Example: Configuring a Virtual Chassis Interconnected Across Multiple Wiring Closets

A Virtual Chassis configuration is a very adaptable access switch solution. You can install member switches in different wiring closets, interconnecting the member switches by cabling and configuring uplink module ports and SFP network ports on EX4200-24F switches as Virtual Chassis ports (VCPs).

This example shows how to use uplink VCPs to connect Virtual Chassis members that are located too far apart to be connected using the dedicated VCPs. Uplink VCPs can also be used to connect Virtual Chassis members to form link aggregation groups (LAGs). For the latter usage, see Example: Configuring Link Aggregation Groups Using Uplink Virtual Chassis Ports.

NOTE: You can also configure the SFP networks ports on EX4200-24F switches as VCPs to connect Virtual Chassis member switches across wiring closets and to form LAGs.

This example describes how to configure a Virtual Chassis access switch interconnected across wiring closets:

Requirements

This example uses the following hardware and software components:

- JUNOS Release 9.0 or later for EX Series switches
- Four EX4200 switches
- Four XFP uplink modules

Before you interconnect the members of the Virtual Chassis configuration across wiring closets, be sure you have:

1. Installed an uplink module in each member switch. See Installing an Uplink Module in an EX3200 or EX4200 Switch.
2. Powered on, connected, and run the EZSetup program on SWA-0 (see Table 1 for switch names used in this example). See Connecting and Configuring an EX Series Switch (CLI Procedure) or Connecting and Configuring an EX Series Switch (J-Web Procedure) for details.
3. Configured SWA-0 with the virtual management Ethernet (VME) interface for remote, out-of-band management of the Virtual Chassis configuration, if desired. See Configuring the Virtual Management Ethernet Interface for Global Management of a Virtual Chassis (CLI Procedure).
4. Interconnected SWA-0 and SWA-1 using the dedicated VCPs on the rear panel. SWA-1 must not be powered on at this time.
5. Interconnected SWA-2 and SWA-3 using the dedicated VCPs on the rear panel. SWA-2 and SWA-3 must not be powered on at this time.

Overview and Topology

In this example, four EX4200 switches will be interconnected in a Virtual Chassis configuration. Two of these (SWA-0 and SWA-1) are located in wiring closet A and the two other (SWA-2 and SWA-3) are located in wiring closet B.

For ease of monitoring and manageability, we want to interconnect all four switches as members of a Virtual Chassis configuration. Prior to configuring the Virtual Chassis, we installed uplink modules in each of the member switches. In this example, uplink modules are installed in all four members so that there are redundant VCP connections across the wiring closets. If you want to expand this configuration to include more members within these wiring closets, you do not need to add any more uplink modules. Simply use the dedicated VCPs on the rear panel. The redundancy of uplink VCPs provided in this example is sufficient.

We have interconnected the switches in wiring closet A and also interconnected the ones in wiring closet B using the dedicated VCPs. The interfaces for the dedicated VCPs are operational by default. They do not need to be configured.

However, the Virtual Chassis cables that interconnect the dedicated VCPs of member switches within a single wiring closet are not long enough to connect member switches across wiring closets. Instead, we will use the fiber-optic cable connections in the uplink modules to interconnect the member switches in wiring closet A to the member switches in wiring closet B. You only need to interconnect one member switch in wiring closet A to one in wiring closet B to form the Virtual Chassis configuration. However, for redundancy, this example connects uplink module ports from the two member switches in wiring closet A to the two member switches in wiring closet B.

We will specify the highest mastership priority value (255) for SWA-0 to make it the master before we power on SWA-1. Because SWA-0 and SWA-1 are interconnected with the dedicated VCPs, the master detects that SWA-1 is a member of its Virtual Chassis configuration and assigns it a member ID.

We configure SWA-2 in wiring closet B without running EZSetup by directly connecting to the console port. If you wish, you can run EZSetup and specify identification parameters. Later, when you interconnect SWA-2 with SWA-0, the master of the Virtual Chassis configuration, the master overwrites any conflicting parameters.

We will use SWA-2 as the backup of the Virtual Chassis configuration. If a problem occurs in wiring closet A, SWA-2 would take control of the Virtual Chassis configuration and maintain the network connections. We will configure the same mastership priority value for SWA-2 (255) that we configured for the master. Because we power on SWA-0 before we power on SWA-2, SWA-0 has additional prioritization properties that allow it to retain mastership of the Virtual Chassis configuration. See Understanding How the Master in a Virtual Chassis Configuration Is Elected. We recommend setting identical mastership priority values for the master and backup members for high availability and smooth transition of mastership in case the original master becomes unavailable. (Setting identical mastership priority values for the master and backup members prevents the previous master from pre-empting the master role from the new master when the previous master comes back online.)

After we have configured SWA-2 and set one of its uplink module ports as an uplink VCP, we will interconnect its uplink VCP with an uplink VCP on SWA-0.

Finally, we will power on SWA-3. Because SWA-3 is interconnected with SWA-2 using the dedicated VCPs on the rear panel, the master will detect that SWA-3 is part of the expanded Virtual Chassis configuration and assign it member ID 3. For redundancy, we will configure an uplink VCP on SWA-3 through the master and interconnect that uplink VCP with an uplink VCP on SWA-1.

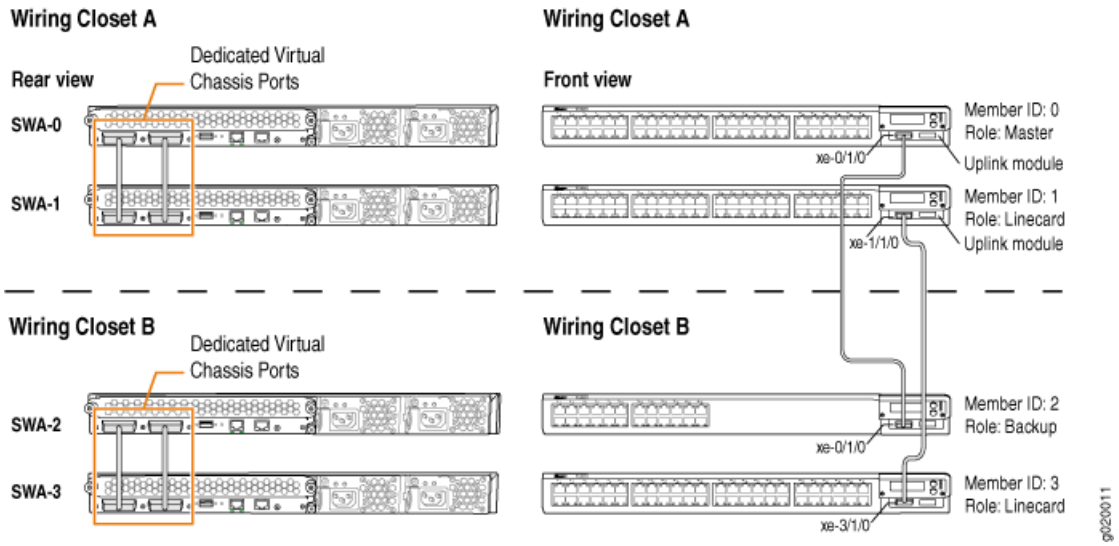
Table 1 shows the Virtual Chassis configuration settings for a Virtual Chassis composed of member switches in different wiring closets.

Table 1: Components of a Virtual Chassis Interconnected Across Multiple Wiring Closets

Switch	Member ID	Role and Priority	Location
SWA-0	0	master; mastership priority 255	Wiring closet A
SWA-1	1	linecard; mastership priority 128	Wiring closet A
SWA-2	2	backup; mastership priority 255	Wiring closet B
SWA-3	3	linecard; mastership priority 128	Wiring closet B

Figure 1 shows the different types of interconnections used for this Virtual Chassis configuration. The rear view shows the member switches within each wiring closet interconnected to each other using the dedicated VCPs. The front view shows the uplink VCPs interconnected across the wiring closets.

Figure 1: Virtual Chassis Interconnected Across Wiring Closets



Configuration

To configure the Virtual Chassis across multiple wiring closets, perform these tasks:

Step-by-Step Procedure

To configure a Virtual Chassis across multiple wiring closets:

1. Configure the mastership priority of SWA-0 (member 0) to be the highest possible value (255), thereby ensuring that it functions as the master of the expanded Virtual Chassis configuration:

```
[edit virtual-chassis]
user@SWA-0# set member 0 mastership-priority 255
```

2. Prepare the members in wiring closet A for interconnecting with the member switches in wiring closet B by setting uplink VCPs for member 0 and member 1:

```
user@SWA-0> request virtual-chassis vc-port  set pic-slot 1 port 0
user@SWA-0> request virtual-chassis vc-port set pic-slot 1 port 0 member
1
```

NOTE:

- For redundancy, this example configures an uplink VCP in both SWA-0 and SWA-1.
- This example omits the specification of the member *member-id* option in configuring an uplink VCP for SWA-0 (and, later, for SWA-2). The command applies by default to the switch where it is executed.

3. Prepare SWA-2 in wiring closet B for interconnecting with the Virtual Chassis configuration by configuring its mastership priority to be the highest possible value (255). Its member ID is currently 0, because it is not yet interconnected with the other members of the Virtual Chassis configuration. It is operating as a standalone switch. Its member ID will change when it is interconnected.

```
[edit virtual-chassis]
user@SWA-2# set member 0 mastership-priority 255
```

NOTE: SWA-2 is configured with the same mastership priority value that we configured for SWA-0. However, the longer uptime of SWA-0 ensures that, once the interconnection is made, SWA-0 functions as the master and SWA-2 functions as the backup.

4. Specify one uplink module port in SWA-2 as an uplink VCP. Its member ID is 0, because it is not yet interconnected with the other members of the Virtual Chassis configuration.

NOTE: The setting of the uplink VCP remains intact when SWA-2 reboots and joins the Virtual Chassis configuration as member 2.

```
user@SWA-2> request virtual-chassis vc-port set pic-slot 1 port 0
```

5. Physically interconnect SWA-0 and SWA-2 across wiring closets using their uplink VCPs. Although SWA-0 and SWA-2 have the same mastership priority value (255), SWA-0 was powered on first and thus has longer uptime. This results in SWA-0 retaining mastership while SWA-2 reboots and joins the now expanded Virtual Chassis configuration as the backup, with member ID 2.
6. Power on SWA-3. It joins the expanded Virtual Chassis configuration as member 3.

NOTE: Member ID 3 is assigned to SWA-3 is 3, because SWA-3 was powered on after members 0, 1, and 2.

7. Because SWA-3 is now interconnected as a member of the Virtual Chassis configuration, you can specify a redundant uplink VCP on SWA-3 through the master of the Virtual Chassis configuration:

```
user@SWA-0> request virtual-chassis vc-port set pic-slot 1 port 0 member
3
```

8. Physically interconnect SWA-3 and SWA-1 across wiring closets using their uplink VCPs. Both SWA-1 and SWA-3 have the default mastership priority value (128) and function in a linecard role.

NOTE: We recommend that you use the commit synchronize command to save any configuration changes that you make to a multimember Virtual Chassis.

Results Display the results of the configuration on SWA-0:

```
[edit]
user@SWA-0# show virtual-chassis
   member 0 {
      mastership-priority 255;
   }
   member 1 {
      mastership-priority 128;
   }
   member 2 {
      mastership-priority 255;
   }
   member 3 {
      mastership-priority 128;
   }
}
```

Verification

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

- Verifying the Member IDs and Roles of the Member Switches on page 6
- Verifying that the Dedicated VCPs and Uplink VCPs Are Operational on page 7

Verifying the Member IDs and Roles of the Member Switches

Purpose Verify that all the interconnected member switches are included within the Virtual Chassis configuration and that their roles are assigned appropriately.

Action Display the members of the Virtual Chassis configuration:

```
user@SWA-0> show virtual-chassis status

Virtual Chassis ID: 0000.e255.00e0

                                          Mastership            Neighbor List
Member ID  Status  Serial No   Model     Priority  Role        ID Interface

0 (FPC 0)  Prsnt   abc123      ex4200-48p    255   Master*     1 vcp-0
                                                               2 vcp-1
                                                               2 vcp-255/1/0

1 (FPC 1)  Prsnt   def456      ex4200-24t    128   Linecard    0 vcp-0
                                                               0 vcp-1
                                                               3 vcp-255/1/0
```

```
2 (FPC 2)  Prsnt   ghi789      ex4200-48p    255   Backup     3 vcp-0
                                                               3 vcp-1
                                                              0 vcp-255/1/0
3 (FPC 3)  Prsnt   jkl012      ex4200-24t    128   Linecard   2 vcp-0
                                                              2 vcp-1
                                                              3 vcp-255/1/0
```

Meaning The show virtual-chassis status command lists the member switches interconnected as a Virtual Chassis configuration with the member IDs that have been assigned by the master, the mastership priority values, and the roles. It also displays the neighbor members with which each member is interconnected.

Verifying that the Dedicated VCPs and Uplink VCPs Are Operational

Purpose Verify that the dedicated VCPs interconnecting member switches in wiring closet A and the uplink VCPs interconnecting the member switches between wiring closets are operational.

Action Display the Virtual Chassis interfaces:

```
user@SWA-0> show virtual-chassis status all-members

fpc0:
--------------------------------------------------------------------------
Interface   Type              Trunk  Status       Speed        Neighbor
or                             ID                (mbps)       ID  Interface
PIC / Port
vcp-0       Dedicated           1    Up           32000
vcp-1       Dedicated           2    Up           32000        1   vcp-0
1/0         Auto-Configured    -1    Up           1000         2   vcp-255/1/0

fpc1:
--------------------------------------------------------------------------
Interface   Type              Trunk  Status       Speed        Neighbor
or                             ID                (mbps)       ID  Interface
PIC / Port
vcp-0       Dedicated           1    Up           32000        0   vcp-0
vcp-1       Dedicated           2    Up           32000        0   vcp-1
1/0         Auto-Configured    -1    Up           1000         3   vcp-255/1/0

fpc2:
--------------------------------------------------------------------------
Interface   Type              Trunk  Status       Speed        Neighbor
or                             ID                (mbps)       ID  Interface
PIC / Port
vcp-0       Dedicated           1    Up           32000        3   vcp-0
vcp-1       Dedicated           2    Up           32000
1/0         Auto-Configured    -1    Up           1000         0   vcp-255/1/0

fpc3:
--------------------------------------------------------------------------
Interface   Type              Trunk  Status       Speed        Neighbor
or                             ID                (mbps)       ID  Interface
```

```
PIC / Port
vcp-0       Dedicated          1    Up          32000       2   vcp-0
vcp-1       Dedicated          2    Up          32000       2   vcp-1
1/0         Auto-Configured   -1    Up          1000        1   vcp-255/1/0
```

Meaning The dedicated VCPs are displayed as vcp-0 and vcp-1. The interface on the switch that has been set as an uplink VCP is displayed as 1/0. The member interface names of uplink VCPs are of the form vcp-255/*pic*/*port*—for example, vcp-255/1/0. In that name, vcp-255 indicates that the interface is an uplink VCP, 1 is the uplink PIC number, and 0 is the uplink port number. The fpc number is the same as the member ID. The Trunk ID is a positive number ID assigned to the LAG formed by the Virtual Chassis. If no LAG is formed, the value is –1.

Troubleshooting

To troubleshoot a Virtual Chassis configuration that is interconnected across wiring closets, perform these tasks:

Troubleshooting Nonoperational VCPs

Problem A uplink VCP shows a status of down.

Solution

- Check the cable to make sure that it is properly and securely connected to the ports.
- If the VCP is an uplink module port, make sure that it has been explicitly set as an uplink VCP.
- If the VCP is an uplink module port, make sure that you have specified the options (*pic-slot*, *port*, and *member*) correctly.

Related Topics

- Example: Configuring a Virtual Chassis with a Master and Backup in a Single Wiring Closet
- Example: Expanding a Virtual Chassis Configuration in a Single Wiring Closet
- Example: Setting Up a Multimember Virtual Chassis Access Switch with a Default Configuration
- Setting an Uplink Module Port as a Virtual Chassis Port (CLI Procedure)

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