table.

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator no-mac-table-binding
```

4. Enable the 802.1X supplicant mode for the interface. In this example, multiple supplicant mode—which authenticates all 802.1X clients individually while also allowing multiple simultaneous 802.1X sessions—is enabled on interface ge-101/0/0.

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator interface ge-101/0/0 supplicant multiple
```

5. Configure the number of times the switch attempts to authenticate the port after an initial failure:

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator interface ge-101/0/0 retries 1
```

6. Configure the transmit period. The transmit period is the amount of time, in seconds, that the port waits before retransmitting the initial PDU to the RADIUS server:

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator interface ge-101/0/0 retries 1
```
7. Configure the server timeout interval. The server timeout interval is the amount of time, in seconds, that the interface will wait for a reply from the authentication server. If a reply is not received within the server timeout interval, the server fail action is invoked.

The server timeout interval is set to 5 seconds in this step.

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator interface ge-101/0/0 server-timeout 5
```

8. Specify the guest VLAN. The guest VLAN is used in this example to provide limited network access for non-authenticated 802.1X supplicants.

This example assumes that a guest VLAN named DEFAULT_USERS has already been configured. For additional information on guest VLANs, see Understanding Guest VLANs for 802.1X on Switches.

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator interface ge-101/0/0 guest-vlan DEFAULT_USERS
```

9. Configure the server reject VLAN. The server reject VLAN is used to provide limited network access for supplicants that fail 802.1X authentication.

This example assumes that a server reject VLAN named FAIL_AUT has already been configured. For additional information on server reject VLANs, see Understanding Server Fail Fallback and Authentication on Switches.

Aggregation device 1:

```
[edit]
user@ad1-ex9208# set groups dot1X-CONFIG protocols dot1x authenticator interface ge-101/0/0 server-reject-vlan FAIL_AUT
```

10. Commit the configuration. Commitment synchronization will commit the configuration on both aggregation devices.

---

**Enabling Loop Detection and Prevention**

**CLI Quick Configuration**

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network.
configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

**Aggregation device 1:**

```plaintext
set groups LOOP-PREVENT-CONFIG when peers [ad1-ex9208 ad2-ex9208]
set apply-groups LOOP-PREVENT-CONFIG
set groups LOOP-PREVENT-CONFIG protocols loop-detect interface all-extended-ports
set groups LOOP-PREVENT-CONFIG protocols loop-detect destination-mac 00:11:22:33:44:55
set groups LOOP-PREVENT-CONFIG protocols rstp interface ae2
set groups LOOP-PREVENT-CONFIG protocols rstp interface ae3
set groups LOOP-PREVENT-CONFIG protocols rstp system-identifier 00:01:02:03:04:05
set groups LOOP-PREVENT-CONFIG protocols rstp bridge-priority 0
```

**Aggregation device 2:**

```plaintext
set apply-groups LOOP-PREVENT-CONFIG
```
There are many technologies that can help detect and prevent loops in a Junos Fusion Enterprise. See Understanding Loop Detection and Prevention on a Junos Fusion.

In this example, loop detection is enabled on all extended ports. You can configure loop detection in a Junos Fusion to detect accidental loops caused by faulty wiring or by VLAN configuration errors. When loop detection is enabled on an extended port, the port periodically transmits a Layer 2 multicast packet—in this example, the packet is sent using the default interval of 30 seconds—with a user-defined MAC address. If the loop detection packet detects an error on an extended port interface in the Junos Fusion topology, the ingress interface is logically shut down and a loop detect error is flagged.

RSTP is used in this topology to prevent loops on the network ports—the non-cascade ports that send and receive network traffic—on the aggregation devices.

To enable loop prevention and RSTP:

1. Create the configuration groups for loop prevention:
   
   **Aggregation device 1:**
   ```
   [edit]
   user@ad1-ex9208# set groups LOOP-PREVENT-CONFIG when peers [ad1-ex9208 ad2-ex9208]
   user@ad1-ex9208# set apply-groups LOOP-PREVENT-CONFIG
   ```
   
   **Aggregation device 2:**
   ```
   [edit]
   user@ad2-ex9208# set apply-groups LOOP-PREVENT-CONFIG
   ```

2. Enable loop detection on all extended ports in the Junos Fusion Enterprise:
   
   **Aggregation device 1:**
   ```
   user@ad1-ex9208# set groups LOOP-PREVENT-CONFIG protocols loop-detect interface all-extended-ports
   ```
   Because no loop detection transmit interval timer is set, a loop detection packet is sent at the default interval of every 30 seconds.

3. Specify the MAC address to use in the loop detection packet:
   
   **Aggregation device 1:**
   ```
   user@ad1-ex9208# set groups LOOP-PREVENT-CONFIG protocols loop-detect destination-mac 00:11:22:33:44:55
   ```
   Any unique MAC address can be specified as the MAC address in this step.
4. Specify the network ports—the non-cascade ports that send and receive network traffic—on the aggregation devices that will enable RSTP.

This step assumes ae2 and ae3 are configured on both aggregation devices, and that matching RSTP configuration is desired on the interfaces on both aggregation devices. See Configuring Aggregated Ethernet Links (CLI Procedure).

Aggregation device 1:

```
user@ad1-ex9208# set groups LOOP-PREVENT-CONFIG protocols rstp interface ae2
user@ad1-ex9208# set groups LOOP-PREVENT-CONFIG protocols rstp interface ae3
```

5. Configure the RSTP system identifier. The RSTP system identifiers is used to identify RSTP instances.

Aggregation device 1:

```
user@ad1-ex9208# set groups LOOP-PREVENT-CONFIG protocols rstp system-identifier 00:01:02:03:04:05
```

6. Set the RSTP bridge priority. The bridge priority in RSTP is used by the spanning tree algorithm to determine the root bridge in the spanning tree instance.

Setting the bridge priority to 0 ensures the aggregation devices assume the root bridge role in the spanning tree instance.

Aggregation device 1:

```
user@ad1-ex9208# set groups LOOP-PREVENT-CONFIG protocols rstp bridge-priority 0
```

7. Commit the configuration. Commitment synchronization will commit the configuration on both aggregation devices.

Enabling Power over Ethernet, LLDP, and LLDP-MED

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the [edit] hierarchy level, and then enter commit from configuration mode.

Aggregation device 1:

```
[edit]
set poe interface all-extended
set protocols lldp interface all
set protocols lldp-med interface all
```

Aggregation device 2:

```
[edit]
set poe interface all-extended
```
Step-by-Step Procedure

This procedure shows how to enable Power over Ethernet (PoE), LLDP, and LLDP-MED for this topology, without using configuration groups.

NOTE: These instructions assume the PoE firmware versions were checked and updated as described in “Preparing the Satellite Devices” on page 39.

1. Enable PoE on all extended ports that support PoE:

   Aggregation device 1:
   
   ```
   [edit]
   user@ad1-ex9208# set poe interface all-extended
   ```

   Aggregation device 2:
   
   ```
   [edit]
   user@ad2-ex9208# set poe interface all-extended
   ```

   The default values for PoE - class management mode, 30W of maximum power per PoE interface, 0 W reserved for guard band - are unchanged in this configuration.

2. Enable LLDP on all extended ports:

   Aggregation device 1:
   
   ```
   [edit]
   user@ad1-ex9208# set protocols lldp interface all
   ```

   Aggregation device 2:
   
   ```
   [edit]
   user@ad2-ex9208# set protocols lldp interface all
   ```

   NOTE: LLDP is enabled by default. This configuration step is added to ensure LLDP is enabled on all extended ports.

3. Enable LLDP-MED on all extended ports:

   Aggregation device 1:
   
   ```
   [edit]
   user@ad1-ex9208# set protocols lldp-med interface all
   ```

   Aggregation device 2:
[edit]
user@ad2-ex9208# set protocols lldp-med interface all

---

**NOTE:** LLDP-MED is enabled by default. This configuration step is added to ensure LLDP-MED is enabled on all extended ports.

---

**Results** From configuration mode, confirm your PoE configuration by entering the `show poe` statement from each aggregation device.

*Aggregation device 1:*

```bash
user@ad1-ex9208# show poe
interface all-extended;
```

*Aggregation device 2:*

```bash
user@ad2-ex9208# show poe
interface all-extended;
```

Confirm your LLDP and LLDP-MED configuration by entering the `show protocols` statement from each aggregation device.

*Aggregation device 1:*

```bash
user@ad1-ex9208# show protocols
lldp {
    interface all;
}
lldp-med {
    interface all;
}
<some output removed for brevity>
```

*Aggregation device 2:*

```bash
user@ad2-ex9208# show protocols
lldp {
    interface all;
}
lldp-med {
    interface all;
}
<some output removed for brevity>
```
Verification

Confirm that the configuration is working properly.

- Verifying that the Satellite Devices are Online on page 65
- Verifying that PoE is Enabled on page 65
- Verifying that LLDP and LLDP-MED are Enabled on page 66
- Verifying that VLANs are Operational on page 67
- Verifying the Aggregated Ethernet Interface Connecting Aggregation Device 2 to Branch Office 2 is Online on page 67

Verifying that the Satellite Devices are Online

Purpose  Verify that the satellite devices in the Junos Fusion are active.

Action   Enter the `show chassis satellite` command from either aggregation device:

```
<table>
<thead>
<tr>
<th>Alias</th>
<th>Slot</th>
<th>State</th>
<th>Cascade Ports</th>
<th>Port State</th>
<th>Total/Up Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>_sd101</td>
<td>101</td>
<td>Online</td>
<td>et-0/2/0</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd102</td>
<td>102</td>
<td>Online</td>
<td>et-0/2/0</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd103</td>
<td>103</td>
<td>Online</td>
<td>et-0/2/0</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd104</td>
<td>104</td>
<td>Online</td>
<td>et-0/2/0</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd105</td>
<td>105</td>
<td>Online</td>
<td>et-0/2/0</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd106</td>
<td>106</td>
<td>Online</td>
<td>et-0/2/0</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>et-0/2/1</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd111</td>
<td>111</td>
<td>Online</td>
<td>et-0/2/2</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd112</td>
<td>112</td>
<td>Online</td>
<td>et-0/2/2</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd113</td>
<td>113</td>
<td>Online</td>
<td>et-0/2/2</td>
<td>online</td>
<td>48/48</td>
</tr>
<tr>
<td>_sd121</td>
<td>121</td>
<td>Online</td>
<td>xe-0/0/0</td>
<td>online</td>
<td>48/48</td>
</tr>
</tbody>
</table>
```

Meaning  The Junos Fusion Enterprise topology is properly configured. The device state for each satellite device in the Junos Fusion Enterprise topology is online, as is the port state for each cascade port.

Verifying that PoE is Enabled

Purpose  Verify that PoE is enabled on the satellite device’s extended ports
**Action**  Confirm PoE is enabled on individual interfaces by entering the `show poe interface` command from either aggregation device.

<table>
<thead>
<tr>
<th>Interface</th>
<th>Admin status</th>
<th>Oper status</th>
<th>Max power</th>
<th>Priority</th>
<th>Power consumption</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>ge-101/0/0</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
<tr>
<td>ge-101/0/1</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
<tr>
<td>ge-101/0/2</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
<tr>
<td>ge-101/0/3</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
<tr>
<td>ge-102/0/0</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
<tr>
<td>ge-102/0/1</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
<tr>
<td>ge-102/0/2</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
<tr>
<td>ge-102/0/3</td>
<td>Enabled</td>
<td>OFF</td>
<td>0.0W</td>
<td>Low</td>
<td>0.0W</td>
<td>not-applicable</td>
</tr>
</tbody>
</table>

**Meaning**  The `show poe interface` output confirms that the admin status is `Enabled` for all interfaces on the satellite devices. The satellite device interfaces can be identified by the FPC ID number; in this output, the PoE status for interfaces on FPC 101 and 102 is shown.

**Verifying that LLDP and LLDP-MED are Enabled**

**Purpose**  Verify that LLDP and LLDP-MED are enabled.

**Action**  Confirm LLDP and LLDP-MED are enabled by entering the `show lldp` command on either aggregation device:

```
user@ad1-ex9208> show lldp
LLDP                      : Enabled
Advertisement interval    : 30 seconds
Transmit delay            : 2 seconds
Hold timer                : 120 seconds
Notification interval     : 5 Second(s)
Config Trap Interval      : 0 seconds
Connection Hold timer     : 300 seconds
LLDP MED                  : Enabled
MED fast start count      : 3 Packets
Port ID TLV subtype       : locally-assigned
Port Description TLV type : interface-alias (ifAlias)
```

<table>
<thead>
<tr>
<th>Interface</th>
<th>Parent Interface</th>
<th>LLDP</th>
<th>LLDP-MED</th>
<th>Power Negotiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>-</td>
<td>Enabled</td>
<td>Enabled</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

**Meaning**  The output confirms that LLDP and LLDP-MED are enabled.
Verifying that VLANs are Operational

**Purpose**
Verify the VLANs exist and are associated with the correct interfaces.

**Action**
Enter the `show vlans` command on either aggregation device:

```
user@ad1-ex9208> show vlans
Routing instance    VLAN name     Tag     Interfaces
default-switch      v10           10      ge-101/0/0.0
                      ge-111/0/0.0
                      ge-121/0/0.0
```

**Meaning**
The output confirms that VLAN v10 is present on the aggregation device, and the correct interfaces are associated with the VLAN.

Verifying the Aggregated Ethernet Interface Connecting Aggregation Device 2 to Branch Office 2 is Online

**Purpose**
Verify that the aggregated ethernet interface connecting aggregation device 2 to branch office 2 is up and operational.

**Action**
Confirm the aggregated ethernet interface is up by entering the `show interfaces ae0 brief` command:

```
user@ad2-ex9208> show interfaces ae0 brief
Physical interface: ae0, Enabled, Physical link is Up
   Link-level type: Ethernet, MTU: 1514, Speed: 200Mbps, Loopback: Disabled,
   Source filtering: Disabled, Flow control: Disabled
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Logical interface ae0.0
   Flags: SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge eth-switch
```

**Meaning**
The output confirms that the aggregated ethernet interface is enabled and that the physical link is up.

**Related Documentation**
- About This Network Configuration Example on page 5
- Use Case Overview on page 5
- Technical Overview on page 7
Appendix: Software Conversion and Upgrades in a Junos Fusion Enterprise

This appendix discusses software conversions and upgrades in a Junos Fusion Enterprise. These tasks are not required at initial Junos Fusion Enterprise setup but are often needed to perform common maintenance tasks like upgrading Junos OS software on the aggregation device or removing a satellite device from a Junos Fusion Enterprise.

This appendix contains the following sections:

- Upgrading Junos OS and Satellite Software in an Operational Junos Fusion Enterprise with Dual Aggregation Devices on page 68
- Converting a Satellite Device Running Satellite Software Into a Standalone Switch Running Junos OS on page 69

Upgrading Junos OS and Satellite Software in an Operational Junos Fusion Enterprise with Dual Aggregation Devices

You may have to upgrade Junos OS on the aggregation devices in your Junos Fusion Enterprise after initial setup.

To ensure consistent behavior and feature support in your Junos Fusion Enterprise, we strongly recommend that both aggregation devices—and both Routing Engines in the aggregation devices—run the same version of Junos OS.

Satellite software should also be upgraded after the Junos OS upgrade to ensure it is compatible with the upgraded Junos OS.

We recommend following this procedure to upgrade Junos OS in a Junos Fusion Enterprise using a dual aggregation device topology:

1. Upgrade the Junos OS software on the backup Routing Engine of one of the aggregation devices. Do not reboot the backup Routing Engine to complete the upgrade at this point of the procedure.

   See Junos Fusion Hardware and Software Compatibility Matrices to retrieve Junos OS images for EX9200 switches that can act as aggregation devices in a Junos Fusion Enterprise.

   This step is performed in this example by showing an upgrade to 17.2R1 with a Junos OS image that is installed in the local /var/tmp folder. See Upgrading Software Packages for information on other procedures that can be used to upgrade Junos OS running on a Routing Engine on an EX9200 switch.

   ```
   user@ad2-ex9208> request system software add /var/tmp/junos-install-ex92xx-x86-64-17.1R2.7.tgz re1
   ```

2. Upgrade the Junos OS software on the master Routing Engine of the same aggregation device. Do not reboot the master Routing Engine to complete the upgrade at this point of the procedure.
3. After steps 1 and 2 are completed successfully, reboot both Routing Engines simultaneously:

```
user@ad2-ex9208> request system reboot both-routing-engines
```

4. Repeat the same procedure on the other aggregation device:

```
user@ad1-ex9208> request system software add /var/tmp/junos-install-ex92xx-x86-64-17.1R2.7.tgz re1
user@ad1-ex9208> request system reboot both-routing-engines
```

5. After all Routing Engines on both aggregation devices have rebooted to complete the Junos OS upgrade, upgrade the satellite software on all satellite devices to the satellite software version that is compatible with the Junos OS running on the aggregation devices. To identify the version of satellite software that works with the new version of Junos OS, see Junos Fusion Hardware and Software Compatibility Matrices. To install the new version of satellite software, see Installing Satellite Software and Adding Satellite Devices to the Junos Fusion and Modifying the Satellite Software Used by a Satellite Software Upgrade Group.

Converting a Satellite Device Running Satellite Software Into a Standalone Switch Running Junos OS

See Removing a Satellite Device from a Junos Fusion for instructions on converting the software on a satellite device from satellite software to Junos OS. A device running satellite software must be converted to a version of Junos OS that supports satellite device conversion. The minimum Junos OS versions are provided in the list below and are also listed in Understanding Junos Fusion Enterprise Software and Hardware Requirements. The following list provides additional information for converting each type of switch from satellite software to Junos OS.

- **EX2300 and EX3400 switches:**
  - EX2300 and EX3400 switches cannot be converted from satellite software to Junos from an aggregation device. To convert the satellite software, remove the satellite device from the Junos Fusion Enterprise and perform the upgrade manually. See Installing Junos OS Software on a Standalone Device Running Satellite Software.
EX2300 and EX3400 switches must be converted to Junos OS Release 15.1X53-D55 or later.

The target Junos OS image must be a signed version of Junos OS. The text string 
-ssigned text must be n the Junos OS image filename when the image is downloaded from the Software Center.

EX4300 switches:

The EX4300 switch must be converted to Junos OS Release 14.1X53-D43 or later.

The target Junos OS image must be a signed version of Junos OS. The text string 
-ssigned text must be n the Junos OS image filename when the image is downloaded.

QFX5100 switches:

The QFX5100 switch must be converted to Junos OS Release 14.1X53-D43 or later.

The target Junos OS image must be a Preboot eXecution Environment (PXE) version of Junos OS. The PXE version of Junos OS includes pxe in the package name when it is downloaded from the Software Center—for example, the PXE image for Junos OS Release 14.1X53-D43 is named install-media-pxe-qfx-5-14.1X53-D43.3-domestic-signed.tgz.

The target Junos OS image must be a signed version of Junos OS. The text string 
-ssigned text must be n the Junos OS image filename when the image is downloaded.

Related Documentation

- Junos Fusion Hardware and Software Compatibility Matrices
- Understanding Junos Fusion Enterprise Software and Hardware Requirements
- Upgrading Software Packages
- Removing a Satellite Device from a Junos Fusion
- Installing Junos OS Software on a Standalone Device Running Satellite Software
- Modifying the Satellite Software Used by a Satellite Software Upgrade Group

Appendix: Converting an MC-LAG Topology into a Junos Fusion Enterprise

This appendix provides a walkthrough of an MC-LAG topology supporting a campus network being converted into a Junos Fusion Enterprise.

In this procedure, two EX9200 switches acting as MC-LAG peers at the aggregation level are converted into aggregation devices in a Junos Fusion Enterprise topology. Access interfaces in the initial topology are provided by a three-member EX4300 Virtual Chassis that is converted into a satellite device cluster. An EX4300 Virtual Chassis member switch that is dual-homed to both EX9200 switches using an MC-LAG at the beginning of this procedure has two uplink interfaces—one to a cascade port on each EX9200 switch—in the post-conversion Junos Fusion Enterprise topology.

This conversion is accomplished with minimal recabling. The ICL, ICCP link, and the high-speed VCP interfaces connecting the EX4300 switches into a Virtual Chassis are
not recabled during this procedure. One high-speed Ethernet interface cable is added to each EX9200 switch to provide a cascade port-to-uplink port connection to the EX4300 Virtual Chassis member switch during this procedure; this is the only recabling required to complete the conversion.

- Requirements on page 71
- Overview and Topology on page 71
- Understanding the MC-LAG Configuration on page 72

Requirements

This example uses the following hardware and software components:

- Two EX9208 switches, each running Junos OS Release 17.3R1.
- Three EX4300 switches, running:
  - MC-LAG (pre-conversion): Junos OS Release 14.1X53-D43
  - Junos Fusion Enterprise (post-conversion): Satellite software version 3.2R1

Overview and Topology

The pre-conversion MC-LAG topology includes two EX9208 switches configured as MC-LAG peers. The MC-LAG client is an EX4300 Virtual Chassis that includes one member switch that is dual-homed to both EX9208 switches.

Figure 8 on page 71 shows the pre-conversion MC-LAG topology.

**Figure 8: Pre-Conversion MC-LAG Topology**

In the post-conversion Junos Fusion Enterprise topology, the EX9208 switches become aggregation devices and each EX4300 member switch in the Virtual Chassis becomes a satellite device. The three-member EX4300 Virtual Chassis becomes a satellite device cluster.

Figure 9 on page 72 shows the post-conversion Junos Fusion Enterprise topology.
Understanding the MC-LAG Configuration

This section provides the MC-LAG configuration on the EX9208 switches before the conversion.

**NOTE:** The configuration in this section is provided to illustrate the existing, pre-conversion configuration only. The MC-LAG configuration for your network is already established if you are using this procedure.

### Aggregation Switch 1

```
set interfaces xe-4/0/1 gigether-options 802.3ad ae10
set interfaces ae10 aggregated-ether-options lACP active
set interfaces ae10 aggregated-ether-options lACP periodic fast
set interfaces ae10 aggregated-ether-options lACP system-id 00:00:00:00:00:01
set interfaces ae10 aggregated-ether-options lACP admin-key 1
set interfaces ae10 aggregated-ether-options mc-ae mc-ae-id 1
set interfaces ae10 aggregated-ether-options mc-ae redundancy-group 3
set interfaces ae10 aggregated-ether-options mc-ae chassis-id 0
set interfaces ae10 aggregated-ether-options mc-ae mode active-active
set interfaces ae10 aggregated-ether-options mc-ae status-control active
set interfaces ae10 aggregated-ether-options mc-ae events iccp-peer-down
prefer-status-control-active
set interfaces ae10 unit 0 family ethernet-switching interface-mode trunk
set interfaces ae10 unit 0 family ethernet-switching vlan members all
```

```
set interfaces lo0 unit 0 family inet address 192.168.10.11/32
set interfaces xe-4/0/2 gigether-options 802.3ad ae0
set interfaces xe-4/0/3 gigether-options 802.3ad ae0
set interfaces ae0 description ICCP-LINK
set interfaces ae0 vlan-tagging
set interfaces ae0 unit 0 vlan-id 4000
set interfaces ae0 unit 0 family inet address 192.168.10.1/30
```

```
set interfaces xe-4/0/4 gigether-options 802.3ad ae1
set interfaces xe-4/0/5 gigether-options 802.3ad ae1
```
set interfaces ae1 description ICL-LINK
set interfaces ae1 unit 0 family ethernet-switching interface-mode trunk
set interfaces ae1 unit 0 family ethernet-switching vlan members all

set protocols iccp local-ip-addr 192.168.10.11
set protocols iccp peer 192.168.10.12 session-establishment-hold-time 50
set protocols iccp peer 192.168.10.12 redundancy-group-id-list 2
set protocols iccp peer 192.168.10.12 backup-liveness-detection backup-peer-id 10.19.11.44
set protocols iccp peer 192.168.10.12 liveness-detection minimum-interval 2000
set protocols iccp peer 192.168.10.12 liveness-detection multiplier 4

Aggregation Switch 2:

set interfaces xe-4/0/1 gigether-options 802.3ad ae10
set interfaces ae10 aggregated-ether-options lacp active
set interfaces ae10 aggregated-ether-options lacp periodic fast
set interfaces ae10 aggregated-ether-options lacp system-id 00:00:00:00:00:01
set interfaces ae10 aggregated-ether-options lacp admin-key 1
set interfaces ae10 aggregated-ether-options mc-ae mc-ae-id 1
set interfaces ae10 aggregated-ether-options mc-ae redundancy-group 3
set interfaces ae10 aggregated-ether-options mc-ae chassis-id 1
set interfaces ae10 aggregated-ether-options mc-ae mode active-active
set interfaces ae10 aggregated-ether-options mc-ae status-control standby
set interfaces ae10 unit 0 family ethernet-switching interface-mode trunk
set interfaces ae10 unit 0 family ethernet-switching vlan members all

set interfaces lo0 unit 0 family inet address 192.168.10.12/32
set interfaces xe-4/0/2 gigether-options 802.3ad ae0
set interfaces xe-4/0/3 gigether-options 802.3ad ae0
set interfaces ae0 description ICCP-LAYER3-LINK
set interfaces ae0 vlan-tagging
set interfaces ae0 unit 0 vlan-id 4000
set interfaces ae0 unit 0 family inet address 192.168.10.2/30

set interfaces xe-4/0/4 gigether-options 802.3ad ae1
set interfaces xe-4/0/5 gigether-options 802.3ad ae1
set interfaces ae1 description ICL-LAYER2-LINK
set interfaces ae1 unit 0 family ethernet-switching interface-mode trunk
set interfaces ae1 unit 0 family ethernet-switching vlan members all

set protocols iccp local-ip-addr 192.168.10.12
set protocols iccp peer 192.168.10.11 session-establishment-hold-time 50
set protocols iccp peer 192.168.10.11 redundancy-group-id-list 2
set protocols iccp peer 192.168.10.11 backup-liveness-detection backup-peer-id 10.19.11.36
set protocols iccp peer 192.168.10.11 liveness-detection minimum-interval 2000
set protocols iccp peer 192.168.10.11 liveness-detection multiplier 4

• Preparing for the Junos Fusion Enterprise Conversion on page 74
• Configuring the Aggregation Switches for the Junos Fusion Enterprise Conversion on page 75
• Converting the Virtual Chassis Into a Satellite Device Cluster on page 80
Preparing for the Junos Fusion Enterprise Conversion

Step-by-Step Procedure

Follow these steps to prepare for the Junos Fusion Enterprise conversion.

1. Backup the configuration file on each switch in the topology.

   There are several options for backing up configuration files. See Understanding How the Junos OS Configuration Is Stored.

   ! CAUTION: Backup your Virtual Chassis switch configuration to a remote location to avoid losing your Virtual Chassis configuration.

   All switches in the EX4300 Virtual Chassis are converted into satellite devices in this procedure. All local Junos configuration files are deleted when a switch becomes a satellite device.

2. Define the member ID, FPC ID, and cluster name parameters for every satellite device and cluster in the final Junos Fusion Enterprise topology.

   These parameters are not configured until steps 3 and 4 in the Configuring the Aggregation Switches for the Junos Fusion Enterprise Conversion chapter of this document, but need to be known prior to the conversion to properly setup the configuration in earlier steps.

   We strongly suggest defining FPC IDs that logically map to the pre-conversion member IDs to simplify configuration in the upcoming steps. For instance, Virtual Chassis members 0, 1, and 2 are converted to FPC IDs 100, 101, & 102 in this procedure.

3. Obtain and log the base MAC address of each memberswitch in the Virtual Chassis. The base MAC addresses are used to configure the system-id parameter—performed in step 4 in the Configuring the Aggregation Switches for the Junos Fusion Enterprise Conversion chapter of this process—in the Junos Fusion Enterprise configuration.

   Enter the `show chassis mac-addresses` command in the Virtual Chassis to obtain the MAC address of each member switch.

```plaintext
user@switch0> show chassis mac-addresses

<table>
<thead>
<tr>
<th>FPC</th>
<th>MAC address information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public base address</td>
</tr>
<tr>
<td></td>
<td>Public count</td>
</tr>
<tr>
<td>FPC 1</td>
<td>MAC address information</td>
</tr>
<tr>
<td></td>
<td>Public base address</td>
</tr>
<tr>
<td></td>
<td>Public count</td>
</tr>
<tr>
<td>FPC 2</td>
<td>MAC address information</td>
</tr>
<tr>
<td></td>
<td>Public base address</td>
</tr>
<tr>
<td></td>
<td>Public count</td>
</tr>
</tbody>
</table>
```
Configuring the Aggregation Switches for the Junos Fusion Enterprise Conversion

Step-by-Step Procedure

Follow these steps to configure the aggregation switches for the conversion:
1. Move the configuration on the Virtual Chassis to the aggregation switches, and modify the configuration to reflect the Junos Fusion Enterprise configuration.

**NOTE:** This step must be performed before converting the member switches in the Virtual Chassis into satellite devices because all Junos OS configuration is erased during the conversion process.

This step can be performed directly in the CLI or in a file that is later loaded into the CLI. For information on setting up a file that is later loaded into the Junos OS CLI, see *Loading a Configuration from a File or the Terminal*. For other file configuration options, see *CLI User Guide*.

The following tasks need to be completed in this step:

- Move all configuration that will be used in the post-conversion Junos Fusion Enterprise from the Virtual Chassis to the aggregation devices. All configuration in a Junos Fusion is done on the aggregation devices. The Virtual Chassis switches will function as satellite devices in the post-conversion Junos Fusion Enterprise, and satellite devices are not configurable.

- Change all configuration that directly references an interface name from the Virtual Chassis interface numbering scheme to the satellite device interface numbering scheme.

  Example for a statement in the interfaces stanza:

  Virtual Chassis (pre-conversion on member 2)

  ```
  set interfaces ge-2/0/1 description PRINTER1
  ```

  Aggregation Devices on Junos Fusion (post conversion on satellite device using FPC ID 102)

  ```
  set interfaces ge-102/0/1 description PRINTER1
  ```

- Example for a statement that is not configured in the interfaces stanza:

  Virtual Chassis (pre-conversion on member 2)

  ```
  set protocols lldp interface ge-2/0/1
  ```

  Aggregation Devices on Junos Fusion (post conversion on satellite device using FPC ID 102)

  ```
  set protocols lldp interface ge-102/0/1
  ```

- If you are using firewall filters on the Virtual Chassis member switches:
- For interface firewall filters, copy the firewall filter definitions to the aggregation devices and change the interface names as described in the previous bullet.

- For firewall filters with the same name and different definitions on different Virtual Chassis access interfaces, change your firewall filter naming scheme on the aggregation devices or reevaluate your firewall filter configurations in the Junos Fusion Enterprise.

- If you are using class of service (CoS) policies:

  - As a best practice, try to standardize CoS policies for all satellite device clusters to simplify management in a Junos Fusion.

  - Note that configuration is now done from the aggregation device for all satellite devices. If CoS policies on one Virtual Chassis share an identical name but are configured differently than the CoS policies for another Virtual Chassis, some CoS policy renaming or reconfiguring must occur.

  - Reconfigure your CoS policies to position them within the Junos Fusion Enterprise.

    CoS policies that were previously-configured on the high-speed interfaces connecting the EX4300 Virtual Chassis to the aggregation switches, for instance, must now be configured on the satellite device uplink ports. Downstream CoS policies from the aggregation devices to the satellite device cluster must now be configured on the cascade ports on the aggregation devices.

- If you are using storm control:

  - In a Junos Fusion Enterprise, the storm control enforcement level is based on traffic seen at the aggregation device level. A configured storm control limit on an extended port might allow more BUM traffic than the configured limit before the storm control profile actions are initiated.

  - Review your configuration, and change any other parameters that may be impacted by the interface name changes or the topology changes that occur when an MC-LAG topology is changed into a Junos Fusion Enterprise.

---

**NOTE:** The Virtual Chassis configuration done in the `edit virtual-chassis` hierarchy does not need to be moved to the aggregation device because it will be replaced by the satellite device cluster configuration.

---

2. Login to aggregation switch 1. Deactivate the interfaces on the aggregation switch that are participating in the MC-LAG:

```
deactivate interfaces ae10
delete interfaces xe-4/0/1 gigether-options 802.3ad
```
3. From the aggregation switch, configure a cluster ID and associate a cascade port with the satellite device cluster. A cluster name is also configured in this step.

The cascade port in this step cannot be the interface that was disabled in the previous step.

```
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 cluster-id 1
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 cascade-ports xe-0/3/1
```

**NOTE:** This procedure assumes commit synchronization is enabled and uses configuration groups. See *Enabling Configuration Synchronization Between Aggregation Devices in a Junos Fusion*.

4. From the aggregation switch, configure each switch in the Virtual Chassis into a member of the satellite device cluster. An FPC slot ID, member ID, and alias are assigned in these steps.

The system ID is the MAC address of the switch, which can be obtained by entering the `show chassis mac-addresses` command as shown in the *Preparing for the Junos Fusion Enterprise Conversion* section.

```
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 100 alias building1-switch1-ex4300
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 100 member-id 1
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 100 system-id 00:00:5E:00:53:a0
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 101 alias building1-switch2-ex4300
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 101 member-id 2
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 101 system-id 00:00:5E:00:53:b0
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 102 alias building1-switch3-ex4300
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 102 member-id 3
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster cluster_ex4300 fpc 102 system-id 00:00:5E:00:53:c0
```

5. Configure the satellite device cluster into the redundancy group used by the MC-LAG.

```
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management redundancy-groups redgrp1 cluster cluster_ex4300
```
6. Configure the interface connecting to the satellite device cluster into a cascade port.

The interface used in this step is the same as the interface associated with the cluster in step 3.

```plaintext
set groups FUSION-ENTERPRISE-BLDG1 interfaces xe-0/3/1 cascade-port
```

7. Commit the configuration.

```plaintext
commit synchronize
```

8. Repeat steps 1 through 7 on aggregation device 2.

```plaintext
deactivate interfaces ae10
delete interfaces xe-4/0/1 gigether-options 802.3ad
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 cluster-id 1
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 cascade-ports xe-5/0/6
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 100 alias building1-switch1-ex4300
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 100 member-id 1
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 100 system-id 00:00:5E:00:53:a0
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 101 alias building1-switch2-ex4300
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 101 member-id 2
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 101 system-id 00:00:5E:00:53:b0
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 102 alias building1-switch3-ex4300
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 102 member-id 3
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management cluster
cluster_ex4300 fpc 102 system-id 00:00:5E:00:53:c0
set groups FUSION-ENTERPRISE-BLDG1 chassis satellite-management redundancy-groups
redgrp1 cluster cluster_ex4300
set groups FUSION-ENTERPRISE-BLDG1 interfaces xe-5/0/6 cascade-port
commit synchronize
```
Converting the Virtual Chassis Into a Satellite Device Cluster

The final step in this procedure requires converting the Virtual Chassis into a satellite device cluster.

The satellite device cluster was configured on the aggregation device in the Configuring the Aggregation Switches for the Junos Fusion Enterprise Conversion section. The member switches in the Virtual Chassis need to be converted into satellite devices before the aggregation device configuration takes effect.

The Virtual Chassis ports (VCPs) must be deleted before the satellite device conversion. The links that were functioning as VCPs in the pre-conversion topology function as clustering ports—interfaces that interconnect satellite devices in the same satellite device cluster—in the post-conversion topology. No additional configuration is required to convert these links into clustering ports.

Follow these steps to login to the Virtual Chassis and complete the conversion.

1. Disable each Virtual Chassis port (VCP).
   Start by disabling the VCPs on the non-master switches to ensure connectivity over the VCPs is not lost during the process.
   ```
   user@switch0> request virtual-chassis vc-port delete pic-slot 2 port 0 member 2
   user@switch0> request virtual-chassis vc-port delete pic-slot 2 port 1 member 2
   user@switch0> request virtual-chassis vc-port delete pic-slot 2 port 0 member 1
   user@switch0> request virtual-chassis vc-port delete pic-slot 2 port 1 member 1
   user@switch0> request virtual-chassis vc-port delete pic-slot 2 port 2 local
   user@switch0> request virtual-chassis vc-port delete pic-slot 2 port 3 local
   ```

   **NOTE:** There are other ways to disable VCPs. See Deleting Virtual Chassis Ports in a Virtual Chassis Configuration.

2. Copy the satellite software image onto each switch
   For information on copying software images onto an EX4300 switch, see Downloading Software Packages from Juniper Networks.
   For information about software compatibility requirements and to obtain the satellite software for your Junos Fusion Enterprise, see Junos Fusion Hardware and Software Compatibility Matrices.

   **NOTE:** The remaining steps assume the satellite software is stored in the /var/tmp folder and that the satellite software image package has not been renamed.
3. Convert each switch into a satellite device:

   **Switch 0:**
   ```
   request chassis device-mode satellite /var/tmp/satellite-ppc-3.2R1.1-signed.tgz
   ```

   **Switch 1:**
   ```
   request chassis device-mode satellite /var/tmp/satellite-ppc-3.2R1.1-signed.tgz
   ```

   **Switch 2:**
   ```
   request chassis device-mode satellite /var/tmp/satellite-ppc-3.2R1.1-signed.tgz
   ```

   **Switch 0 Sample Output**
   ```
   user@switch0>  request chassis device-mode satellite /var/tmp/satellite-ppc-3.2R1.1-signed.tgz
   Metatags extracted
   Satellite package version is '3.2R1.1'
   Using host.tgz for ppc from the package
   all conditions passed
   Proceeding with conversion to satellite device
   Formatting the alternate partition /dev/da0s2 and creating a fat32 msdos filesystem
   /dev/da0s2: 673376 sectors in 84172 FAT32 clusters (4096 bytes/cluster)
   bps=512 spc=8 res=32 nft=2 mid=0xf0 spt=63 hds=255 hid=0 bsec=674730 bspf=658
   rdcl=2 infs=1 bkbs=2
   ```

   Each EX4300 switch reboots as a satellite device. Satellite devices do not run Junos OS and all previous local Junos OS configuration files—including the configuration files that stored the Virtual Chassis configuration—are deleted. All configuration for the Junos Fusion Enterprise is done from the aggregation devices from this point onward.

4. Enter the `show chassis satellite` command from the aggregation devices after the satellite devices have rebooted to confirm Junos Fusion Enterprise operations.

   See Verifying that the Satellite Devices are Online or Verifying Connectivity, Device States, Satellite Software Versions, and Operations in a Junos Fusion for sample outputs and other procedures that can be performed to confirm operation of the Junos Fusion Enterprise.

**Related Documentation**
- About This Network Configuration Example on page 5
- Use Case Overview on page 5
- Technical Overview on page 7