# 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 ports as Virtual Chassis ports (VCPs).

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
- Two EX 4200-48P switches
- Two EX 4200-24T switches
- Four EX-UM-2XFP uplink modules

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

1. Installed an EX-UM-2XFP uplink module in the member switches that will be interconnected across wiring closets. See Installing an Uplink Module in an EX3200 or EX4200 Switch.
2. Powered on, connected and run the EZ Setup program on SWA-0. Follow the prompts to specify the host name and other identification, time zone, and network properties. See Connecting and Configuring an EX Series Switch (CLI Procedure) or Connecting and Configuring an EX Series Switch (J-Web Procedure) for details. SWA-0 is going to be configured in the example to function as the master of the Virtual Chassis. Thus, the properties that you specified for SWA-0 apply to the entire Virtual Chassis configuration, including all the member switches that you later interconnect with the master.
3. Configured SWA-0 with the virtual management Ethernet (VME) for remote, out-of-band management of the Virtual Chassis configuration, if desired.

```
[edit]
user@SWA-0# set interfaces vme unit 0 family inet address /ip-address/mask/
```

4. Interconnected SWA-0 and SWA-1 (the two member switches in wiring closet A) using the dedicated VCPs on the rear panel. SWA-1 should not be powered on at this time.
5. Interconnected SWA-2 and SWA-3 (the two member switches in wiring closet B) using the dedicated VCPs on the rear panel. SWA-2 and SWA-3 should not be powered on at this time.

**NOTE:** Beginning with JUNOS Release 9.2 for EX-series switches, you can use either a 10-Gbps Ethernet uplink port (EX-UM-2XFP) or a 1-Gbps Ethernet uplink port (EX-UM-4SFP) as a VCP interface. When an uplink port is set as a VCP interface, it cannot be used for any other purpose. The EX-UM-2XP uplink module has two 10-Gbps ports; the EX-UM-4SFP has four 1-Gbps ports. You can set one port as a VCP interface and configure the other port in trunk mode as an uplink to a distribution switch.

## *Overview and Topology*

In this example, four EX 4200 switches will be interconnected in a Virtual Chassis configuration. Two switches (SWA-0 and SWA-1) are located in wiring closet A and two switches (SWA-2 and SWA-3) are located at the other end of the floor in wiring closet B.

For easier 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. We are going to interconnect the member switches across wiring closets, setting the 10-gigabit uplink ports as VCP interfaces. 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.

First, we will complete the Virtual Chassis configuration of the member switches in wiring closet A.

We have decided that SWA-0 will function as the master, so we set its mastership priority value to the highest possible value (255).

The switches (SWA-0 and SWA-1) in wiring closet A have been interconnected using the dedicated Virtual Chassis ports (VCPs) . The interfaces for the rear panel, dedicated VCPs are operational by default. They do not need to be configured.

However, the rear-panel Virtual Chassis cables that interconnect the VCPs of member switches within a single wiring closet are not long enough to connect member switches across wiring closets. Instead, you can use the fiber cable connections in the uplink modules to interconnect the member switches in wiring closet A to the member switch in wiring closet B. For redundancy, this example connects uplink ports from the two member switches in wiring closet A to the two member switches in wiring closet B.

After specifying the highest mastership priority value (255) for SWA-0, 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 a member ID. We can now set the VCP uplinks for both SWA-0 and SWA-1 through the master in preparation for interconnecting them with the member switches in wiring closet B.

However, in order for the master to recognize the existence of SWA-2, you must first set one of the SWA-2 uplinks as a VCP. You cannot set the SWA-2 uplink through the master of the Virtual Chassis configuration, because SWA-2 is not yet interconnected as a member switch.

We will power on and configure SWA-2 prior to powering on SWA-3.

When you power on SWA-2, its member ID is **0**, its default mastership priority is **128**, and it is functioning in the **master** role.

You can configure SWA-2 without running EZ Setup by directly connecting to the console port. If you wish, you can run EZ Setup and specify identification parameters. Later, when you interconnect SWA-2 with the master of the Virtual Chassis configuration, the master overwrites any conflicting parameters.

We want to 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 configure the same mastership priority value for SWA-2 (255) that we configured for the master. Because SWA-0 has already been powered on prior to SWA-2, it 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 SWA-2 has been configured and its uplink port has been set as a VCP interface, interconnect its VCP uplink port with the VCP uplink of SWA-0 in wiring closet A. SWA-2 reboots and joins the Virtual Chassis configuration as member 2 and as backup of the expanded Virtual Chassis configuration.

Now, power on SWA-3. Because SWA-3 is interconnected with SWA-2 using the dedicated VCPs on the rear panel, the master detects that SWA-3 is part of the expanded Virtual Chassis configuration and assigns it member ID 3. For redundancy, configure a VCP uplink on member 3 through the master and interconnect this uplink with the VCP uplink of SWA-1 in wiring closet A.

The topology for this example consists of:

- Two EX 4200-48P switches
- Two EX 4200-24T switches
- Four EX-UM-2XFP uplink modules.

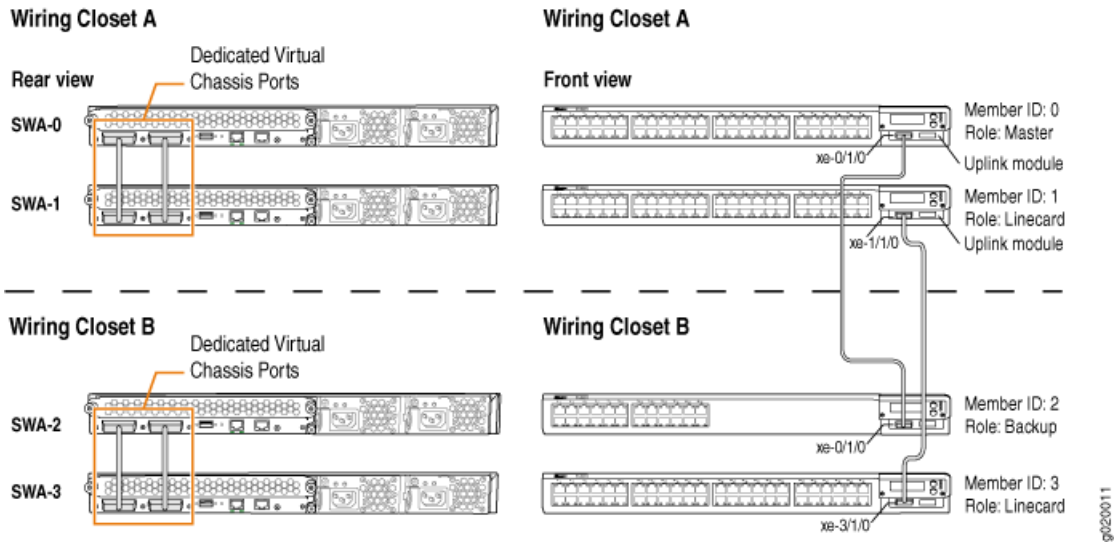
Table 1 shows the Virtual Chassis configuration settings for a Virtual Chassis composed of member switches in different wiring closets.

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

| Switch | Member ID | Role and Priority | Uplinks Connecting Member Switches | Hardware | Location |
|---|---|---|---|---|---|
| SWA-0 | 0 | master; mastership priority 255 | xe-0/1/0 | EX 4200-48P and EX-UM-2XFP uplink module | Wiring closet A |
| SWA-1 | 1 | linecard; mastership priority 128 | xe-1/1/0 | EX 4200-24T and EX-UM-2XFP uplink module | Wiring closet A |
| SWA-2 | 2 | backup; mastership priority 255 | xe-0/1/0 | EX 4200-48P and EX-UM-2XFP uplink module | Wiring closet B |
| SWA-3 | 3 | linecard; mastership priority 128 | xe-3/1/0 | EX 4200-24T and EX-UM-2XFP uplink module | Wiring closet B |

Figure 1 shows the different types of interconnections used for this Virtual Chassis configuration. The rear view shows that the member switches within each wiring closet are interconnected to each other using the dedicated VCPs. The front view shows that the uplink ports that have been set as VCP interfaces and interconnected across the wiring closets. The uplink ports that are not used as VCPs can be configured as trunk ports to connect to a distribution switch.

**Figure 1: A Virtual Chassis Interconnected Across Wiring Closets**




## *Configuration*

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

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

**CLI Quick Configuration**

To quickly configure a Virtual Chassis across multiple wiring closets, configure a master in one closet and a backup in the other by copying the following commands into the specified terminal windows (SWA-0 and SWA-2):

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

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

**NOTE:** At this point, SWA-2 is a standalone switch, so its member ID is 0.

**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 the uplink for SWA-0. The command applies by default to the switch where it is executed.

3. Prepare the potential member switch (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 it functions as the master and that SWA-2 functions as the backup.

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

**NOTE:** The setting of the VCP interface 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
```

This example omits the specification of the member *member-id* option. The command applies by default to the switch where it is executed.

5. After you have set the uplink VCP in SWA-2, you should 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 a backup with member ID 2.
6. Power on SWA-3, which is interconnected with SWA-2 using the dedicated VCPs on the rear panel. It joins the expanded Virtual Chassis configuration as member 3.

**NOTE:** We have assumed that the member ID assigned to SWA-3 is 3, because it was powered on in that sequence.

7. Since SWA-3 is now interconnected as a member of the Virtual Chassis configuration, you can specify a redundant VCP uplink 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. After you have configured the uplink VCP of SWA-3, you should 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.

**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 8
- Verifying That the Dedicated VCPs and Uplink VCPs Are Operational on page 9

### 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
                1 vcp-1
                                                           2 1/0

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


2 (FPC 2)  Prsnt   ghi789      ex4200-48p    255  Backup    3 vcp-0

                                   3 vcp-1
                                                           0 1/0

3 (FPC 3)  Prsnt   jkl012      ex4200-24t    128  Linecard  2 vcp-0
                                                           2 vcp-1
                                                           1 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 the 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 vc-port all-members
fpc0:
--------------------------------------------------------------------------
Interface        Type             Status
or
PIC / Port
vcp-0            Dedicated        Up
vcp-1            Dedicated        Up
1/0              Configured       Up


fpc1:
--------------------------------------------------------------------------
Interface        Type             Status
or
PIC / Port
vcp-0            Dedicated        Up
vcp-1            Dedicated        Up
1/0              Configured       Up


fpc2:
--------------------------------------------------------------------------
Interface        Type             Status
or
PIC / Port
vcp-0            Dedicated        Up
vcp-1            Dedicated        Up
1/0              Configured       Up


fpc3:
--------------------------------------------------------------------------
Interface        Type             Status
or
PIC / Port
vcp-0            Dedicated        Up
vcp-1            Dedicated        Up
1/0              Configured       Up
```

**Meaning** The dedicated VCPs are displayed as vcp-0 and vcp-1. The uplinks configured as VCPs are displayed as 1/0. The fpc number is the same as the member ID.

## *Troubleshooting*

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

### Troubleshooting Nonoperational VCPs

**Problem** A VCP interface 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 port, make sure that the uplink port has been explicitly set as a VCP.
- If the VCP is an uplink port, make sure that you have specified the options (pic-slot, port-number, member-id) 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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