



OcNOS®

**Open Compute
Network Operating System
for Routed Optical
Networking
Version 6.3.5**

Layer 1 Guide

June 2024

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Contents

Preface	v
IP Maestro Support	v
Audience	v
Conventions	v
Chapter Organization	v
Related Documentation	v
Migration Guide	vi
Feature Availability	vi
Support	vi
Comments	vi
Command Line Interface	vii
Overview	vii
Command Line Interface Help	vii
Command Completion	viii
Command Abbreviations	viii
Command Line Errors	viii
Command Negation	ix
Syntax Conventions	ix
Variable Placeholders	x
Command Description Format	xi
Keyboard Operations	xi
Show Command Modifiers	xii
String Parameters	xv
Command Modes	xv
Transaction-based Command-line Interface	xvii
Layer 1 Configuration Guide	xix
CHAPTER 1 Cross-Connect (XC)	xxi
Overview	xxi
OSPF, BGP and BFD Session Establishments via Cross-connect	xxi
Cross-connect using Dynamic/Static LAG	xxxiii
CHAPTER 2 Cross-Connect (XC) Resiliency	xli
Overview	xli
CHAPTER 3 CFM over xConnect Configuration	li
Topology	li
Layer 1 Command Reference	lix
CHAPTER 1 Port Based xConnect Commands	lxi
backup	lxii
cross-connect	lxiii
cross-connect switchover type revertive	lxiv

disable	lxv
ep1 <interface_name> ep2 <interface_name>	lxvi
link-fault-pass-through enable	lxvii
show cross-connect	lxviii
Index.....	lxxi

Preface

This guide describes how to configure OcNOS.

IP Maestro Support

Monitor devices running OcNOS Release 6.3.4-70 and above using IP Maestro software.

Audience

This guide is intended for network administrators and other engineering professionals who configure OcNOS.

Conventions

[Table 1](#) shows the conventions used in this guide.

Table 1: Conventions

Convention	Description
Italics	Emphasized terms; titles of books
Note:	Special instructions, suggestions, or warnings
<code>monospaced type</code>	Code elements such as commands, parameters, files, and directories

Chapter Organization

The chapters in command references are organized as described in [Command Description Format](#).

The chapters in configuration guides are organized into these major sections:

- An overview that explains a configuration in words
- Topology with a diagram that shows the devices and connections used in the configuration
- Configuration steps in a table for each device where the left-hand side shows the commands you enter and the right-hand side explains the actions that the commands perform
- Validation which shows commands and their output that verify the configuration

Related Documentation

For information about installing of OcNOS, see the *Installation Guide* for your platform.

Migration Guide

Check the *Migration Guide* for configuration changes to make when migrating from one version of OcNOS to another.

Feature Availability

The features described in this document that are available depend upon the OcNOS SKU that you purchased. See the *Feature Matrix* for a description of the OcNOS SKUs.

Support

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Command Line Interface

This chapter introduces the OcNOS Command Line Interface (CLI) and how to use its features.

Overview

You use the CLI to configure, monitor, and maintain OcNOS devices. The CLI is text-based and each command is usually associated with a specific task.

You can give the commands described in this manual locally from the console of a device running OcNOS or remotely from a terminal emulator such as `putty` or `xterm`. You can also use the commands in scripts to automate configuration tasks.

Command Line Interface Help

You access the CLI help by entering a full or partial command string and a question mark “?”. The CLI displays the command keywords or parameters along with a short description. For example, at the CLI command prompt, type:

```
> show ?
```

The CLI displays this keyword list with short descriptions for each keyword:

```
show ?
  application-priority      Application Priority
  arp                       Internet Protocol (IP)
  bfd                       Bidirectional Forwarding Detection (BFD)
  bgp                       Border Gateway Protocol (BGP)
  bi-lsp                    Bi-directional lsp status and configuration
  bridge                    Bridge group commands
  ce-vlan                   COS Preservation for Customer Edge VLAN
  class-map                 Class map entry
  cli                       Show CLI tree of current mode
  clns                      Connectionless-Mode Network Service (CLNS)
  control-adjacency         Control Adjacency status and configuration
  control-channel           Control Channel status and configuration
  cspf                      CSPF Information
  customer                  Display Customer spanning-tree
  cvlan                     Display CVLAN information
  debugging                 Debugging functions (see also 'undebug')
  etherchannel              LACP etherchannel
  ethernet                  Layer-2
  ...
```

If you type the ? in the middle of a keyword, the CLI displays help for that keyword only.

```
> show de?
  debugging  Debugging functions (see also 'undebug')
```

If you type the ? in the middle of a keyword, but the incomplete keyword matches several other keywords, OcNOS displays help for all matching keywords.

```
> show i? (CLI does not display the question mark).
  interface  Interface status and configuration
  ip         IP information
  isis      ISIS information
```

Command Completion

The CLI can complete the spelling of a command or a parameter. Begin typing the command or parameter and then press the tab key. For example, at the CLI command prompt type `sh`:

```
> sh
```

Press the tab key. The CLI displays:

```
> show
```

If the spelling of a command or parameter is ambiguous, the CLI displays the choices that match the abbreviation. Type `show i` and press the tab key. The CLI displays:

```
> show i
  interface ip          ipv6          isis
> show i
```

The CLI displays the `interface` and `ip` keywords. Type `n` to select `interface` and press the tab key. The CLI displays:

```
> show in
> show interface
```

Type `?` and the CLI displays the list of parameters for the `show interface` command.

```
> show interface
  IFNAME  Interface name
  |       Output modifiers
  >       Output redirection
  <cr>
```

The CLI displays the only parameter associated with this command, the `IFNAME` parameter.

Command Abbreviations

The CLI accepts abbreviations that uniquely identify a keyword in commands. For example:

```
> sh int xe0
```

is an abbreviation for:

```
> show interface xe0
```

Command Line Errors

Any unknown spelling causes the CLI to display the error `Unrecognized command` in response to the `?`. The CLI displays the command again as last entered.

```
> show dd?
% Unrecognized command
> show dd
```

When you press the Enter key after typing an invalid command, the CLI displays:

```
(config)#router ospf here
                        ^
% Invalid input detected at '^' marker.
```

where the `^` points to the first character in error in the command.

If a command is incomplete, the CLI displays the following message:

```
> show
% Incomplete command.
```

Some commands are too long for the display line and can wrap mid-parameter or mid-keyword, as shown below. This does *not* cause an error and the command performs as expected:

```
area 10.10.0.18 virtual-link 10.10.0.19 authent
ication-key 57393
```

Command Negation

Many commands have a `no` form that resets a feature to its default value or disables the feature. For example:

- The `ip address` command assigns an IPv4 address to an interface
- The `no ip address` command removes an IPv4 address from an interface

Syntax Conventions

[Table 1](#) describes the conventions used to represent command syntax in this reference.

Table 1: Syntax conventions

Convention	Description	Example
monospaced font	Command strings entered on a command line	<code>show ip ospf</code>
lowercase	Keywords that you enter exactly as shown in the command syntax.	<code>show ip ospf</code>
UPPERCASE	See Variable Placeholders	IFNAME
()	Optional parameters, from which you must select one. Vertical bars delimit the selections. Do not enter the parentheses or vertical bars as part of the command.	(A.B.C.D <0-4294967295>)
()	Optional parameters, from which you select one or none. Vertical bars delimit the selections. Do not enter the parentheses or vertical bars as part of the command.	(A.B.C.D <0-4294967295>)
()	Optional parameter which you can specify or omit. Do not enter the parentheses or vertical bar as part of the command.	(IFNAME)
{ }	Optional parameters, from which you must select one or more. Vertical bars delimit the selections. Do not enter the braces or vertical bars as part of the command.	{intra-area <1-255> inter-area <1-255> external <1-255>}

Table 1: Syntax conventions (Continued)

Convention	Description	Example
[]	Optional parameters, from which you select zero or more. Vertical bars delimit the selections. Do not enter the brackets or vertical bars as part of the command.	[<1-65535> AA:NN internet local-AS no-advertise no-export]
?	Nonrepeatable parameter. The parameter that follows a question mark can only appear once in a command string. Do not enter the question mark as part of the command.	?route-map WORD
.	Repeatable parameter. The parameter that follows a period can be repeated more than once. Do not enter the period as part of the command.	set as-path prepend .<1-65535>

Variable Placeholders

Table 2 shows the tokens used in command syntax use to represent variables for which you supply a value.

Table 2: Variable placeholders

Token	Description
WORD	A contiguous text string (excluding spaces)
LINE	A text string, including spaces; no other parameters can follow this parameter
IFNAME	Interface name whose format varies depending on the platform; examples are: eth0, Ethernet0, ethernet0, xe0
A.B.C.D	IPv4 address
A.B.C.D/M	IPv4 address and mask/prefix
X:X::X:X	IPv6 address
X:X::X:X/M	IPv6 address and mask/prefix
HH:MM:SS	Time format
AA:NN	BGP community value
XX:XX:XX:XX:XX:XX	MAC address
<1-5> <1-65535> <0-2147483647> <0-4294967295>	Numeric range

Command Description Format

[Table 3](#) explains the sections used to describe each command in this reference.

Table 3: Command descriptions

Section	Description
Command Name	The name of the command, followed by what the command does and when should it be used
Command Syntax	The syntax of the command
Parameters	Parameters and options for the command
Default	The state before the command is executed
Command Mode	The mode in which the command runs; see Command Modes
Example	An example of the command being executed

Keyboard Operations

[Table 4](#) lists the operations you can perform from the keyboard.

Table 4: Keyboard operations

Key combination	Operation
Left arrow or Ctrl+b	Moves one character to the left. When a command extends beyond a single line, you can press left arrow or Ctrl+b repeatedly to scroll toward the beginning of the line, or you can press Ctrl+a to go directly to the beginning of the line.
Right arrow or Ctrl-f	Moves one character to the right. When a command extends beyond a single line, you can press right arrow or Ctrl+f repeatedly to scroll toward the end of the line, or you can press Ctrl+e to go directly to the end of the line.
Esc, b	Moves back one word
Esc, f	Moves forward one word
Ctrl+e	Moves to end of the line
Ctrl+a	Moves to the beginning of the line
Ctrl+u	Deletes the line
Ctrl+w	Deletes from the cursor to the previous whitespace
Alt+d	Deletes the current word
Ctrl+k	Deletes from the cursor to the end of line
Ctrl+y	Pastes text previously deleted with Ctrl+k, Alt+d, Ctrl+w, or Ctrl+u at the cursor

Table 4: Keyboard operations (Continued)

Key combination	Operation
Ctrl+t	Transposes the current character with the previous character
Ctrl+c	Ignores the current line and redisplay the command prompt
Ctrl+z	Ends configuration mode and returns to exec mode
Ctrl+l	Clears the screen
Up Arrow or Ctrl+p	Scroll backward through command history
Down Arrow or Ctrl+n	Scroll forward through command history

Show Command Modifiers

You can use two tokens to modify the output of a `show` command. Enter a question mark to display these tokens:

```
# show users ?
  | Output modifiers
  > Output redirection
```

You can type the | (vertical bar character) to use output modifiers. For example:

```
> show rsvp | ?
begin      Begin with the line that matches
exclude    Exclude lines that match
include    Include lines that match
last       Last few lines
redirect   Redirect output
```

Begin Modifier

The `begin` modifier displays the output beginning with the first line that contains the input string (everything typed after the `begin` keyword). For example:

```
# show running-config | begin xe1
...skipping
interface xe1
  ipv6 address fe80::204:75ff:fee6:5393/64
!
interface xe2
  ipv6 address fe80::20d:56ff:fe96:725a/64
!
line con 0
  login
!
end
```

You can specify a regular expression after the `begin` keyword, This example begins the output at a line with either “xe2” or “xe4”:

```
# show running-config | begin xe[3-4]
...skipping
```

```

interface xe3
 shutdown
!
interface xe4
 shutdown
!
interface svlan0.1
 no shutdown
!
route-map myroute permit 3
!
route-map mymap1 permit 10
!
route-map rmap1 permit 3
!
line con 0
 login
line vty 0 4
 login
!
end

```

Include Modifier

The `include` modifier includes only those lines of output that contain the input string. In the output below, all lines containing the word “input” are included:

```

# show interface xe1 | include input
  input packets 80434552, bytes 2147483647, dropped 0, multicast packets 0
  input errors 0, length 0, overrun 0, CRC 0, frame 0, fifo 1, missed 0

```

You can specify a regular expression after the `include` keyword. This examples includes all lines with “input” or “output”:

```

#show interface xe0 | include (in|out)put
  input packets 597058, bytes 338081476, dropped 0, multicast packets 0
  input errors 0, length 0, overrun 0, CRC 0, frame 0, fifo 0, missed 0
  output packets 613147, bytes 126055987, dropped 0
  output errors 0, aborted 0, carrier 0, fifo 0, heartbeat 0, window 0

```

Exclude Modifier

The `exclude` modifier excludes all lines of output that contain the input string. In the following output example, all lines containing the word “input” are excluded:

```

# show interface xe1 | exclude input
Interface xe1
Scope: both
Hardware is Ethernet, address is 0004.75e6.5393
index 3 metric 1 mtu 1500 <UP,BROADCAST,RUNNING,MULTICAST>
VRF Binding: Not bound
Administrative Group(s): None
DSTE Bandwidth Constraint Mode is MAM
inet6 fe80::204:75ff:fee6:5393/64
  output packets 4438, bytes 394940, dropped 0
  output errors 0, aborted 0, carrier 0, fifo 0, heartbeat 0, window 0
  collisions 0

```

You can specify a regular expression after the `exclude` keyword. This example excludes lines with “output” or “input”:

```
# show interface xe0 | exclude (in|out)put
Interface xe0
  Scope: both
  Hardware is Ethernet   Current HW addr: 001b.2139.6c4a
  Physical:001b.2139.6c4a Logical:(not set)
  index 2 metric 1 mtu 1500 duplex-full arp ageing timeout 3000
  <UP,BROADCAST,RUNNING,MULTICAST>
  VRF Binding: Not bound
  Bandwidth 100m
  DHCP client is disabled.
  inet 10.1.2.173/24 broadcast 10.1.2.255
  VRRP Master of : VRRP is not configured on this interface.
  inet6 fe80::21b:21ff:fe39:6c4a/64
  collisions 0
```

Redirect Modifier

The `redirect` modifier writes the output into a file. The output is not displayed.

```
# show cli history | redirect /var/frame.txt
```

The output redirection token (`>`) does the same thing:

```
# show cli history >/var/frame.txt
```

Last Modifier

The `last` modifier displays the output of last few number of lines (As per the user input). The last number ranges from 1 to 9999.

For example:

```
#show running-config | last 10
```

String Parameters

The restrictions in [Table 5](#) apply for all string parameters used in OcnOS commands, unless some other restrictions are noted for a particular command.

Table 5: String parameter restrictions

Restriction	Description
Input length	1965 characters or less
Restricted special characters	“?”, “,”, “>”, “ ”, and “=” The “ ” is allowed only for <code>description</code> CLI in interface mode.

Command Modes

Commands are grouped into modes arranged in a hierarchy. Each mode has its own set of commands. [Table 6](#) lists the command modes common to all protocols.

Table 6: Common command modes

Name	Description
Executive mode	Also called <i>view</i> mode, this is the first mode to appear after you start the CLI. It is a base mode from where you can perform basic commands such as <code>show</code> , <code>exit</code> , <code>quit</code> , <code>help</code> , and <code>enable</code> .
Privileged executive mode	Also called <i>enable</i> mode, in this mode you can run additional basic commands such as <code>debug</code> , <code>write</code> , and <code>show</code> .
Configure mode	Also called <i>configure terminal</i> mode, in this mode you can run configuration commands and go into other modes such as <code>interface</code> , <code>router</code> , <code>route map</code> , <code>key chain</code> , and <code>address family</code> . Configure mode is single user. Only one user at a time can be in configure mode.
Interface mode	In this mode you can configure protocol-specific settings for a particular interface. Any setting you configure in this mode overrides a setting configured in <code>router</code> mode.
Router mode	This mode is used to configure router-specific settings for a protocol such as BGP or OSPF.

Command Mode Tree

The diagram below shows the common command mode hierarchy.

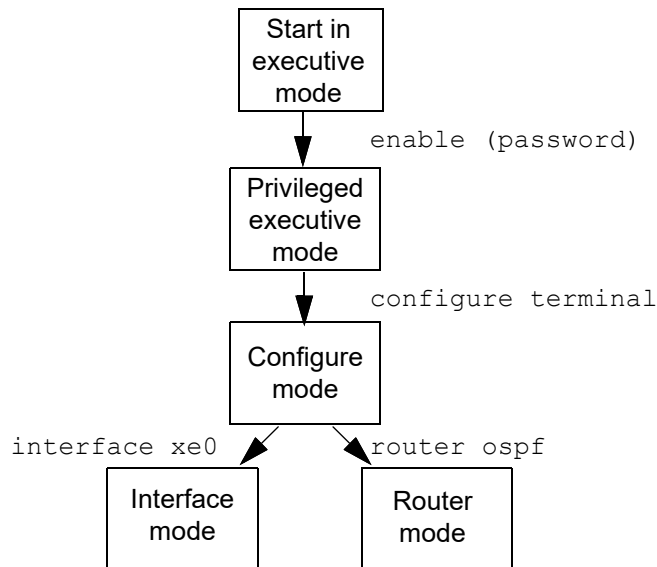


Figure 4-1: Common command modes

To change modes:

1. Enter privileged executive mode by entering `enable` in Executive mode.
2. Enter configure mode by entering `configure terminal` in Privileged Executive mode.

The example below shows moving from executive mode to privileged executive mode to configure mode and finally to router mode:

```

> enable mypassword
# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
(config)# router ospf
(config-router)#
  
```

Note: Each protocol can have modes in addition to the common command modes. See the command reference for the respective protocol for details.

Transaction-based Command-line Interface

The OcNOS command line interface is transaction based:

- Any changes done in configure mode are stored in a separate *candidate* configuration that you can view with the `show transaction current` command.
- When a configuration is complete, apply the candidate configuration to the running configuration with the `commit` command.
- If a `commit` fails, no configuration is applied as the entire transaction is considered failed. You can continue to change the candidate configuration and then retry the `commit`.
- Discard the candidate configuration with the `abort transaction` command.
- Check the last aborted transaction with the `show transaction last-aborted` command.
- Multiple configurations cannot be removed with a single `commit`. You must remove each configuration followed by a `commit`.

Note: All commands **MUST** be executed only in the default CML shell (`cmlsh`). If you log in as `root` and start `imish`, then the system configurations will go out of sync. The `imish` shell is not supported and should not be started manually.

Layer 1 Configuration Guide

CHAPTER 1 Cross-Connect (XC)

This Chapter contains the cross-connect configuration example.

Overview

This feature is to configure the cross connection between two ports.

The cross connect is bi-directional. The traffic which is received on the first interface is transmitted out to the second interface and the traffic which is received on the second interface is transmitted out to the first interface.

It is point-to-point and same end points cannot be used for another cross connect

The following are the types of endpoints supported by this port based cross connect.

1. Native Ethernet interface
2. LAG interface

OSPF, BGP and BFD Session Establishments via Cross-connect

The following configuration example will illustrate OSPF, BFD and BGP session establishments via Cross-connect.

Topology

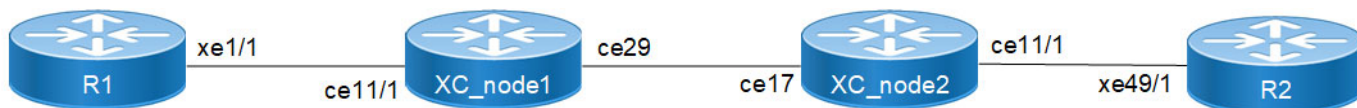


Figure 1-1: Session establishments via Cross-connect

R1

#configure terminal	Enter configure mode
(config)#hostname R1	Configure the host name
(config)#interface xe1/1	Enter into interface level
(config-if)#ip address 10.10.10.1/24	Configure IP address to the interface
(config-if)#exit	Exiting from interface level
(config)#interface xe32/1	Enter into interface mode
(config-if)#ip address 20.20.20.1/24	Configure ip address to the interface
(config-if)#exit	Exiting from interface level
(config)#interface lo	Enter into loop-back interface
(config-if)#ip address 1.1.1.1/24 secondary	Configuring secondary IP address
(config-if)#exit	Exiting the loop-back interface level
(config)#bfd interval 3 minrx 3 multiplier 3	Configuring BFD options
(config)#router ospf 10	Configuring OSPF process
(config-router)#router-id 1.1.1.1	Configuring router-id

Cross-Connect (XC)

(config-router)#network 10.10.10.0 0.0.0.255 area 0	Configuring Network id and Area ID
(config-router)#redistribute connected	Configuring redistribute connected
(config-router)#bfd all-interfaces	Configuring bfd on all-interfaces
(config-router)#exit	Exiting the OSPF process
(config)#router bgp 100	Configuring BGP process
(config-router)#neighbor 10.10.10.2 remote- as 200	Configuring neighbor details
(config-router)#commit	Commit the configuration

XC_node1

#configure terminal	Enter configure mode
(config)#hostname Xc Node-1	Configuring the hostname
(config)#coherent-module 7	Entering into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exiting the coherent module
(config)#interface ce29	Entering into interface level
(config-if)#switchport	Configuring switchport
(config-if)#exit	Exiting the interface level
(config)#interface cell1/1	Entering the interface level
(config-if)#switchport	Configuring the switchport
(config-if)#exit	Exiting the interface level
(config)#cross-connect OSPF_BFD_BGP	Configuring the Cross-connect
(config-XC)#ep1 cell1/1 ep2 ce29	Creating endpoints
(config-XC)#commit	Commit the configuration

XC_node2

#configure terminal	Enter configure mode
(config)#hostname Xc Node-2	Configuring the hostname
(config)#coherent-module 1	Entering into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exiting the coherent module
(config)#interface cel7	Entering into interface level
(config-if)#switchport	Configuring switchport
(config-if)#exit	Exiting the interface level
(config)#interface cell1/1	Entering the interface level
(config-if)#switchport	Configuring the switchport
(config-if)#exit	Exiting the interface level
(config)#cross-connect OSPF_BFD_BGP-1	Configuring the Cross-connect

(config-XC)#ep1 ce17 ep2 ce11/1	Creating endpoints
(config-XC)#commit	Commit the configuration

R2

#configure terminal	Enter configure mode
(config)#hostname R2	Configure the host name
(config)#interface xe49/1	Enter into interface level
(config-if)#ip address 10.10.10.2/24	Configure IP address to the interface
(config-if)#exit	Exiting from interface level
(config)#interface xe45	Enter into interface mode
(config-if)#ip address 30.30.30.1/24	Configure ip address to the interface
(config-if)#exit	Exiting from interface level
(config)#interface lo	Enter into loop-back interface
(config-if)#ip address 2.2.2.2/24 secondary	Configuring secondary IP address
(config-if)#exit	Exiting the loop-back interface level
(config)#bfd interval 3 minrx 3 multiplier 3	Configuring BFD options
(config)#router ospf 10	Configuring OSPF process
(config-router)#router-id 2.2.2.2	Configuring router-id
(config-router)#network 10.10.10.0 0.0.0.255 area 0	Configuring Network id and Area ID
(config-router)#redistribute connected	Configuring redistribute connected
(config-router)#bfd all-interfaces	Configuring bfd on all-interfaces
(config-router)#exit	Exiting the OSPF process
(config)#router bgp 200	Configuring BGP process
(config-router)#neighbor 10.10.10.1 remote-as 100	Configuring neighbor details
(config-router)#commit	Commit the configuration

Validation

Coherent-module Summary Validation

```
XC_node1#show coherent-module 7
```

```
-----
SLOT-ID : 7
-----
```

```

Module Type           : DCO
Admin-Status          : UP
Oper-Status           : Ready
Vendor-name           : Acacia Comm Inc.
Vendor-SN             : 203066225
Vendor-FW-Version     : 38.5
Network-Interfaces    : 1
Host-Interfaces       : 2
CFP2 Vendor-name     : Acacia Comm Inc.

```

Cross-Connect (XC)

CFP2 Vendor-OUI : 0x0
CFP2 Vendor-Part : AC200-D23-005
CFP2 Vendor-SN : 203066225
CFP2 Vendor-FW-Version : 38.5
CFP2 Temperature : 48.60 °C
CFP2 Power Supply : 3.322 V

SLOT-ID : 7 NETIF : 0

OperStatus : ready
DSP-OperStatus : ready
Modulation-format : dp-16-qam
FEC Mode : 15per-denali
Differential Encoding : FALSE
Pulseshaping-Rx :
Pulseshaping-Tx : TRUE
Loopback-type : none
PRBS-type : none
Losi-Enabled :
PRBS-IN-SYNC : FALSE
Current PRBS BER : nan
Current BER Period : 1000 ms
Current PRE FEC BER : 1.115706e-03
Current POST FEC BER :
Current Chromatic Dispersion : -1 ps/nm
Current Differential Group Delay : 3 ps
Tx-Disable : FALSE
TX-Output-Power : 0.00 dBm
TX-Laser-freq : 193500000.000000 MHz
Min-LaserFreq : 191250000.000000 MHz
Max-LaserFreq : 196100000.000000 MHz
Current TX Laser Freq : 193500000.000000 MHz
Grid-Spacing : 6.25-ghz
Laser-Grid : 50-ghz 12.5-ghz 6.25-ghz
Current Output Power : 0.04 dBm
Current Input Power : -4.36 dBm
Current Post VOA Power :
Current Prov~ Chnl Power : -3.78 dBm
Current Post VOA Prov~ Chnl Power : -3.78 dBm
Current OSNR Estimate : 34.30 dB
Current Q-Margin : 2.80 dB
Current Uncorrected Block-count : 0
Laser Age : 0 %

SLOT-ID : 7 HOSTIF : 0

Fec-type : none
Loopback-type : none

```
Current PRE FEC BER          : nan
```

```
-----
SLOT-ID : 7   HOSTIF : 1
```

```
-----
Fec-type           : none
Loopback-type      : none
Current PRE FEC BER : nan
```

```
XC_node2#sh coherent-module 1
```

```
-----
SLOT-ID : 1
```

```
-----
Module Type        : DCO
Admin-Status       : UP
Oper-Status        : Ready
Vendor-name        : LUMENTUM
Vendor-SN          : VCD19310002
Vendor-FW-Version  : 0.52
Network-Interfaces : 1
Host-Interfaces    : 2
CFP2 Vendor-name   : LUMENTUM
CFP2 Vendor-OUI    : 0xF00200
CFP2 Vendor-Part   : TRB200DAA-01
CFP2 Vendor-SN     : VCD19310002
CFP2 Vendor-FW-Version : 0.52
CFP2 Temperature   : 69.02 °C
CFP2 Power Supply  : 3.340 V
```

```
-----
SLOT-ID : 1   NETIF : 0
```

```
-----
OperStatus         : ready
DSP-OperStatus     : ready
Modulation-format  : dp-16-qam
FEC Mode           : 15per-denali
Differential Encoding : FALSE
Pulseshaping-Rx    :
Pulseshaping-Tx    : TRUE
Loopback-type      : none
PRBS-type          : none
Losi-Enabled       :
PRBS-IN-SYNC       : FALSE
Current PRBS BER   : nan
Current BER Period : 1000 ms
Current PRE FEC BER : 4.560457e-04
Current POST FEC BER :
Current Chromatic Dispersion : 5 ps/nm
Current Differential Group Delay : 6 ps
Tx-Disable         : FALSE
TX-Output-Power    : 0.00 dBm
```

Cross-Connect (XC)

```
TX-Laser-freq           : 193500000.000000 MHz
Min-LaserFreq           : 191150000.000000 MHz
Max-LaserFreq           : 196100000.000000 MHz
Current TX Laser Freq   : 193500000.000000 MHz
Grid-Spacing            : 6.25-ghz
Laser-Grid              : 100-ghz 50-ghz 25-ghz 12.5-ghz 6.25-ghz
Current Output Power    : -0.18 dBm
Current Input Power     : -1.79 dBm
Current Post VOA Power  :
Current Prov~ Chnl Power : -2.44 dBm
Current Post VOA Prov~ Chnl Power : -2.44 dBm
Current OSNR Estimate   : 25.00 dB
Current Q-Margin        : 3.50 dB
Current Uncorrected Block-count : 0
Laser Age               : 0 %
```

```
SLOT-ID : 1  HOSTIF : 0
```

```
Fec-type           : none
Loopback-type      : none
Current PRE FEC BER : nan
```

```
SLOT-ID : 1  HOSTIF : 1
```

```
Fec-type           : none
Loopback-type      : none
Current PRE FEC BER : nan
```

```
XC_node2#sh run interface cel17
!
interface cel17
!
```

Cross-Connect Validation

```
XC_node1# sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
* - Active Endpoint, none - not configured Cross-connect name : OSPF_BFD_BGP
EP1:cell1/1EP2:ce29Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UPOper Status:UP
```

```
+=====+
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
|Interface Status|
+=====+
=====+
| EP1*
|UP| -
| | - |0 |0 |0 |0
| EP2*
|UP| -
| | - |0 |0 |0 |0
```

```

=====
=====+
cross-connect summary Total XC      : 1
Admin Up      : 1
Admin Down    : 0
Total Rules   : 1

XC_node1#show running-config cross-connect
cross-connect OSPF_BFD_BGP
  ep1 cell1/1 ep2 ce29

XC_node2# sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
* - Active Endpoint, none - not configured Cross-connect name : OSPF_BFD_BGP-1
EP1:cel17EP2:cell1/1Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UOper Status:UP
=====
=====+
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
|Interface Status|
=====
=====+
| EP1*
|UP| -
| | - |0 |0 |0 |0
| EP2*
|UP| -
| | - |0 |0 |0 |0
=====
=====+
cross-connect summary Total XC      : 1
Admin Up      : 1
Admin Down    : 0
Total Rules   : 1

XC_node2#show running-config cross-connect
cross-connect OSPF_BFD_BGP-1
  ep1 cel17 ep2 cell1/1

```

OSPF Validation

```
R1#show ip ospf neighbor
```

```

Total number of full neighbors: 1
OSPF process 10 VRF(default):
Neighbor ID      Pri   State                Dead Time   Address        Interface
  Instance ID
2.2.2.2          1    Full/Backup          00:00:37   10.10.10.2    xe1/1
0

```

```
R2#show ip ospf neighbor
```

```

Total number of full neighbors: 1
OSPF process 10 VRF(default):

```

Cross-Connect (XC)

Neighbor ID	Pri	State	Dead Time	Address	Interface
1.1.1.1	1	Full/Backup	00:00:38	10.10.10.1	xe49/1

Instance ID
0

BFD Validation

```
R1#show bfd interface xe1/1
Interface:      xe1/1  ifindex: 10001 state:  UP
Interface level configuration: NO ECHO, NO SLOW TMR
Min Tx: 3  Min Rx: 3  Multiplier: 3
```

```
R1#show bfd session
```

```
BFD process for VRF: (DEFAULT VRF)
```

```
=====
=====
Sess-Idx  Remote-Disc  Lower-Layer  Sess-Type  Sess-State  UP-Time  Interface
      Down-Reason  Remote-Addr
1          1             IPv4         Single-Hop  Up           00:02:54  xe1/1
      NA             10.10.10.2/32
Number of Sessions:  1
```

```
R1#show bfd session
```

```
BFD process for VRF: (DEFAULT VRF)
```

```
=====
=====
Sess-Idx  Remote-Disc  Lower-Layer  Sess-Type  Sess-State  UP-Time  Interface
      Down-Reason  Remote-Addr
1          1             IPv4         Single-Hop  Up           00:02:54  xe1/1
      NA             10.10.10.2/32
Number of Sessions:  1
```

```
R1#show bfd session detail
```

```
BFD process for VRF: (DEFAULT VRF)
```

```
=====
=====
Session Interface Index : 10001          Interface name :xe1/1
Session Index : 1
Lower Layer : IPv4                       Version : 1
Session Type : Single Hop                 Session State : Up
Local Discriminator : 1                   Local Address : 10.10.10.1/32
Remote Discriminator : 1                  Remote Address : 10.10.10.2/32
Local Port : 49152                        Remote Port : 3784
Options :
```

```
Diagnostics : None
```

```
Timers in Milliseconds :
```

```

Min Tx: 3           Min Rx: 3           Multiplier: 3
Neg Tx: 3           Neg Rx: 3           Neg detect mult: 3
Min echo Tx: 1000   Min echo Rx: 1000   Neg echo intrvl: 0
Storage type : 2
Sess down time : 00:00:00
Sess Down Reason : NA
Bfd GTSM Disabled
Bfd Authentication Disabled

```

Counters values:

```

Pkt In : 000000000000000117138      Pkt Out : 000000000000000117172
Pkts Drop : 000000000000000000000    Auth Pkts Drop : 000000000000000000000
Echo Out : 000000000000000000000      IPv6 Echo Out : 000000000000000000000
IPv6 Pkt In : 000000000000000000000    IPv6 Pkt Out : 000000000000000000000
UP Count : 1                          UPTIME : 00:05:42

```

Protocol Client Info:

```
OSPF-> Client ID: 4      Flags: 4
```

```
-----
Number of Sessions:      1
```

```
R2#show bfd interface xe49/1
```

```
Interface:      xe49/1  ifindex: 10049 state:  UP
Interface level configuration: NO ECHO, NO SLOW TMR
Min Tx: 3  Min Rx: 3  Multiplier: 3
```

```
R2#show bfd session
```

```
BFD process for VRF: (DEFAULT VRF)
```

```
=====
=====
```

Sess-Idx	Remote-Disc	Lower-Layer	Sess-Type	Sess-State	UP-Time	Interface
	Down-Reason	Remote-Addr				
1	1	IPv4	Single-Hop	Up	00:04:12	xe49/1
	NA	10.10.10.1/32				

```
Number of Sessions:      1
```

```
R2#sh bfd session detail
```

```
BFD process for VRF: (DEFAULT VRF)
```

```
=====
=====
```

Session Interface Index : 10049	Interface name :xe49/1
Session Index : 1	
Lower Layer : IPv4	Version : 1
Session Type : Single Hop	Session State : Up
Local Discriminator : 1	Local Address : 10.10.10.2/32
Remote Discriminator : 1	Remote Address : 10.10.10.1/32
Local Port : 49152	Remote Port : 3784
Options :	

Cross-Connect (XC)

Diagnostics : None

Timers in Milliseconds :

Min Tx: 3	Min Rx: 3	Multiplier: 3
Neg Tx: 3	Neg Rx: 3	Neg detect mult: 3
Min echo Tx: 1000	Min echo Rx: 1000	Neg echo intrvl: 0

Storage type : 2
Sess down time : 00:00:00
Sess Down Reason : NA
Bfd GTSM Disabled
Bfd Authentication Disabled

Counters values:

Pkt In : 000000000000000044905	Pkt Out : 000000000000000044905
Pkts Drop : 00000000000000000000	Auth Pkts Drop : 00000000000000000000
Echo Out : 00000000000000000000	IPv6 Echo Out : 00000000000000000000
IPv6 Pkt In : 00000000000000000000	IPv6 Pkt Out : 00000000000000000000
UP Count : 1	UPTIME : 00:02:11

Protocol Client Info:

OSPF-> Client ID: 4 Flags: 4

Number of Sessions: 1

BGP Vaildation

R1#sh bgp neighbors

BGP neighbor is 10.10.10.2, remote AS 200, local AS 100, external link
BGP version 4, local router ID 10.10.10.1, remote router ID 2.2.2.2
BGP state = Established, up for 00:04:00
Last read 00:00:08, hold time is 90, keepalive interval is 30 seconds
Neighbor capabilities:
Route refresh: advertised and received (old and new)
Address family IPv4 Unicast: advertised and received
Received 11 messages, 0 notifications, 0 in queue
Sent 12 messages, 0 notifications, 0 in queue
Route refresh request: received 0, sent 0
Minimum time between advertisement runs is 30 seconds
For address family: IPv4 Unicast
BGP table version 1, neighbor version 1
Index 1, Offset 0, Mask 0x2
Community attribute sent to this neighbor (both)
0 accepted prefixes
0 announced prefixes

Connections established 1; dropped 0
Local host: 10.10.10.1, Local port: 179
Foreign host: 10.10.10.2, Foreign port: 58033
Nexthop: 10.10.10.1
Nexthop global: ::

```
Nexthop local: ::
BGP connection: non shared network
```

```
R2#sh ip bgp neighbors
BGP neighbor is 10.10.10.1, remote AS 100, local AS 200, external link
  BGP version 4, local router ID 2.2.2.2, remote router ID 10.10.10.1
  BGP state = Established, up for 00:00:03
  Last read 00:00:03, hold time is 90, keepalive interval is 30 seconds
  Neighbor capabilities:
    Route refresh: advertised and received (old and new)
    Address family IPv4 Unicast: advertised and received
  Received 2 messages, 0 notifications, 0 in queue
  Sent 2 messages, 0 notifications, 0 in queue
  Route refresh request: received 0, sent 0
  Minimum time between advertisement runs is 30 seconds
For address family: IPv4 Unicast
  BGP table version 1, neighbor version 1
  Index 1, Offset 0, Mask 0x2
  Community attribute sent to this neighbor (both)
  0 accepted prefixes
  0 announced prefixes
```

```
Connections established 1; dropped 0
Local host: 10.10.10.2, Local port: 58033
Foreign host: 10.10.10.1, Foreign port: 179
Nexthop: 10.10.10.2
Nexthop global: ::
Nexthop local: ::
BGP connection: non shared network
```

Show interface counters

```
R1#sh interface counters rate gbps
```

Interface	Rx gbps	Rx pps	Tx gbps	Tx pps
xe1/1	6.91	13082945	6.91	13082949
xe32/1	6.91	13082325	6.91	13082325

```
XC_nod1#sh interface counters rate gbps
```

Interface	Rx gbps	Rx pps	Tx gbps	Tx pps
cell1/1	6.91	13082437	6.91	13082437
ce29	6.91	13082457	6.91	13082458

```
XC_nod1# sh cross-connect
```

```
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
```

```
* - Active Endpoint, none - not configured Cross-connect name : OSPF_BFD_BGP
```

```
EP1:cell1/1EP2:ce29Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UPOper Status:UP
```

```
=====
=====+
```

Cross-Connect (XC)

```
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
```

```
|Interface Status|
```

```
+=====+
```

```
=====+
```

```
| EP1*
```

```
|UP| -
```

```
| | - |13082437|1674551936|13082437|1674551936
```

```
| EP2*
```

```
|UP| -
```

```
| | - |13082457|1674554496|13082457|1674554496
```

```
+=====+
```

```
=====+
```

```
cross-connect summary Total XC : 1
```

```
Admin Up : 1
```

```
Admin Down : 0
```

```
Total Rules : 1
```

```
XC_node2#sh interface counters rate gbps
```

```
+-----+-----+-----+-----+-----+
```

```
| Interface | Rx gbps | Rx pps | Tx gbps | Tx pps |
```

```
+-----+-----+-----+-----+-----+
```

```
cell/1      6.91      13082428    6.91      13082429
```

```
cel7        6.91      13082381    6.91      13082378
```

```
XC_node2# sh cross-connect
```

```
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
```

```
* - Active Endpoint, none - not configured Cross-connect name : OSPF_BFD_BGP-1
```

```
EP1:cel7EP2:cell/1Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UPOper Status:UP
```

```
+=====+
```

```
=====+
```

```
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
```

```
|Interface Status|
```

```
+=====+
```

```
=====+
```

```
| EP1*
```

```
|UP| -
```

```
| | - |13082428|1674550784|13082429|1674550784
```

```
| EP2*
```

```
|UP| -
```

```
| | - |13082381|1674544768|13082381|1674544768
```

```
+=====+
```

```
=====+
```

```
cross-connect summary Total XC : 1
```

```
Admin Up : 1
```

```
Admin Down : 0
```

```
Total Rules : 1
```



```
R2#sh interface counters rate gbps
```

Interface	Rx gbps	Rx pps	Tx gbps	Tx pps
xe45	6.91	13081988	6.91	13081988
xe49/1	6.91	13082339	6.91	13082339

Cross-connect using Dynamic/Static LAG

The following configuration example illustrates configuration of cross-connect using LAG interfaces on XC Nodes.

Topology

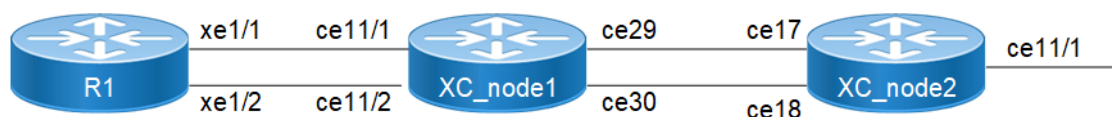


Figure 1-2: Cross-connect using LAG Interfaces

R1

#configure terminal	Enter configure mode
(config)#interface po100	Create Port channel interface
(config-if)#exit	Exiting from interface level
(config)#interface xe1/1	Enter into interface mode
(config-if)#channel-group 100 mode active	Adding member port to the port channel interface
(config-if)#exit	Exiting from interface level
(config)#interface xe1/2	Enter into interface level
(config-if)#channel-group 100 mode active	Adding member port to the port channel interface
(config-if)#commit	Commit the configuration

XC_node1

#configure terminal	Enter configure mode
(config)#interface po100	Create Port channel interface
(config-if)#switchport	Configuring Switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#interface po200	Create Port channel interface
(config-if)#switchport	Configuring Switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#interface ce11/1	Enter into interface level
(config-if)#channel-group 100 mode active	Adding member port to the port channel interface
(config-if)#exit	Exiting from interface level
(config)#interface ce11/2	Enter into interface level

Cross-Connect (XC)

(config-if)#channel-group 100 mode active	Adding member port to the port channel interface
(config-if)#exit	Exiting from interface level
(config)#interface ce29	Enter into interface level
(config-if)#channel-group 200 mode active	Adding member port to the port channel interface
(config-if)#exit	Exiting from interface level
(config)#interface ce30	Enter into interface level
(config-if)#channel-group 200 mode active	Adding member port to the port channel interface
(config-if)#exit	Exiting from interface level
(config)#cross-connect lag	Create cross-connect by providing the name
(config-XC)#ep1 po100 ep2 po200	Adding end-points ep1 and ep2 as lag interfaces
(config-XC)#exit	Exit Cross-connect mode
(config)#commit	Commit the configuration

XC_node2

#configure terminal	Enter configure mode
(config)#interface po200	Create Port channel interface
(config-if)#switchport	Configuring Switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#interface ce29	Enter into interface level
(config-if)#channel-group 200 mode active	Adding member port to the port channel interface
(config-if)#exit	Exiting from interface level
(config)#interface ce30	Enter into interface level
(config-if)#channel-group 200 mode active	Adding member port to the port channel interface
(config-if)#exit	Exiting from interface level
(config)#interface ce11/1	Enter into interface level
(config-if)#switchport	Configuring Switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#cross-connect lag	Create cross-connect by providing the name
(config-XC)#ep1 po100 ep2 ce11/1	Adding end-points ep1 and ep2 as lag interfaces
(config-XC)#exit	Exit Cross-connect mode
(config)#commit	Commit the configuration

Validation

Cross-connect using Dynamic LAG on XC_node1

```
# sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
* - Active Endpoint, none - not configured Cross-connect name : lag
EP1:po100EP2:po200Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UPOper Status:UP
+=====+
=====+
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
|Interface Status|
```

```

=====
=====+
| EP1*
|UP| -
| | - |0 |0 |0 |0
| EP2*
|UP| -
| | - |0 |0 |0 |0
=====
=====+
cross-connect summary Total XC : 1
Admin Up : 1
Admin Down : 0
Total Rules : 1

#sh running-config cross-connect
!
cross-connect lag
ep1 po100 ep2 po200
!

#sh etherchannel summary
Aggregator po100 100100
Aggregator Type: Layer2
Admin Key: 0100 - Oper Key 0100
Link: cell/1 (5073) sync: 1
Link: cell/2 (5074) sync: 1
-----
Aggregator po200 100200
Aggregator Type: Layer2
Admin Key: 0200 - Oper Key 0200
Link: ce30 (5005) sync: 1
Link: ce29 (5006) sync: 1

```

Cross-connect using Dynamic lag on XC_node2

```

# sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
* - Active Endpoint, none - not configured Cross-connect name : lag
EP1:po200EP2:cell/1Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UPOper Status:UP
=====
=====+
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
|Interface Status|
=====
=====+
| EP1*
|UP| -
| | - |0 |0 |0 |0
| EP2*
|UP| -
| | - |0 |0 |0 |0

```

Cross-Connect (XC)

```
+=====+
=====+
cross-connect summary Total XC    : 1
Admin Up : 1
Admin Down : 0
Total Rules : 1

#show running-config cross-connect
!
cross-connect lag
  ep1 po200 ep2 ce11/1

#sh etherchannel summary
  Aggregator po200 100200
  Aggregator Type: Layer2
  Admin Key: 0200 - Oper Key 0200
  Link: ce18 (5009) sync: 1
  Link: ce17 (5010) sync: 1
```

Configuring Cross-connect using Static LAG Interfaces

R1

#configure terminal	Enter configure mode
(config)#interface sa100	Create static LAG interface
(config-if)#exit	Exiting from interface level
(config)#interface xe1/1	Enter into interface mode
(config-if)#static-channel-group 100	Adding member port to the static LAG interface
(config-if)#exit	Exiting from interface level
(config)#interface xe1/2	Enter into interface level
(config-if)#static-channel-group 100	Adding member port to the static LAG interface
(config-if)#commit	Commit the configuration

XC_node1

#configure terminal	Enter configure mode
(config)#interface sa100	Create static LAG interface
(config-if)#switchport	Configuring Switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#interface sa200	Create static LAG interface
(config-if)#switchport	Configuring Switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#interface ce11/1	Enter into interface level
(config-if)#static-channel-group 100	Adding member port to the static LAG interface
(config-if)#exit	Exiting from interface level

(config)#interface ce11/2	Enter into interface level
(config-if)#static-channel-group 100	Adding member port to the static LAG interface
(config-if)#exit	Exiting from interface level
(config)#interface ce29	Enter into interface level
(config-if)#static-channel-group 200	Adding member port to the static LAG interface
(config-if)#exit	Exiting from interface level
(config)#interface ce30	Enter into interface level
(config-if)#static-channel-group 200	Adding member port to the static LAG interface
(config-if)#exit	Exiting from interface level
(config)#cross-connect static-lag	Create cross-connect by providing the name
(config-XC)#ep1 sa100 ep2 sa200	Adding end-points ep1 and ep2 as lag interfaces
(config-XC)#exit	Exit Cross-connect mode
(config)#commit	Commit the configuration

XC_node2

#configure terminal	Enter configure mode
(config)#interface sa200	Create static LAG interface
(config-if)#switchport	Configuring Switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#interface ce29	Enter into interface level
(config-if)#static-channel-group 200	Adding member port to the static LAG interface
(config-if)#exit	Exiting from interface level
(config)#interface ce30	Enter into interface level
(config-if)#static-channel-group 200	Adding member port to the static LAG interface
(config-if)#exit	Exiting from interface level
(config)#interface ce11/1	Enter into interface level
(config-if)#switchport	Configure switchport to the interface
(config-if)#exit	Exiting from interface level
(config)#cross-connect static-lag	Create cross-connect by providing the name
(config-XC)#ep1 po200 ep2 ce11/1	Adding end-points ep1 and ep2 as lag interfaces
(config-XC)#exit	Exit Cross-connect mode
(config)#commit	Commit the configuration

Validation

Cross-connect using Static LAG on XC_node1

```
#sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
* - Active Endpoint, none - not configured Cross-connect name : static-lag
EP1:sa100EP2:sa200Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UPOper Status:UP
+=====+
=====+
```

Cross-Connect (XC)

```
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
```

```
|Interface Status|
```

```
+=====+
```

```
=====+
```

```
| EP1*
```

```
|UP| -
```

```
| | - |0 |0 |0 |0
```

```
| EP2*
```

```
|UP| -
```

```
| | - |0 |0 |0 |0
```

```
+=====+
```

```
=====+
```

```
cross-connect summary Total XC : 1
```

```
Admin Up : 1
```

```
Admin Down : 0
```

```
Total Rules : 1
```

Cross-connect using Static Lag on XC_node2

```
# sh cross-connect
```

```
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
```

```
* - Active Endpoint, none - not configured Cross-connect name : static-lag
```

```
EP1:sa200EP2:cel1/1Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UOper Status:UP
```

```
+=====+
```

```
=====+
```

```
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
```

```
|Interface Status|
```

```
+=====+
```

```
=====+
```

```
| EP1*
```

```
|UP| -
```

```
| | - |0 |0 |0 |0
```

```
| EP2*
```

```
|UP| -
```

```
| | - |0 |0 |0 |0
```

```
+=====+
```

```
=====+
```

```
cross-connect summary Total XC : 1
```

```
Admin Up : 1
```

```
Admin Down : 0
```

```
Total Rules : 1
```

Disable Cross-connect on XC_node1

```
#configure terminal
```

```
Enter configure mode
```

```
(config)#cross-connect lag
```

```
Create cross-connect by providing the name
```

```
(config-XC)#disable
```

```
Disabling the Cross-connect
```

```
(config-XC)#exit
```

```
Exit Cross-connect mode
```

```
(config)#commit
```

```
Commit the configuration
```

Validation

Disable the cross-connect on XC node1

```
# sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
* - Active Endpoint, none - not configured Cross-connect name : lag
EP1:po100EP2:po200Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:DOWNOper
Status:DOWN
=====
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
|Interface Status|
=====
| EP1*
|UP| -
| | - |13082428|1674550784|13082429|1674550784
| EP2*
|UP| -
| | - |13082381|1674544768|13082381|1674544768
=====
cross-connect summary Total XC: 1
Admin Up : 0 Admin Down : 1 Total Rules : 0
```

Enable Cross-connect on XC_node1

#configure terminal	Enter configure mode
(config)#cross-connect lag	Create cross-connect by providing the name
(config-XC)#no disable	Enable the Cross-connect
(config-XC)#exit	Exit Cross-connect mode
(config)#commit	Commit the configuration

Validation

Cross-connect after enable on XC_node1

```
# sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
* - Active Endpoint, none - not configured Cross-connect name : lag
EP1:po100EP2:po200Revertive:NoBkp_EP1:NoneBkp_EP2:None Admin Status:UPOper Status:UP
=====
| EP| OVID| IVID| Rx packets| Rx bytes| Tx packets|Tx bytes
|Interface Status|
=====
| EP1*
|UP| -
```

Cross-Connect (XC)

| | - |13082428|1674550784|13082429|1674550784

| EP2*

|UP| -

| | - |13082381|1674544768|13082381|1674544768

+=====+
=====+

cross-connect summary Total XC: 1

Admin Up : 1 Admin Down : 0 Total Rules : 1

CHAPTER 2 Cross-Connect (XC) Resiliency

This Chapter contains the cross-connect resiliency configuration example.

Overview

This feature is to support resiliency to port level cross connect link by providing backup link if primary link goes down. Whenever, any of the endpoint of cross-connect goes down, pre-configured backup endpoint will be chosen and cross-connect will be up with backup endpoint. Same backup endpoints cannot be used in another cross-connect.

The following are the types of end points supported as backup endpoints.

1. Native Ethernet interface
2. LAG interface

Topology

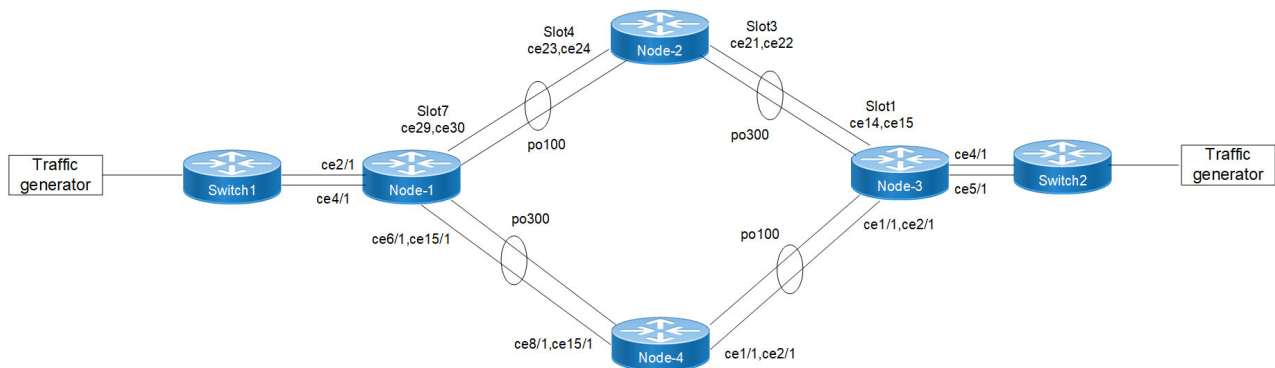


Figure 2-1: Cross-connect Resiliency Topology

LFPT (Link-Fault-Pass-Through)

If one endpoint goes down, other endpoint of the link should get notified and port status should be made as DOWN.

Example: If po100 interface of Node-1 goes down, then Node-2 will inform to Node-3 via LFPT to down the po300 interface.

Revertive

When primary EP comes up, then traffic need to switch from backup EP to Primary EP.

Example: Suppose po100 is down on Node-1, so the traffic flows via backup EP1 i.e., po300. But when po100 comes up on Node-1 then the traffic need to switch from backup EP to primary EP i.e., from po300 to po100

Node-1

#configure terminal	Enter configure mode
(config)#hostname Node-1	Configure the hostname

Cross-Connect (XC) Resiliency

(config)#coherent-module 7	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exiting the coherent module
(config)#interface po100	Create port channel interface
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce29	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce30	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface po300	Create port channel interface
(config-if)#switchport	Configure switchport on LAG interface
(config-if)#exit	Exit the interface level
(config)#interface ce6/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce15/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce2/1	Enter interface level
(config-if)#switchport	Configure switchport
(config)#interface ce4/1	Enter interface level
(config-if)#switchport	Configure switchport
(config-if)#exit	Exit the interface level
(config)#cross-connect sample	Create cross-connect by providing the name
(config-XC)#ep1 po100 ep2 ce2/1	Add end-points end-point1 and end-point2
(config-XC)#backup ep1 po300	Add backup end-point1
(config-XC)#backup ep2 ce4/1	Add backup end-point2
(config-XC)#cross-connect switchover type revertive	Configure revertive mode
(config-XC)#link-fault-pass-through enable	Configure LFPT
(config-XC)#commit	Commit the configuration

Node-2

#configure terminal	Enter configure mode
(config)#hostname Node-2	Configure the hostname
(config)#coherent-module 4	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exit from coherent module mode
(config)#coherent-module 3	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exiting the coherent module
(config)#interface po100	Create port channel interface
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce23	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce24	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface po300	Create port channel interface
(config-if)#switchport	Configure switchport on LAG interface
(config-if)#exit	Exit the interface level
(config)#interface ce21	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce22	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#cross-connect sample2	Create cross-connect by providing the name
(config-XC)#ep1 po100 ep2 po300	Add end-points end-point1 and end-point2
(config-XC)#link-fault-pass-through enable	Configure LFPT
(config-XC)#commit	Commit the configuration

Node-3

#configure terminal	Enter configure mode
(config)#hostname Node-3	Configure the hostname

Cross-Connect (XC) Resiliency

(config)#coherent-module 1	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exiting the coherent module
(config)#interface po300	Create port channel interface
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce13	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce14	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface po100	Create port channel interface
(config-if)#switchport	Configure switchport on LAG interface
(config-if)#exit	Exit the interface level
(config)#interface ce1/1	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce2/1	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce4/1	Enter interface level
(config-if)#switchport	Configure switchport
(config)#interface ce5/1	Enter interface level
(config-if)#switchport	Configure switchport
(config-if)#exit	Exit the interface level
(config)#cross-connect sample3	Create cross-connect by providing the name
(config-XC)#ep1 po300 ep2 ce4/1	Add end-points end-point1 and end-point2
(config-XC)#backup ep1 po100	Add backup end-point1
(config-XC)#backup ep2 ce5/1	Add backup end-point2
(config-XC)#cross-connect switchover type revertive	Configure revertive mode
(config-XC)#link-fault-pass-through enable	Configure LFPT
(config-XC)#commit	Commit the configuration

Node-4

#configure terminal	Enter configure mode
(config)#hostname Node-4	Configure the hostname
(config)#interface po100	Create port channel interface
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce1/1	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce2/1	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface po300	Create port channel interface
(config-if)#switchport	Configure switchport on LAG interface
(config-if)#exit	Exit the interface level
(config)#interface ce8/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce15/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#cross-connect sample4	Create cross-connect by providing the name
(config-XC)#ep1 po300 ep2 po100	Add end-points end-point1 and end-point2
(config-XC)#link-fault-pass-through enable	Configure LFPT
(config-XC)#commit	Commit the configuration

Validation**Cross-connect using Dynamic LAG on Node-1**

```
Node-1#sh etherchannel summary
  Aggregator po100 100100
  Aggregator Type: LayeNode-2
  Admin Key: 0100 - Oper Key 0100
    Link: ce29 (5073) sync: 1
    Link: ce30 (5074) sync: 1
-----
  Aggregator po300 100300
  Aggregator Type: LayeNode-2
  Admin Key: 0300 - Oper Key 0300
```

Cross-Connect (XC) Resiliency

Link: ce6/1 (5005) sync: 1

Link: ce15/1 (5006) sync: 1

Node-1#sh running-config cross-connect

```
!  
cross-connect sample  
ep1 po100 ep2 ce2/1  
cross-connect switchover type revertive  
link-fault-pass-through enable  
backup ep1 po300  
backup ep2 ce4/1  
!
```

Node-1#sh cross-connect

Codes: EP - Endpoint, Bkp_EP - Backup endpoint

* - Active Endpoint, none - not configured

Cross-connect name : sample

EP1:po100 EP2:ce2/1 Revertive:Yes Bkp_EP1:po300 Bkp_EP2:ce4/1
Admin Status:UP Oper Status:UP

```
+=====+  
+=====+  
| EP      | OVID    | IVID    | Rx packets | Rx bytes  | Tx packets | Tx bytes  
|Interface Status|  
+=====+  
+=====+  
| EP1*   | -      | -      | 0          | 0         | 5974137342  
|764688374912 |UP      |         |           |           |  
| EP2*   | -      | -      | 5973605019 | 764619747456 | 0         | 0  
|UP      |         |         |           |           |  
| bkp_EP1 | -      | -      | 5973879754 | 764654827904 | 0         | 0  
|UP      |         |         |           |           |  
| bkp_EP2 | -      | -      | 0          | 0         | 0         | 0  
|UP      |         |         |           |           |  
+=====+  
+=====+
```

cross-connect summary

Total XC : 1

Admin Up : 1

Admin Down : 0

Total Rules : 1

Cross-connect using Dynamic LAG on Node-2

Node-2#sh etherchannel summary

Aggregator po100 100100

Aggregator Type: LayeNode-2

Admin Key: 0100 - Oper Key 0100

Link: ce23 (5067) sync: 1

Link: ce24 (5068) sync: 1

Aggregator po300 100300

Aggregator Type: LayeNode-2

```
Admin Key: 0300 - Oper Key 0300
  Link: ce21 (5063) sync: 1
  Link: ce22 (5064) sync: 1
```

```
Node-2#show running-config cross-connect
!
cross-connect sample2
!
cross-connect sample2
  ep1 po100 ep2 po300
  link-fault-pass-through enable
!
```

```
Node-2#sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
      * - Active Endpoint, none - not configured
Cross-connect name : sample2
EP1:po100      EP2:po300      Revertive:No      Bkp_EP1:None      Bkp_EP2:None
Admin Status:UP      Oper Status:UP
=====
| EP      | OVID    | IVID    | Rx packets  | Rx bytes    | Tx packets  | Tx bytes
|Interface Status|
=====
| EP1*   | -      | -      | 3710        | 470780      | 723         | 90626
|UP      |      |      |
| EP2*   | -      | -      | 72          | 6468        | 14          | 1548
|UP      |      |      |
=====
```

```
cross-connect summary
Total XC      : 1
Admin Up      : 1
Admin Down    : 0
Total Rules   : 1
```

Cross-connect using Dynamic LAG on Node-3

```
Node-3#sh etherchannel summary
  Aggregator po100 100100
  Aggregator Type: LayeNode-2
  Admin Key: 0100 - Oper Key 0100
    Link: ce1/1 (5005) sync: 1
    Link: ce2/1 (5006) sync: 1
-----
  Aggregator po300 100300
  Aggregator Type: LayeNode-2
  Admin Key: 0300 - Oper Key 0300
    Link: ce13 (5011) sync: 1
    Link: ce14 (5012) sync: 1
```

Cross-Connect (XC) Resiliency

```
Node-3#sh running-config cross-connect
```

```
!  
cross-connect sample3  
ep1 po300 ep2 ce4/1  
cross-connect switchover type revertive  
link-fault-pass-through enable  
backup ep1 po100  
backup ep2 ce5/1  
!
```

```
Node-3#sh cross-connect
```

```
Codes: EP - Endpoint, Bkp_EP - Backup endpoint  
* - Active Endpoint, none - not configured
```

```
Cross-connect name : sample3
```

```
EP1:po300 EP2:ce4/1 Revertive:Yes Bkp_EP1:po100 Bkp_EP2:ce5/1  
Admin Status:UP Oper Status:UP
```

```
+=====+  
+=====+  
| EP      | OVID    | IVID    | Rx packets | Rx bytes | Tx packets | Tx bytes  
|Interface Status|  
+=====+  
+=====+  
| EP1*   | -      | -      | 201        | 13536    | 83318167485  
|10664725404928 |UP      |  
| EP2*   | -      | -      | 93501105144 | 11968141426060 | 2 | 128  
|UP      |  
| bkp_EP1 | -      | -      | 0          | 0        | 10171776397  
|1301987373312 |UP      |  
| bkp_EP2 | -      | -      | 93501187674 | 11968152089344 | 0 | 0  
|UP      |  
+=====+  
+=====+
```

```
cross-connect summary
```

```
Total XC      : 1  
Admin Up      : 1  
Admin Down    : 0  
Total Rules   : 1
```

Cross-connect using Dynamic LAG on Node-4

```
Node-4#sh etherchannel summary
```

```
Aggregator po100 100100  
Aggregator Type: LayeNode-2  
Admin Key: 0100 - Oper Key 0100  
Link: ce1/1 (5005) sync: 1  
Link: ce2/1 (5006) sync: 1
```

```
-----  
Aggregator po300 100300  
Aggregator Type: LayeNode-2  
Admin Key: 0300 - Oper Key 0300  
Link: ce8/1 (5009) sync: 1
```


Link: ce15/1 (5012) sync: 1

```
Node-4#sh running-config cross-connect
!
cross-connect sample4
ep1 po300 ep2 po100
link-fault-pass-through enable
!
```

Disable the Cross-connect on Node-1

#configure terminal	Enter configure mode
(config)#cross-connect sample	Enter into cross-connect mode
(config-XC)#disable	Disabling the cross-connect
(config-XC)#commit	Commit the configuration
(config-XC)#exit	Exit the cross-connect

Validation

Disable the cross-connect on Node-1

```
Node-1#sh cross-connect
Codes: EP - Endpoint, Bkp_EP - Backup endpoint
      * - Active Endpoint, none - not configured
Cross-connect name : sample
EP1:po100      EP2:ce2/1      Revertive:Yes      Bkp_EP1:po300      Bkp_EP2:ce4/1
Admin Status:DOWN      Oper Status:DOWN
```

```

=====
| EP      | OVID    | IVID    | Rx packets  | Rx bytes    | Tx packets  | Tx bytes
|Interface Status|
=====
| EP1*    | -      | -      | 0           | 0           | 5974137342
|764688374912 |UP
| EP2*    | -      | -      | 5973605019  | 764619747456 | 0           | 0
|UP
| bkp_EP1 | -      | -      | 5973879754  | 764654827904 | 0           | 0
|UP
| bkp_EP2 | -      | -      | 0           | 0           | 0           | 0
|UP
=====

```

```
cross-connect summary
Total XC      : 1
Admin Up      : 0
Admin Down    : 1
Total Rules   : 0
```

Enable the Cross-connect Node-1

Cross-Connect (XC) Resiliency

#configure terminal	Enter configure mode
(config)#cross-connect sample	Enter into cross-connect mode
(config-XC)#no disable	Enable the cross-connect
(config-XC)#commit	Commit the configuration
(config-XC)#exit	Exit the cross-connect

Validation

Cross-connect after enable on Node-1

Node-1#sh cross-connect

Codes: EP - Endpoint, Bkp_EP - Backup endpoint

* - Active Endpoint, none - not configured

Cross-connect name : sample

EP1:po100 EP2:ce2/1 Revertive:Yes Bkp_EP1:po300 Bkp_EP2:ce4/1

Admin Status:UP Oper Status:UP

```
=====
=====+
| EP      | OVID    | IVID    | Rx packets | Rx bytes | Tx packets | Tx bytes
|Interface Status|
=====+
| EP1*   | -      | -      | 0          | 0        | 5974137342
|764688374912 |UP      |
| EP2*   | -      | -      | 5973605019 | 764619747456 | 0          | 0
|UP      |
| bkp_EP1 | -      | -      | 5973879754 | 764654827904 | 0          | 0
|UP      |
| bkp_EP2 | -      | -      | 0          | 0        | 0          | 0
|UP      |
=====+
=====
```

cross-connect summary

Total XC : 1

Admin Up : 1

Admin Down : 0

Total Rules : 1

CHAPTER 3 CFM over xConnect Configuration

This chapter contains a complete example of CFM over xConnect configuration.

The main objective of this feature is to achieve L2 resiliency using CFM over xConnect where the traffic is switched to the next available link within xConnect when CFM detects errors or link failure on the monitored link in OTN platforms.

Topology

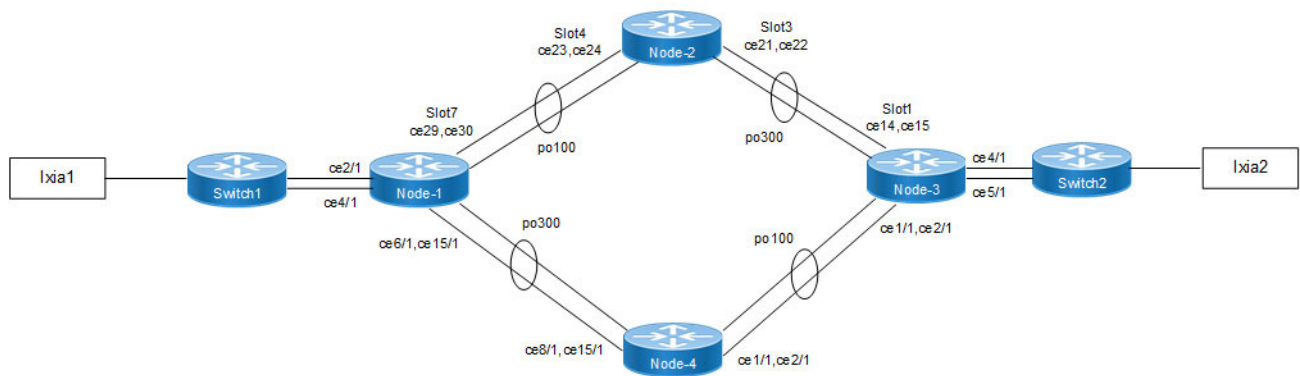


Figure 3-1: CFM over xConnect Topology

Node-1

#configure terminal	Enter configure mode
(config)# hostname Node-1	Configure the hostname.
(config)#coherent-module 7	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exiting the coherent module
(config)#interface po100	Create port channel interface.
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce29	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface.
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce30	Enter interface level

CFM over xConnect Configuration

<code>(config-if)#channel-group 100 mode active</code>	Add member port to the port channel interface
<code>(config-if)#lacp timeout short</code>	Configure LACP timeout as short
<code>(config-if)#exit</code>	Exit the interface level
<code>(config)#interface po300</code>	Create port channel interface
<code>(config-if)#switchport</code>	Configure switchport on LAG interface
<code>(config-if)#exit</code>	Exit the interface level
<code>(config)#interface ce6/1</code>	Enter interface level
<code>(config-if)#channel-group 300 mode active</code>	Add member port to the port channel interface
<code>(config-if)#lacp timeout short</code>	Configure LACP timeout as short
<code>(config-if)#exit</code>	Exit the interface level
<code>(config)#interface ce15/1</code>	Enter interface level
<code>(config-if)#channel-group 300 mode active</code>	Add member port to the port channel interface
<code>(config-if)#lacp timeout short</code>	Configure LACP timeout as short
<code>(config-if)#exit</code>	Exit the interface level
<code>(config)#interface ce2/1</code>	Enter interface level
<code>(config-if)#switchport</code>	Configure switchport
<code>(config)#interface ce4/1</code>	Enter interface level
<code>(config-if)#switchport</code>	Configure switchport
<code>(config-if)#exit</code>	Exit the interface level
<code>(config)#cross-connect xc1</code>	Create cross-connect by providing the name
<code>(config-XC)#ep1 po100 ep2 ce2/1</code>	Add end-points end-point1 and end-point2
<code>(config-XC)#backup ep1 po300</code>	Add backup end-point1
<code>(config-XC)#backup ep2 ce4/1</code>	Add backup end-point2
<code>(config-XC)#exit</code>	Exit XC mode
<code>(config)#ethernet cfm domain-type character-string domain-name mdnam1 level 0 mip-creation none</code>	Create CFM domain with type as character string with level 0 and set MIP creation criteria to none.
<code>(config-ether-cfm)#service ma-type string ma-name test1</code>	Create ma type as string
<code>(config-ether-cfm-ma)#link-level-ma</code>	Configure link-level-ma
<code>(config-ether-cfm-ma)#ethernet cfm mep down mpid 1 active true po100</code>	Create down MEP for local-VID on po100
<code>(config-ether-cfm-ma-mep)#cc multicast state enable</code>	Enable cc multicast
<code>(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode</code>	Exit ethernet cfm ma-mep mode
<code>(config-ether-cfm-ma)#mep crosscheck mpid 2</code>	Configure crosscheck to remote MEP
<code>(config-ether-cfm-ma)#cc interval 10ms</code>	Enable cc interval for 10 millisecond
<code>(config-ether-cfm-ma)#exit-ether-ma-mode</code>	Exit ethernet ma mode
<code>(config-ether-cfm)#exit</code>	Exit ethernet CFM mode
<code>(config)#ethernet cfm domain-type character-string domain-name mdnam2 level 0 mip-creation none</code>	Create CFM domain with type as character string with level 0 and set MIP creation criteria to none.

(config-ether-cfm)#service ma-type string ma-name test2	Create MA type as string
(config-ether-cfm-ma)#link-level-ma	Configure link-level-ma
(config-ether-cfm-ma)#ethernet cfm mep down mpid 3 active true po300	Create down MEP for local-VID on po300
(config-ether-cfm-ma-mep)#cc multicast state enable	Enable CC multicast
(config-ether-cfm-ma-mep)#exit-ether-ma- mep-mode	Exit ethernet CFM MA-MEP mode
(config-ether-cfm-ma)#mep crosscheck mpid 4	Configure crosscheck to remote MEP
(config-ether-cfm-ma)#cc interval 10ms	Enable CC interval for 10 millisecond
(config-ether-cfm-ma)#exit-ether-ma-mode	Exit ethernet MA mode
(config-ether-cfm)#exit	Exit ethernet CFM mode

Node-2

#configure terminal	Enter configure mode
(config)#hostname Node-2	Configure the hostname
(config)#coherent-module 4	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exit from coherent module mode
(config)#coherent-module 3	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exit from coherent module mode
(config)#interface po100	Create port channel interface
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce23	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level.
(config)#interface ce24	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface po300	Create port channel interface
(config-if)#switchport	Configure switchport on LAG interface
(config-if)#exit	Exit the interface level
(config)#interface ce21	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce22	Enter interface level

CFM over xConnect Configuration

(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#cross-connect xcl	Create cross-connect by providing the name
(config-XC)#ep1 po100 ep2 po300	Add end-points end-point1 and end-point2

Node-3

#configure terminal	Enter configure mode
(config)#hostname Node-3	Configure the hostname
(config)#coherent-module 1	Enter into coherent-module
(config-module)#enable	Enabling the coherent module
(config-module)#exit	Exit from coherent module mode
(config)#interface po300	Create port channel interface
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce13	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level.
(config)#interface ce14	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface po100	Create port channel interface
(config-if)#switchport	Configure switchport on LAG interface
(config-if)#exit	Exit the interface level
(config)#interface ce1/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce2/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce4/1	Enter interface level
(config-if)#switchport	Configure switchport
(config)#interface ce5/1	Enter interface level
(config-if)#switchport	Configure switchport
(config-if)#exit	Exit the interface level
(config)#cross-connect xcl	Create cross-connect by providing the name

(config-XC)#ep1 po300 ep2 ce4/1	Add end-points end-point1 and end-point2
(config-XC)#backup ep1 po100	Add backup end-point1
(config-XC)#backup ep2 ce5/1	Add backup end-point2
(config-XC)#exit	Exit XC mode
(config)#ethernet cfm domain-type character-string domain-name mdnam1 level 0 mip-creation none	Create cfm domain with type as character string with level 0 and set mip creation criteria to none.
(config-ether-cfm)#service ma-type string ma-name test1	Create ma type as string
(config-ether-cfm-ma)#link-level-ma	Configure link-level-ma
(config-ether-cfm-ma)#ethernet cfm mep down mpid 2 active true po300	Create down mep for local-vid on po100
(config-ether-cfm-ma-mep)#cc multicast state enable	Enable cc multicast
(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode	Exit ethernet cfm ma-mep mode
(config-ether-cfm-ma)#mep crosscheck mpid 1	Configure crosscheck to remote MEP
(config-ether-cfm-ma)#cc interval 10ms	Enable cc interval for 10 millisecond
(config-ether-cfm-ma)#exit-ether-ma-mode	Exit ethernet ma mode
(config-ether-cfm)#exit	Exit ethernet CFM mode
(config)#ethernet cfm domain-type character-string domain-name mdnam2 level 0 mip-creation none	Create cfm domain with type as character string with level 0 and set mip creation criteria to none.
(config-ether-cfm)#service ma-type string ma-name test2	Create ma type as string
(config-ether-cfm-ma)#link-level-ma	Configure link-level-ma
(config-ether-cfm-ma)#ethernet cfm mep down mpid 4 active true po100	Create down mep for local-vid on po300
(config-ether-cfm-ma-mep)#cc multicast state enable	Enable cc multicast
(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode	Exit ethernet cfm ma-mep mode
(config-ether-cfm-ma)#mep crosscheck mpid 3	Configure crosscheck to remote MEP
(config-ether-cfm-ma)#cc interval 10ms	Enable cc interval for 10 millisecond
(config-ether-cfm-ma)#exit-ether-ma-mode	Exit ethernet ma mode
(config-ether-cfm)#exit	Exit ethernet CFM mode

Node-4

#configure terminal	Enter configure mode
(config)#hostname Node-4	Configure the hostname
(config)#interface po100	Create port channel interface
(config-if)#switchport	Configure switchport on LAG port
(config-if)#exit	Exit the interface level
(config)#interface ce1/1	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface

CFM over xConnect Configuration

(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level.
(config)#interface ce2/1	Enter interface level
(config-if)#channel-group 100 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface po300	Create port channel interface
(config-if)#switchport	Configure switchport on LAG interface
(config-if)#exit	Exit the interface level
(config)#interface ce8/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#interface ce15/1	Enter interface level
(config-if)#channel-group 300 mode active	Add member port to the port channel interface
(config-if)#lacp timeout short	Configure LACP timeout as short
(config-if)#exit	Exit the interface level
(config)#cross-connect xc1	Create cross-connect by providing the name
(config-XC)#ep1 po300 ep2 po100	Add end-points end-point1 and end-point2

Validation

Node-1

```
#sh ethernet cfm maintenance-points local mep domain mdnam2 ma-name test2
```

```
MPID Dir Lvl VLAN CC-Stat CC-Intvl MAC-Address Def Port MD Name
```

```
-----  
3 Dn 0 0 Enable 10 ms 34ef.b689.e05a T po300 mdnam2
```

```
#sh ethernet cfm maintenance-points local mep domain mdnam1 ma-name test1
```

```
MPID Dir Lvl VLAN CC-Stat CC-Intvl MAC-Address Def Port MD Name
```

```
-----  
1 Dn 0 0 Enable 10 ms 34ef.b689.e020 F po100 mdnam1
```

```
#sh ethernet cfm maintenance-points remote mpid 3 domain mdnam2
```

```
MEPID RMEPID LEVEL VLAN Rx CCM RDI PEER-MAC TYPE
```

```
-----  
3 4 0 0 Yes False 5cff.35b7.54b3 Configured
```

```
#sh ethernet cfm maintenance-points remote mpid 1 domain mdnam1
```

```
MEPID RMEPID LEVEL VLAN Rx CCM RDI PEER-MAC TYPE
```

```
-----  
1 2 0 0 Yes False 5cff.35b7.54bb Configured
```

```
#sh ethernet cfm errors domain mdnam1
```

```
Domain Name Level Vlan MEPID Defects
```

```
-----
```



```
mdnam1          0          0          1          .....
```

```
1. defRDICCM    2. defMACstatus  3. defRemoteCCM
4. defErrorCCM  5. defXconCCM
```

```
#sh ethernet cfm errors domain mdnam2
```

```
Domain Name      Level      Vlan      MEPID      Defects
-----
mdnam2           0          0          3          .....
```

```
1. defRDICCM    2. defMACstatus  3. defRemoteCCM
4. defErrorCCM  5. defXconCCM
```

Node-3

```
#sh ethernet cfm maintenance-points local mep domain mdnam1 ma-name test1
```

```
MPID Dir Lvl VLAN CC-Stat  CC-Intvl MAC-Address  Def Port  MD Name
-----
2    Dn  0  0    Enable  10 ms    5cff.35b7.54bb F   po300 mdnam1
```

```
#sh ethernet cfm maintenance-points local mep domain mdnam2 ma-name test2
```

```
MPID Dir Lvl VLAN CC-Stat  CC-Intvl MAC-Address  Def Port  MD Name
-----
4    Dn  0  0    Enable  10 ms    5cff.35b7.54b3 F   po100 mdnam2
```

```
#sh ethernet cfm maintenance-points remote mpid 4 domain mdnam2
```

```
MEPID    RMEPID    LEVEL    VLAN    Rx CCM    RDI    PEER-MAC    TYPE
-----
4         3         0        0        Yes       False  34ef.b689.e05a Configured
```

```
#sh ethernet cfm maintenance-points remote mpid 2 domain mdnam1
```

```
MEPID    RMEPID    LEVEL    VLAN    Rx CCM    RDI    PEER-MAC    TYPE
-----
2         1         0        0        Yes       False  34ef.b689.e020 Configured
```

```
#sh ethernet cfm errors domain mdnam1
```

```
Domain Name      Level      Vlan      MEPID      Defects
-----
mdnam1           0          0          2          .....
```

```
1. defRDICCM    2. defMACstatus  3. defRemoteCCM
4. defErrorCCM  5. defXconCCM
```

```
#sh ethernet cfm errors domain mdnam2
```

```
Domain Name      Level      Vlan      MEPID      Defects
-----
mdnam2           0          0          4          .....
```

```
1. defRDICCM    2. defMACstatus  3. defRemoteCCM
4. defErrorCCM  5. defXconCCM
```


Layer 1 Command Reference

CHAPTER 1 Port Based xConnect Commands

This chapter contains the port based xConnect commands.

- `backup`
- `cross-connect`
- `cross-connect switchover type revertive`
- `disable`
- `ep1 <interface_name> ep2 <interface_name>`
- `link-fault-pass-through enable`
- `show cross-connect`

backup

Use this command to configure backup for primary endpoints.

Use `no` form of this command to unconfigure backup for primary endpoint.

Command Syntax

```
backup (ep1|ep2) IFNAME
no backup (ep1|ep2)
```

Parameters

IFNAME	Interface name for backup endpoint
--------	------------------------------------

Default

None

Command Mode

Configure-XC mode

Applicability

This command was introduced in OcNOS-OTN version 4.2.

Example

```
#configure terminal
(config)#cross-connect temp
(config-XC)#backup ep1 xe35

(config-XC)#no backup ep1
```

cross-connect

Use this command to provide name for a xConnect. This command will change mode from config to cross-connect mode.

Command Syntax

```
cross-connect <xc-name>
```

Parameters

<code>xc-name</code>	Cross-connect name
----------------------	--------------------

Default

None

Command Mode

Configure mode

Applicability

This command was introduced in OcNOS-OTN version 1.1.0.

Example

```
#configure terminal
(config)#cross-connect temp
(config-XC)#
```

cross-connect switchover type revertive

Use this command to configure revertive mode for cross-connect.

Use the no form of this command to make it non-revertive mode for cross-connect.

Command Syntax

```
cross-connect switchover type revertive
no cross-connect switchover type revertive
```

Parameters

None

Default

Non-revertive by default.

Command Mode

Configure-XC mode

Applicability

This command was introduced in OcNOS-OTN version 4.2.

Example

```
#configure terminal
(config)#cross-connect temp
(config-XC)#cross-connect switchover type revertive
(config-XC)#no cross-connect switchover type revertive
```

disable

Use this command to do admin shutdown on a cross-connect.

Use the `no` form of this command to enable cross-connect.

Command Syntax

```
disable
no disable
```

Parameters

None

Default

By default, the cross-connect will be enabled.

Command Mode

Configure-XC mode

Applicability

This command was introduced in OcNOS-OTN version 1.1.0.

Example

```
#configure terminal
(config)#cross-connect temp
(config-XC)#disable
(config-XC)#no disable
```

ep1 <interface_name> ep2 <interface_name>

Use this command to configure xConnect between two endpoints.

Command Syntax

```
ep1 IFNAME1 ep2 IFNAME2
```

Parameters

IFNAME1	Interface name for ep1
IFNAME2	Interface name for ep2

Default

None

Command Mode

Configure-XC mode

Applicability

This command was introduced in OcNOS-OTN version 1.1.0.

Example

```
#configure terminal
(config)#cross-connect temp
(config-XC)#ep1 xe33 ep2 xe34
```

link-fault-pass-through enable

Use this command to enable LFPT in the cross-connect.

Use the `no` form of this command to disable LFPT.

Command Syntax

```
link-fault-pass-through enable
no link-fault-pass-through enable
```

Parameters

None

Default

LFPT is disabled by default.

Command Mode

Configure-XC mode

Applicability

This command was introduced in OcNOS-OTN version 4.2.

Example

```
#configure terminal
(config)#cross-connect temp
(config-XC)#link-fault-pass-through enable
(config-XC)#no link-fault-pass-through enable
```

show cross-connect

Use this command to show cross-connect entry.

Command Syntax

```
show cross-connect (name WORD| count|)
```

Parameters

WORD	Cross-connect name
count	Cross-connect count

Default

None

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS-OTN version 1.1.0.

Example

```
OcNOS#sh cross-connect
```

```
Cross-connect name : temp
EP1:ce13/1      EP2:ce4/1      Revertive:No      Bkp_EP1:ce14/1      Bkp_EP2:ce15/1
Admin Status:UP      Oper Status:UP
```

```

=====
=====+
| EP      | OVID    | IVID    | Rx packets | Rx bytes | Tx packets | Tx bytes
|Interface Status|
=====+
| EP1*   | -      | -      | 177629    | 12078772 | 0          | 0
|UP      |        |        |           |          |           |
| EP2*   | -      | -      | 0         | 0        | 177633    | 12079044
|UP      |        |        |           |          |           |
| bkp_EP1 | -      | -      | 0         | 0        | 0         | 0
|UP      |        |        |           |          |           |
| bkp_EP2 | -      | -      | 0         | 0        | 0         | 0
|UP      |        |        |           |          |           |
=====
=====+

```

```
cross-connect summary
```

```
Total XC      : 1
Admin Up      : 1
Admin Down    : 0
Total Rules   : 1
```

OcNOS#sh cross-connect temp

Cross-connect name : temp

EP1:ce13/1 EP2:ce4/1 Revertive:No Bkp_EP1:ce14/1 Bkp_EP2:ce15/1
 Admin Status:UP Oper Status:UP

```

=====+
| EP      | OVID    | IVID    | Rx packets | Rx bytes | Tx packets | Tx bytes
|Interface Status|
=====+
| EP1*   | -      | -      | 177629     | 12078772 | 0          | 0
|UP      |        |        |            |          |           |
| EP2*   | -      | -      | 0          | 0         | 177633     | 12079044
|UP      |        |        |            |          |           |
| bkp_EP1 | -      | -      | 0          | 0         | 0          | 0
|UP      |        |        |            |          |           |
| bkp_EP2 | -      | -      | 0          | 0         | 0          | 0
|UP      |        |        |            |          |           |
=====+
    
```

cross-connect summary

Total XC : 1
 Admin Up : 1
 Admin Down : 0
 Total Rules : 1

OcNOS#sh cross-connect count

cross-connect summary

Total XC : 1
 Admin Up : 1
 Admin Down : 0
 Total Rules : 1

Index

B

begin modifier xii
BGP community value
 command syntax x
braces
 command syntax ix

C

command abbreviations viii
command completion viii
command line
 errors viii
 help vii
 keyboard operations xi
command modes xv
 configure xv
 exec xv
 interface xv
 privileged exec xv
 router xv
command negation ix
command syntax
 ? x
 . x
 () ix
 {} ix
 | ix
 A.B.C.D/M x
 AA:NN x
 BGP community value x
 braces ix
 conventions ix
 curly brackets ix
 HH:MM:SS x
 IFNAME x
 interface name x
 IPv4 address x
 IPv6 address x
 LINE x
 lowercase ix
 MAC address x
 monospaced font ix
 numeric range x
 parentheses ix
 parenteses ix
 period x
 question mark x
 square brackets x
 time x
 uppercase ix
 variable placeholders x
 vertical bars ix
 WORD x

- X:X::X:X x
- X:X::X:X/M x
- XX:XX:XX:XX:XX:XX x
- configure mode xv
- curly brackets
 - command syntax ix

E

- exec command mode xv

I

- IFNAME x
- interface mode xv
- IPv4 address
 - command syntax x
- IPv6 address
 - command syntax x

L

- LINE x

M

- MAC address
 - command syntax x

P

- parentheses
 - command syntax ix
- parentheses
 - command syntax ix
- period
 - command syntax x
- privileged exec mode xv

Q

- question mark
 - command syntax x

R

- router mode xv

S

- show commands xii
 - exclude modifier xiii
 - include modifier xiii
 - redirect modifier xiv
- square brackets
 - command syntax x

T

time
command syntax x

V

vertical bars
command syntax ix

W

WORD x

