



Migrating to a Back-to-Back System

The Universal Fabric Card (UFC) supports a back-to-back configuration between two Cisco NCS 6000 LCCs. The back-to-back configuration is supported on Cisco IOS XR release 6.2.1 and later releases. This chapter describes how to migrate two Cisco NCS 6000 LCC routers from single-chassis to a back-to-back configuration.

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Prerequisites

- Before you perform any procedures, review the safety guidelines in the [Cisco Network Convergence System 6000 Series Routers Hardware Installation Guide](#) to avoid injuring yourself or damaging the equipment.
- Before cabling the system, install each line card chassis (LCC) in the planned location. Ensure that you have adequate floor space to cable the back-to-back configuration and an environment that meets the recommended specifications. For more information, see the [Cisco Network Convergence System 6000 Series Routers Site Planning Guide](#).
- Verify that both single chassis routers (RACK0 and RACK1) are running Cisco IOS XR release 6.2.1 or later (with all applicable SMUs and packages).
- From each chassis, use the **show chassis** command from SysAdmin VM and make note of each chassis serial number.



Note The chassis serial number can also be found on the label on the chassis front/rear face plate.

- Perform the Router Health check on both routers to ensure that any errors or exception are resolved prior to migrating to back-to-back mode. See [Commands for Router Health Check](#).

- Verify that field-programmable device (FPD) upgrades are completed for all FPDs on both routers by using the **show hw-module fpd** command. For any FPD components that show status as NEED UPGD, use the **upgrade hw-module location *location* fpd** command. For any FPD components that show status as RLOAD REQ, use the **hw-module location *location* reload** command.
- Create a backup of the RACK0 running configuration using the **copy running-config** command in both System Admin EXEC mode and XR EXEC mode.

Required Tools and Equipment

For a fully-loaded back-to-back configuration, the following Cisco NCS 6000 hardware is required:

- 2 Cisco NCS 6000 routers (NCS-6008)
- 4 Fan Trays (NC6-FANTRAY or NC6-FANTRAY-2)



Caution Both fan trays installed in a chassis must be the same type. Do not install NC6-FANTRAY and NC6-FANTRAY-2 fan trays in the chassis.

- 4 Power Trays, with 6 PEM for each Power Tray (NCS-AC-PWRTRAY)
- 4 Route Processors (NC6-RP)

For the Route Processor Ethernet Control connections between RACK0 and RACK1:

- 8 SFP+ optics (SFP-10G-SR)
- 4 LC-to-LC OM3 Multimode cables

- 12 Universal Fabric Cards (NC6-FC2-U)

For the Fabric Card connections between RACK0 and RACK1:

- 2 optical module set that includes 96 CXP-100G-SR12 modules each (NCS-FAB-OPT)
- 96 MTP-24 100G Multimode cables



Note Install a CXP transceiver module or an EMI/dust plug (supplied) in all CXP ports. Do not operate the FC with an open port.

- Supported line cards:
 - NC6-10X100G-M-P—10-port 100Gbps CXP
 - NC6-10X100G-L-P—10-port 100Gbps CXP
 - NC6-10X100G-M-K—10-port 100Gbps CPAK
 - NC6-2/10X100G-L-K—10-port 100Gbps CPAK
 - NC6-60X10GE-L-S—60-port 10Gbps SFP+

- NC6-60X10GE-M-S—60-port 10Gbps SFP+



Note The 20-port 100Gbps Line Card (NC6-20X100GE-L-C, NC6-20X100GE-M-C) is not supported in back-to-back configuration.

Additional required tool and equipment:

- ESD (Electrostatic Discharge) wrist strap (for inserting a optical modules)
- Number-2 Phillips screwdriver
- Cable Director (P/N 2123610-1), to provide support and strain relief for fabric cable connections (provided by Cisco approved vendor Tyco Electronics)
- Supply of Velcro tie wraps (to bundle cables)
- Ladder

Migrating RACK0 Fabric Planes to Back-to-Back Mode



Note This procedure must be completed for each fabric plane, one at a time, on RACK0.

To migrate to back-to-back mode using the Universal Fabric Cards (UFC), perform the following steps on RACK0:

Before you begin

Review and perform all tasks in the safety guidelines, prerequisites, and required equipment sections before performing this task.

Step 1 From SysAdmin VM configuration mode, shut down the fabric plane.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# controller fabric plane 0 shutdown
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# exit
```

Step 2 Use the **show controller fabric plane all detail** command to verify that the fabric plane Admin State and Plane State are down.

Example:

```
sysadmin-vm:0_RP0# show controller fabric plane all detail

Plane Admin Plane  Plane  up->dn  up->mcast Total  Down  PPU
```

Id	State	State	Mode	counter	counter	Bundles	Bundles	State
0	DN	DN	SC	0	0	16	0	NA
1	UP	UP	SC	0	0	16	0	NA
2	UP	UP	SC	0	0	16	0	NA
3	UP	UP	SC	0	0	16	0	NA
4	UP	UP	SC	0	0	16	0	NA
5	UP	UP	SC	0	0	16	0	NA

Step 3 From SysAdmin VM configuration mode, power off the fabric card.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# hw-module shutdown location 0/FC0
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# exit
```

Step 4 Use the **show platform location** command to verify that the fabric card is powered off.

Example:

```
sysadmin-vm:0_RP0# # show platform location 0/FC0
Mon Dec 5 23:54:02.366 UTC
Location Card Type HW State SW State Config State
-----
0/FC0 NC6-FC POWERED_OFF N/A NSHUT
```

Step 5 Remove the legacy fabric card following the steps in the [Removing a Fabric Card](#) section.

Step 6 Install the UFC following the steps in the [Installing a Fabric Card](#) section.

Note Do not connect any cables to the UFC.

Step 7 From SysAdmin VM configuration mode, change the fabric plane mode to B2B.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# controller fabric plane 0 b2b
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# exit
```

Step 8 Use the **show controller fabric plane all detail** command to verify that the fabric plane mode is B2B and that Admin State and Oper State are down.

Example:

```
sysadmin-vm:0_RP0# show controller fabric plane all detail

Plane Admin Plane Plane up->dn up->mcast Total Down PPU
Id State State Mode counter counter Bundles Bundles State
-----
0 DN DN B2B 0 0 16 0 NA
1 UP UP SC 0 0 16 0 NA
2 UP UP SC 0 0 16 0 NA
3 UP UP SC 0 0 16 0 NA
4 UP UP SC 0 0 16 0 NA
```

```
5      UP      UP      SC          0          0      16          0      NA
```

Step 9 From SysAdmin VM configuration mode, unshut the fabric card.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# no hw-module shutdown location 0/FC0

O/RP0/ADMIN0:Dec 5 11:27:52.757 : shelf_mgr[2921]: %INFRA-SHELF_MGR-6-CARD_HW_OPERATIONAL :
  Card: 0/FC0 hardware state going to Operational
O/RP0/ADMIN0:Dec 5 11:28:09.532 : confd_helper[2900]: %MGBL-CONFD_HELPER-5-SYSADMIN_COMMIT :
  A sysadmin configuration change has been committed. Use 'show configuration commit list'
  in admin mode for more details
LC/0/0/CPU0:Dec 5 11:28:15.538 : fia_driver[246]: %PLATFORM-CIH-5-ASIC_ERROR_THRESHOLD : fia[2]:
  A link-err error has occurred. CMIC.CMIC_CMC0_IRQ_STAT3.RTP.Interrupt_Register.LinkMaskChange
  Threshold has been exceeded
LC/0/5/CPU0:Dec 5 11:28:15.740 : fia_driver[216]: %PLATFORM-CIH-5-ASIC_ERROR_THRESHOLD : fia[4]:
  A link-err error has occurred. CMIC.CMIC_CMC0_IRQ_STAT3.RTP.Interrupt_Register.LinkMaskChange
  Threshold has been exceeded
LC/0/2/CPU0:Dec 5 11:28:15.927 : fia_driver[293]: %PLATFORM-CIH-5-ASIC_ERROR_THRESHOLD : fia[3]:
  A link-err error has occurred. CMIC.CMIC_CMC0_IRQ_STAT3.RTP.Interrupt_Register.LinkMaskChange
  Threshold has been exceeded
O/RP0/ADMIN0:Dec 5 11:28:17.401 : fsdbagg[4620]: %FABRIC-FSDB_AGG-5-PLANE_UPDOWN : [4620] :
  Plane 0 state changed to UP

sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# exit
```

Step 10 Use the **show platform location** command to verify that the fabric card is operational.

Example:

```
sysadmin-vm:0_RP0# show platform location 0/FC0
Mon Dec 5 23:54:02.366 UTC
Location Card Type HW State SW State Config State
-----
O/FC0 NC6-FC2-U OPERATIONAL N/A NSHUT
```

Step 11 Use the **show hw-module fpd** command to verify the status of all FPDs.

Verify that no FPD components require an upgrade (as indicated by NEED UPGD in the Status field) and that the Running and Programmed fields display the same version. See the [Prerequisites](#) section for FPD upgrade information.

Step 12 From SysAdmin VM configuration mode, unshut the fabric plane.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# no controller fabric plane 0 shutdown
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# exit
```

Step 13 Use the **show controller fabric plane all detail** command to verify that the Plane Mode is B2B and that Admin State and Plane State are up.

Example:

```
sysadmin-vm:0_RP0# show controller fabric plane all detail
```

Plane Id	Admin State	Plane State	Plane Mode	up->dn counter	up->mcast counter	Total Bundles	Down Bundles	PPU State
0	UP	UP	B2B	0	0	16	0	NA
1	UP	UP	SC	0	0	16	0	NA
2	UP	UP	SC	0	0	16	0	NA
3	UP	UP	SC	0	0	16	0	NA
4	UP	UP	SC	0	0	16	0	NA
5	UP	UP	SC	0	0	16	0	NA

Step 14 Perform the Router Health Check. See [Commands for Router Health Check](#).

What to do next

Repeat these steps for each remaining fabric plane (FC1, FC2, FC3, FC4, and FC5) until all six fabric planes have been migrated to back-to-back mode.

Go to the next section to add RACK1 to back-to-back mode.

Adding RACK1 to Back-to-Back Mode

To add RACK1 to back-to-back mode, perform the following steps:

Before you begin

Review and perform all tasks in the safety guidelines, prerequisites, and required equipment sections before performing this task.

Use the **show chassis** command and make note of serial number for the chassis.

Perform all steps in the [Migrating RACK0 Fabric Planes to Back-to-Back Mode](#) for each fabric plane on RACK0.

- Step 1** Power off RACK1.
- Step 2** Remove all line cards following the steps in the [Removing a Line Card](#) section.
- Step 3** Remove all legacy fabric cards following the steps in the [Removing a Fabric Card](#) section.
- Step 4** Install the Universal Fabric Cards (UFCs) following the steps in the [Installing a Fabric Card](#) section.
- Step 5** Power on RACK1.
- Step 6** Use the **show hw-module fpd** command to verify the status of all FPDs. Verify that no FPD components require an upgrade (as indicated by NEED UPGD in the Status field) and that the Running and Programmed fields display the same version. See the [Prerequisites](#) section for FPD upgrade information.
- Step 7** Power off RACK1.
- Step 8** From SysAdmin VM configuration mode on RACK0, configure the chassis serial numbers.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# chassis serial NNN#####NA
sysadmin-vm:0_RP0(config)# rack 0
```

```

sysadmin-vm:0_RP0(config)# chassis serial NNN#####NB
sysadmin-vm:0_RP0(config)# rack 1
sysadmin-vm:0_RP0(config)# commit

```

Step 9 Connect the Ethernet Control between RACK0 and RACK1.

See the [Cabling the Ethernet Control Plane](#) section.

Step 10 Connect the Fabric between RACK0 and RACK1.

See the [Cabling the Fabric](#) section.

Step 11 When all Ethernet Control and Fabric connections have been made, power on RACK1.

Step 12 Use the **show platform** command to verify that the fabric card is operational.

Example:

```

sysadmin-vm:0_RP0# show platform
Mon Dec 6 00:54:02.366 UTC
Location Card Type HW State SW State Config State
-----
0/FC0 NC6-FC OPERATIONAL OPERATIONAL NSHUT
0/FC1 NC6-FC OPERATIONAL OPERATIONAL NSHUT
0/FC2 NC6-FC OPERATIONAL OPERATIONAL NSHUT
0/FC3 NC6-FC OPERATIONAL OPERATIONAL NSHUT
0/FC4 NC6-FC OPERATIONAL OPERATIONAL NSHUT
0/FC5 NC6-FC OPERATIONAL OPERATIONAL NSHUT
0/3 NC6-10X100G-M OPERATIONAL OPERATIONAL NSHUT
. . .

```

Step 13 Perform the Router Health Check. See [Commands for Router Health Check](#).

Step 14 Install the line cards following the steps in the [Installing a Line Card](#) section.

Both RACK0 and RACK1 are in back-to-back mode.

Cabling Overview

Cable Routing Considerations

Cabling Routing

Whether the cables will be run overhead or under the floor, consider the airflow and cable characteristics of the combined cable sets to ensure that your cable management structures support the total capacity of cables for the Cisco NCS 6000 back-to-back system installation.

Raised Floor Installations

To plan cable routing in an installation with a raised floor, consider all the characteristics of each cable required for the installation. Allow slack for cabling so that cables can be pooled under the floor for future expansion without exceeding bend radius or cable length limitations. Riser cables are not rated for installation in air plenum passages, nor are they designed for use in LSZH (low smoke zero halogen) applications.

Cable Characteristics

Plan your cable runs, consider the characteristics of each cable, such as the cable length limitations, combined diameter of bundled cables (such as power cables), weight of the cable groups, and bend radius of the cable or cables. Couple these considerations with the cable infrastructure available (or needed) at your facility. The infrastructure could include structures like the overhead cabling monorail or J-hook system, sleeve and riser diameters, and distances between floors or elements of the Cisco NCS 6000 back-to-back system.

Analyze the cabling infrastructures, risers, and racking available in your facility to determine if the capacity of the cabling management systems at your facility will accommodate the required capacities of the back-to-back system cabling.

Cable Length

The limit of the cables is 100 meters (328 feet). Consider this distance when planning the physical locations of the LCCs. For more information on the range of lengths available for the OM4 fabric cables, contact a Cisco approved vendor such as Tyco Electronics or Molex.

Cable Bend Radius

Exceeding the bend radius allowed for a cable can break the glass in the cable or cause attenuation or loss of signal. Do not bend a cable more than the allowable bend radius.

See the [Cisco Network Convergence System 6000 Series Routers Site Planning Guide](#) for information on planning component locations and cable runs.

General Cabling Procedures

Observe these procedures as you attach every cable:

- Strap the bundles to the horizontal cable management brackets on the chassis.
 - Four horizontal cable management brackets are preinstalled on the LCC (two on the front side and two on the rear side of each chassis).
- Handle all fiber-optic cables carefully.
 - Do not allow a fiber-optic cable to bend in a radius smaller than the allowable bend radius specified for that cable type.
 - Fiber-optic cables are glass. Do not step on fiber-optic cables or handle them roughly. Do not twist or stretch the cables.
 - To keep optical connections clean, do not remove the cable dust cover until immediately before you install the cable.
 - After you install a cable, immediately reserve each dust cover for storage by office personnel in a dust-free storage area. After all of the cables have been installed ensure that all the reserved dust covers are stored by office personnel in a dust free area for future use.
 - Install clean dust covers on every unused connection.
 - Consider labeling the chassis interconnection cables or creating a diagram of the cabling to ensure that the cables are connected correctly during system installation.
 - Consider labeling the chassis. Consider whether each chassis need to be physically positioned in sequence. Label each cable with the location of each termination as you install each cable

MPO-24 Cable Specifications



Note Cisco provides the optical modules but does not provide the cables. You can order these cables from a Cisco approved vendor such as Tyco Electronics or Molex. To obtain the optics, please contact your Cisco sales representative for further information.



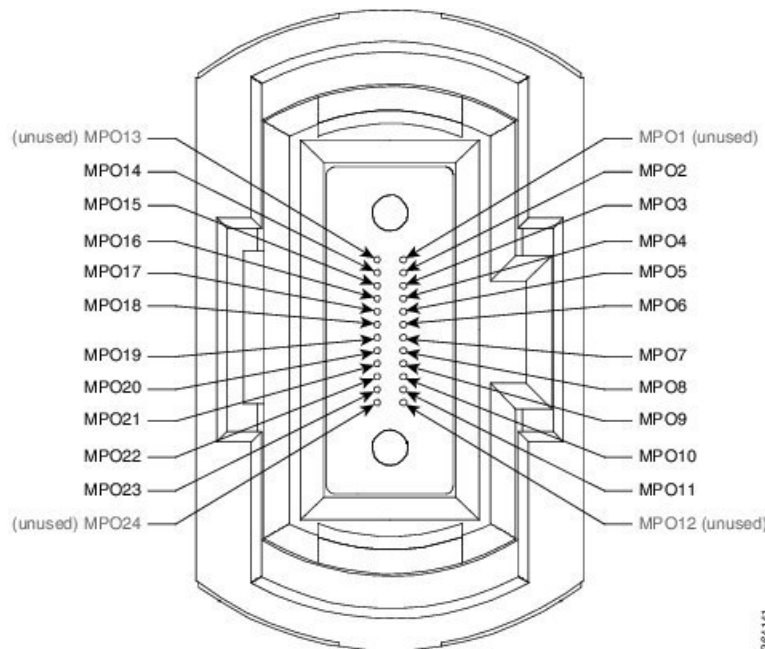
Note The CXP pluggable transceiver module has 12 dedicated transmit (Tx) channels and 12 receive (Rx) channels per transceiver with data rates up to 10.3125 Gbps and OTN rates up to 11.25 Gbps. The CXP module provides 2-wire serial (I2C) management interface and digital diagnostics, including Tx and Rx optical power monitoring per wavelength. The CXP module uses a 24-fiber MPO connector that supports bidirectional transmission across the fibers (12 Tx + 12 Rx).



Note Install a CXP transceiver module or an EMI/dust plug (supplied) in all CXP ports. Do not operate the fabric card with an open port.

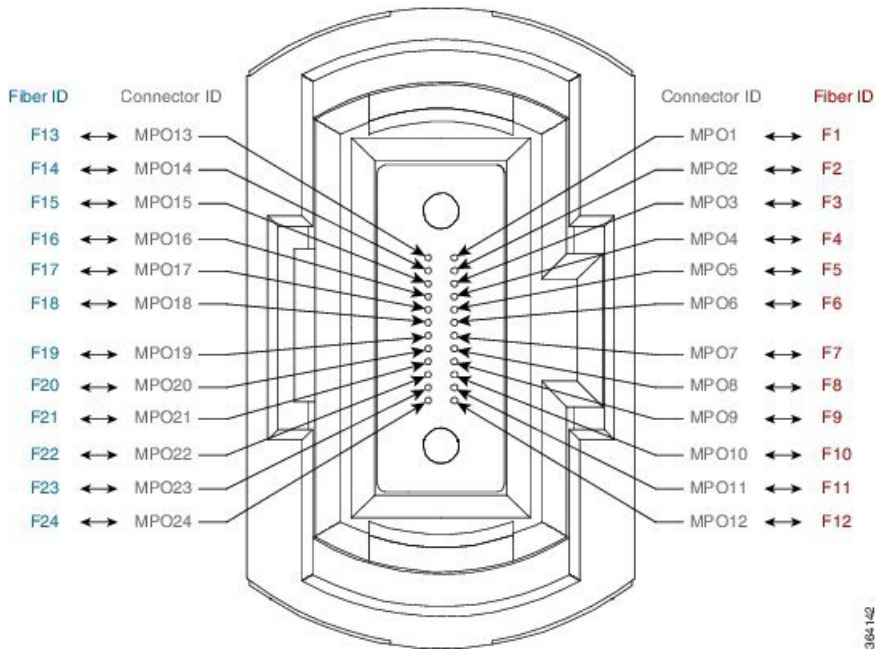
The following figure shows the MPO-24 connector pinouts.

Figure 1: MPO-24 Connector Pinouts



The following figure shows the MPO-24 connector fiber assignments.

Figure 2: MPO-24 Connector Fiber Assignments



The following table lists the 100G to 100G crossover cable connections.

Table 1: Crossover Cable Connections

MPO Connector		CXP Module		Connector		CXP Module	
Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)	Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)
MPO1	F1	1	RX	MPO1	F13	1	RX
MPO2	F2	2	RX	MPO2	F14	2	RX
MPO3	F3	3	RX	MPO3	F15	3	RX
MPO4	F4	4	RX	MPO4	F16	4	RX
MPO5	F5	5	RX	MPO5	F17	5	RX
MPO6	F6	6	RX	MPO6	F18	6	RX
MPO7	F7	7	RX	MPO7	F19	7	RX
MPO8	F8	8	RX	MPO8	F20	8	RX
MPO9	F9	9	RX	MPO9	F21	9	RX
MPO10	F10	10	RX	MPO10	F22	10	RX
MPO11	F11	11	RX	MPO11	F23	11	RX
MPO12	F12	12	RX	MPO12	F24	12	RX

MPO Connector		CXP Module		Connector		CXP Module	
Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)	Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)
MPO13	F13	13	TX	MPO13	F1	13	TX
MPO14	F14	14	TX	MPO14	F2	14	TX
MPO15	F15	15	TX	MPO15	F3	15	TX
MPO16	F16	16	TX	MPO16	F4	16	TX
MPO17	F17	17	TX	MPO17	F5	17	TX
MPO18	F18	18	TX	MPO18	F6	18	TX
MPO19	F19	19	TX	MPO19	F7	19	TX
MPO20	F20	20	TX	MPO20	F8	20	TX
MPO21	F21	21	TX	MPO21	F9	21	TX
MPO22	F22	22	TX	MPO22	F10	22	TX
MPO23	F23	23	TX	MPO23	F11	23	TX
MPO24	F24	24	TX	MPO24	F12	24	TX

Cabling the Ethernet Control Plane

This section describes how to cable the Ethernet control plane between the RACK0 and RACK1 in mesh configuration to ensure Ethernet control plane failover connectivity across both racks. The Ethernet control plane carries all the signaling, routing updates, system configuration, and management packets for the NCS 6000.



Note See the [Required Tools and Equipment](#) section for more information on the required equipment.

The following figure shows the Ethernet control plane connections.

Figure 3: Cabling the Ethernet Control Plane in Back-to-Back Mode

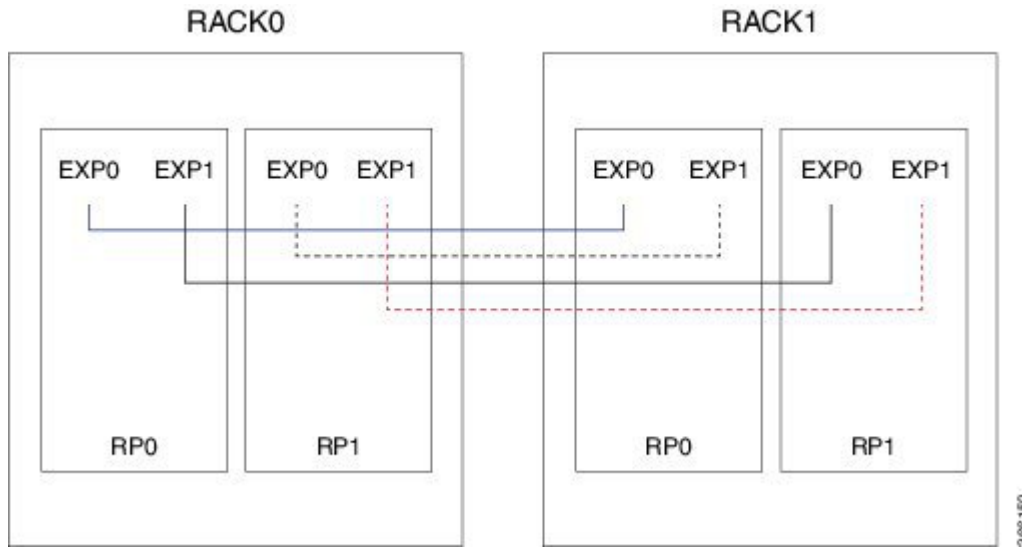


Table 2: Ethernet Control Plane Cabling for Back-to-Back Mode

RACK0	RACK1
RP0, EXP0	RP0, EXP0
RP0, EXP1	RP1, EXP0
RP1, EXP0	RP0, EXP1
RP1, EXP1	RP1, EXP1

Cabling the Fabric

This section describes how to cable the UFCs between RACK0 and RACK1 for back-to-back mode.



Note See the [Required Tools and Equipment](#) section for more information on the required equipment.

The fabric provides the data connection for router traffic between all the CXP optical ports in the line card chassis. The fabric cabling must be completed to enable data communications.

The following figure shows the fabric connections for one fabric plane. To complete the configuration, you must repeat the cabling for the remaining five fabric planes until all fabric cards are connected.

Figure 4: Cabling Fabric Plane 0 in Back-to-Back Mode

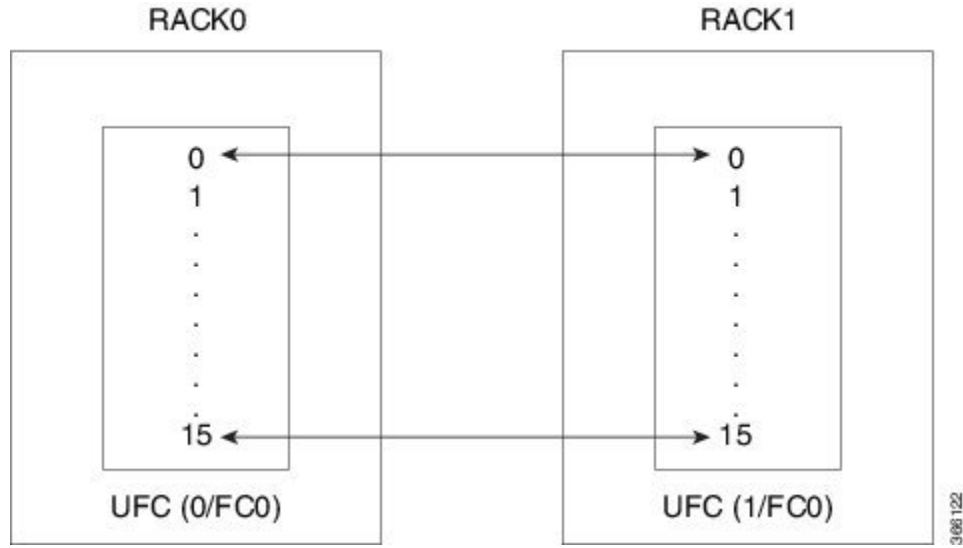


Table 3: Cabling the Fabric for Back-to-Back Mode

Plane 0	Plane 1	<...>	Plane 5
RACK0 slot/port to RACK1 slot/port			
0/FC0/0 to 1/FC0/0	0/FC1/0 to 1/FC1/0	<...>	0/FC5/0 to 1/FC5/0
0/FC0/1 to 1/FC0/1	0/FC1/1 to 1/FC1/1	<...>	0/FC5/1 to 1/FC5/1
0/FC0/2 to 1/FC0/2	0/FC1/2 to 1/FC1/2	<...>	0/FC5/2 to 1/FC5/2
0/FC0/3 to 1/FC0/3	0/FC1/3 to 1/FC1/3	<...>	0/FC5/3 to 1/FC5/3
0/FC0/4 to 1/FC0/4	0/FC1/4 to 1/FC1/4	<...>	0/FC5/4 to 1/FC5/4
0/FC0/5 to 1/FC0/5	0/FC1/5 to 1/FC1/5	<...>	0/FC5/5 to 1/FC5/5
0/FC0/6 to 1/FC0/6	0/FC1/6 to 1/FC1/6	<...>	0/FC5/6 to 1/FC5/6
0/FC0/7 to 1/FC0/7	0/FC1/7 to 1/FC1/7	<...>	0/FC5/7 to 1/FC5/7
0/FC0/8 to 1/FC0/8	0/FC1/8 to 1/FC1/8	<...>	0/FC5/8 to 1/FC5/8
0/FC0/9 to 1/FC0/9	0/FC1/9 to 1/FC1/9	<...>	0/FC5/9 to 1/FC5/9
0/FC0/10 to 1/FC0/10	0/FC1/10 to 1/FC1/10	<...>	0/FC5/10 to 1/FC5/10
0/FC0/11 to 1/FC0/11	0/FC1/11 to 1/FC1/11	<...>	0/FC5/11 to 1/FC5/11
0/FC0/12 to 1/FC0/12	0/FC1/12 to 1/FC1/12	<...>	0/FC5/12 to 1/FC5/12
0/FC0/13 to 1/FC0/13	0/FC1/13 to 1/FC1/13	<...>	0/FC5/13 to 1/FC5/13
0/FC0/14 to 1/FC0/14	0/FC1/14 to 1/FC1/14	<...>	0/FC5/14 to 1/FC5/14

Plane 0	Plane 1	<...>	Plane 5
RACK0 slot/port to RACK1 slot/port			
0/FC0/15 to 1/FC0/15	0/FC1/15 to 1/FC1/15	<...>	0/FC5/15 to 1/FC5/15