ip infusion™

OcNOS®

Open Compute Network Operating System for Data Centers

Carrier Ethernet Guide
Version 7.0.2
September 2026

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Contents

Preface 6
Audience 6
Conventions 6
IP Infusion Product Release Version 6
Related Documentation 7
Feature Availability 7
Migration Guide 7
IP Maestro Support 7
Technical Support 7
Command Line Interface 9
Overview 9
Chapter Organization 9
Command Line Interface Help 9
Command Completion 10
Command Abbreviations 10
Command Line Errors 11
Command Negation 11
Syntax Conventions 11
Variable Placeholders 12
Command Description Format 13
Keyboard Operations 13
Show Command Modifiers 14
String Parameters 17
Command Modes 17
Transaction-based Command-line Interface 19

Carrier Ethernet Configuration 20

CHAPTER 1 G.8032 ERPS Version 2 21
Overview 21
Validation 31
Sub-ring without Virtual Channel on a LAG interface 35

CHAPTER 2 Ethernet CFM Configurations 55
Continuity Check Message (CCM) 55

Carrier Ethernet Command Reference 60

CHAPTER 1 CFM Commands 61
cc interval 62
cc multicast 63
cfm snmp restart 64
clear ethernet cfm maintenance-point remote 65
clear ethernet cfm statistics 66
clear ethernet cfm traceroute-cache 67
ethernet cfm debug 68

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ethernet cfm domain-type 69
ethernet cfm mep 70
ethernet cfm mip 71
exit-ether-ma-mep-mode 72
exit-ether-ma-mode 73
link-level 74
mep crosscheck 75
mep lowest-priority-defect 76
mip-creation 77
ping ethernet mac 78
service ma-type 79
show debugging ethernet cfm 80
show ethernet cfm errors 81
show ethernet cfm ma status 82
show ethernet cfm maintenance-points count 83
show ethernet cfm maintenance-points local mep 84
show ethernet cfm maintenance-points local mip 86
show ethernet cfm maintenance-points remote 87
show ethernet cfm traceroute-cache 88
show ethernet cfm statistics 89
show running-config cfm 91
traceroute ethernet 92
vlan 93

CHAPTER 2 G.8032 ERPS Version 2 Commands 94
aps-channel level 95
aps-channel vlan 96
clear g8032 erp-instance 97
data vlan 98
debug g8032 99
east-interface 100
enable-tcn-propagation 101
g8032 erp-instance 102
g8032 erp-instance force-switch 103
g8032 erp-instance manual-switch 104
g8032 ring 105
g8032-profile 106
g8032 profile 107
non-virtual-channel 108
ring 109
ring-id 110
ring-type 111
rpl role 112
show g8032 all erp-instance 113
show g8032 erp-instance 114
show g8032 profile 115
show g8032 ring 116

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switching mode 117
tcn-to-instance 118
timer 119
virtual-channel 120
west-interface 121

Index 122

Preface

This guide describes how to configure OcNOS.

Audience

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

Conventions

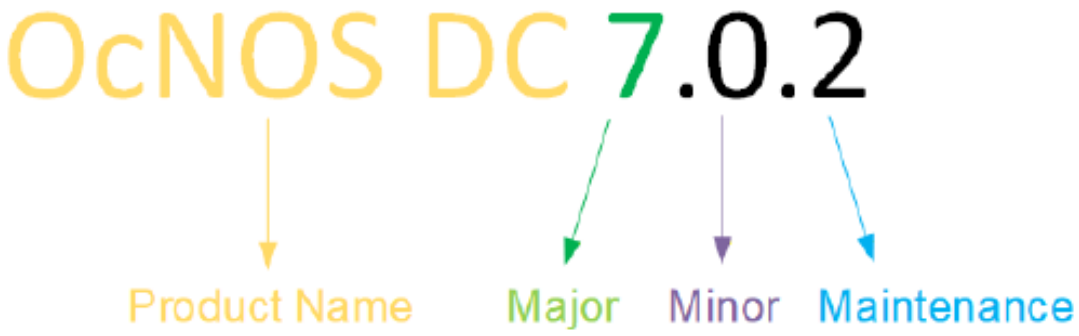
Table 1 on page 6 shows the conventions used in this guide.

Table 1: Conventions

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

IP Infusion Product Release Version

Each integer in release number indicates Major, Minor, and Maintenance release versions. Build numbers that follow the release numbers are for internal tracking and verification of the software build process and are visible to customers as part of the software version number.



Product Name: IP Infusion Product Family

Major Version: New customer-facing functionality that represents a significant change to the code base; including, a significant marketing change or direction in the product.

Minor Version: Enhancements or extensions to existing features, changes to address external needs, or internal requirements might be motivated by improvements to satisfy new sales regions or marketing initiatives.

Maintenance Version: A collection of product bugs or hotfixes usually scheduled every 30 or 60 days, based on the number of hotfixes.

Related Documentation

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

Feature Availability

Each OcNOS SKU contains a set of supported features. For a list of available features based on the SKU that you purchased. Refer to the *Feature Matrix*.

Migration Guide

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

IP Maestro Support

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

Technical Support

IP Infusion maintains an online technical support site that provides a variety of technical support programs for licensed OcNOS customers at the Technical Assistance Center.

Customers and partners enjoy full access to the support website. The site allows customers and partners to open technical support calls, update open calls with new information, and review the status of open or closed calls. The password-protected site includes technical documentation, Release Notes, and descriptions of service offerings.

Technical Sales

Contact the IP Infusion sales representative for more information about the OcNOS solution.

Technical Documentation

For core commands and configuration procedures, visit: Product Documentation.

For training videos, visit: OcNOS Free Training Videos.

For a list of supported platforms and SKUs of OcNOS features, refer to the OcNOS Feature Matrix.

Disclaimer

The global documentation site is evolving to provide an enhanced website user experience for select topics included in this release. Some guides are now available outside the existing documentation library and can be accessed directly from custom documentation landing pages. These guides offer robust in-built search functionality.

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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.

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

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
```

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```
  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
```

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 2 on page 11 describes the conventions used to represent command syntax in this reference.

Table 2: Syntax conventions

Convention	Description	Example
`monospaced font`	Command strings entered on a command line	`show ip ospf`
`lowercase`	Keywords that you enter exactly as shown in the command syntax.	`show ip ospf`
`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>)`

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Table 2: Syntax conventions (Continued)

Convention	Description	Example
`()`	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>}`
`[]`	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 3 on page 12 shows the tokens used in command syntax use to represent variables for which you supply a value.

Table 3: 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

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Table 3: Variable placeholders

Token	Description
`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 4 on page 13 explains the sections used to describe each command in this reference.

Table 4: 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
Applicability	The command introduced in a specific release version and modified or updated in subsequent versions.
Example	An example of the command being executed

Keyboard Operations

Table 5 on page 13 lists the operations you can perform from the keyboard.

Table 5: 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.

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Table 5: Keyboard operations (Continued)

Key combination	Operation
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
Ctrl+t	Transposes the current character with the previous character
Ctrl+c	Ignores the current line and redisplays 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

Note: The show command output included in the guides is for illustration purposes only. Based on the combination of features enabled and ongoing enhancements made to the commands, the output for these commands may vary. For instance, the actual command output may differ depending on the software version, configuration, and platform. Field names, values, and formats are subject to change.

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[2-4]

...skipping
interface xe2
 shutdown
!
interface xe4
 shutdown
!
interface svlan0.1
 no shutdown
!
route-map myroute permit 2
!
route-map mymap1 permit 10
!
route-map rmap1 permit 2
!
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 6 on page 17 apply for all string parameters used in OcNOS commands, unless some other restrictions are noted for a particular command.

Table 6: String parameter restrictions

Restriction	Description
Input length	1965 characters or less
Restricted special characters	“?”, “,”, “>”, “|”, and “=” The “|” character is allowed only for the `description` command in interface mode.

Command Modes

Commands are grouped into modes arranged in a hierarchy. Each mode has its own set of commands. Table P-7 lists the command modes common to all protocols.

Table 7: Common command modes

Name	Description
Executive mode	Also called *view* 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 `show`, `exit`, `quit`, `help`, and `enable`.
Privileged executive mode	Also called *enable* mode, in this mode you can run additional basic commands such as `debug`, `write`, and `show`.
Configure mode	Also called *configure terminal* mode, in this mode you can run configuration commands and go into other modes such as interface, router, route map, key chain, and address family. 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 router mode.
Router mode	This mode is used to configure router-specific settings for a protocol such as BGP or OSPF.

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Command Mode Tree

The diagram below shows the common command mode hierarchy.

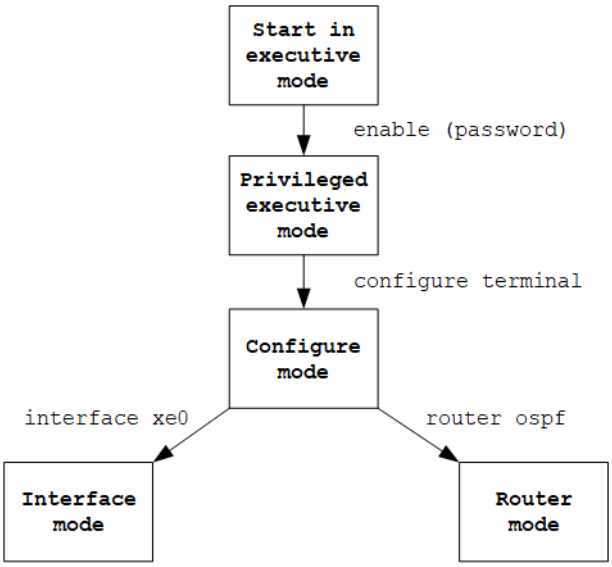


Figure 1: Common command modes

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.

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Carrier Ethernet Configuration

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CHAPTER 1 G.8032 ERPS Version 2

Overview

G.8032 Ethernet Ring Protection Switching (ERPS) Version 2 is an ITU-T standard that provides sub-50 ms protection switching for Ethernet traffic in ring topologies. ERPS Version 2 improves on the original G.8032 by supporting multiple interconnected rings and ladder topologies, enabling scalable and resilient Layer 2 networks.

In OcNOS, ERPS Version 2 ensures loop-free forwarding and rapid failover by designating a Ring Protection Link (RPL) and managing its state. When a fault occurs, ERPS Version 2 blocks or unblocks specific ring ports to maintain uninterrupted traffic flow.

Topology

Figure 1-1 displays a sample Ring Protection topology on which protection switching is configured with four bridges. The Ring Protection Link (RPL) owner is the link between Bridge 3 and Bridge 4 (xe16), on which one side of the link is defined explicitly as RPL owner (Bridge 4) and RPL neighbor (Bridge 3). The rest of the bridges are explicitly configured RPL non owner to enable ERPS in the ring.

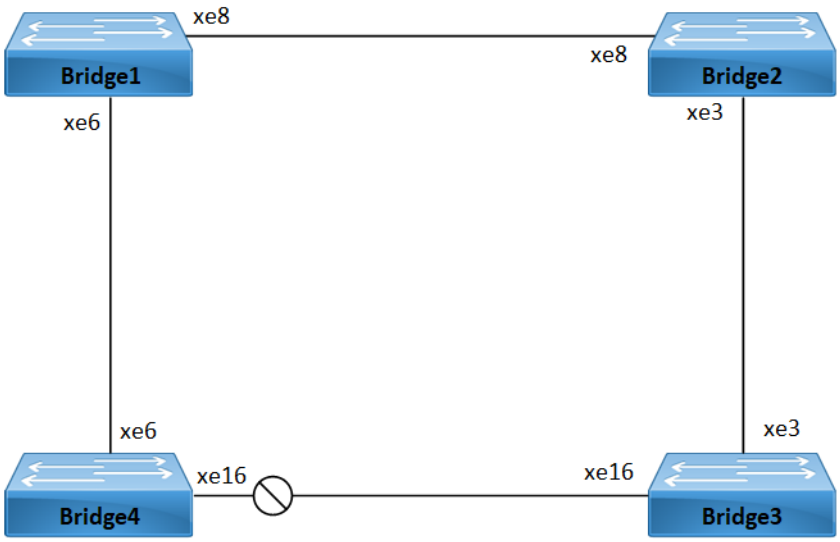


Figure 1-1: Major Ring Topology

Prerequisite

- A ring topology built with VLAN-enabled OcNOS interfaces
- Proper bridge-domain and VLAN assignments

Bridge 1

`Bridge1#configure terminal`	Enter configure mode
`Bridge1(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.

`Bridge1((config)#vlan database`	Configure VLAN database
`Bridge1(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge1(config-vlan)#interface xe6`	Configure interface xe6
`Bridge1(config-if)#switchport`	Configure xe6 as a layer 2 port
`Bridge1(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge1(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge1(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge1(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe6 interface
`Bridge1(config-if)#interface xe8`	Configure interface xe8
`Bridge1(config-if)#switchport`	Configure xe8 as a layer 2 port
`Bridge1(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge1(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge1(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge1(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe8 interface
`Bridge1(config-if)#ethernet cfm domain-type character-string domain-name nod12 level 7 mip-creation none`	Create cfm domain with type as character string with name nod12 and set mip creation criteria to default with level 7 on bridge 1
`Bridge1(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge1(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge1(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge1(config-ether-cfm-ma)#ethernet cfm mep down mpid 12 active true xe8`	Create down mep 12 for xe8 interface
`Bridge1(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge1(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge1(config-ether-cfm-ma)#mep crosscheck mpid 21`	Configure crosscheck to remote MEP with value 21
`Bridge1(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge1(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge1(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod41 level 7 mip-creation none`	Create cfm domain with type as character string with name nod41 and set mip creation criteria to default with level 7 on bridge 1

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`Bridge1(config-ether-cfm)#service ma-type string ma-name 43982 vl`	Create ma type as string with name 43982.
`Bridge1(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge1(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge1(config-ether-cfm-ma)#ethernet cfm mep down mpid 14 active true xe6`	Create down mep 14 for xe6 interface
`Bridge1(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge1(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge1(config-ether-cfm-ma)#mep crosscheck mpid 41`	Configure crosscheck to remote MEP with value 41
`Bridge1(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge1(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge1(config-ether-cfm)#g8032 ring RING1`	Create a g8032 ring with name RING1
`Bridge1(g8032-ring-config)#east-interface xe6`	Associate xe6 interface as east-interface
`Bridge1(g8032-ring-config)#west-interface xe8`	Associate xe8 interface as west-interface
`Bridge1(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge1(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge1(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge1(g8032-profile-config)#timer guard-time 10`	Configure guard-time value as 10ms
`Bridge1(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge1(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge1(g8032-config-switch)#ring RING1`	Associate Physical ring RING1 to erp1 instance
`Bridge1(g8032-config-switch)#rpl role non-owner`	Configure the node as non-owner node
`Bridge1(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp1 instance
`Bridge1(g8032-config-switch)#aps-channel level 7`	Configure level as 7

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`Bridge1(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge1(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge1(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge1(g8032-config-switch)#g8032 ring lagsubring`	Create g8032 ring with name lagsubring
`Bridge1(g8032-ring-config)#east-interface po6`	Associate po6 interface as east-interface
`Bridge1(g8032-ring-config)#g8032 erp-instance erp2`	Create g8032 erp instance erp2
`Bridge1(g8032-config-switch)#ring-type sub-ring`	Configure ring-type as sub-ring
`Bridge1(g8032-config-switch)#ring lagsubring`	Associate Physical ring lagsubring to erp2 instance
`Bridge1(g8032-config-switch)#rpl role neighbor east-interface`	Configure the node as neighbor node on east interface
`Bridge1(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp2 instance
`Bridge1(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge1(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge1(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge1(g8032-config-switch)#ring-id 2`	Configure ring-id as 2
`Bridge1(g8032-config-switch)#non-virtual-channel`	Enable Non Virtual Channel
`Bridge1(g8032-config-switch)# enable-tcn-propagation`	Enable tcn propagation
`Bridge1(g8032-config-switch)# tcn-to-instance erp1`	Attach erp1 instance to erp2 instance to notify any changes in subring to major ring
`Bridge1(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge1(g8032-config-switch)#end`	Exit g8032 erp instance mode

Bridge 2

`Bridge2#config terminal`	Enter configure mode
`Bridge2(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`Bridge2((config)#vlan database`	Configure VLAN database
`Bridge2(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge2(config-vlan)#interface xe3`	Configure interface xe3
`Bridge2(config-if)#switchport`	Configure xe3 as a layer 2 port
`Bridge2(config-if)#bridge-group 1`	Configure interface in bridge group 1

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`Bridge2(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge2(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge2(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe3 interface
`Bridge2(config-if)#interface xe8`	Configure interface xe8
`Bridge2(config-if)#switchport`	Configure xe8 as a layer 2 port
`Bridge2(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge2(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge2(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge2(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe8 interface
`Bridge2(config-if)#ethernet cfm domain-type character-string domain-name nod23 level 7 mip-creation none`	Create cfm domain with type as character string with name nod23 and set mip creation criteria to default with level 7 on bridge 1
`Bridge2(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge2(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge2(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge2(config-ether-cfm-ma)#ethernet cfm mep down mpid 23 active true xe3`	Create down mep 23 for xe3 interface
`Bridge2(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge2(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge2(config-ether-cfm-ma)#mep crosscheck mpid 32`	Configure crosscheck to remote MEP with value 32
`Bridge2(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge2(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge2(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod12 level 7 mip-creation none`	Create cfm domain with type as character string with name nod12 and set mip creation criteria to default with level 7 on bridge 1
`Bridge2(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge1(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge1(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge2(config-ether-cfm-ma)#ethernet cfm mep down mpid 21 active true xe8`	Create down mep 21 for xe8 interface
`Bridge2(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast

`Bridge2(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge2(config-ether-cfm-ma)#mep crosscheck mpid 12`	Configure crosscheck to remote MEP with value 12
`Bridge2(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge2(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma modes
`Bridge2(config-ether-cfm)#g8032 ring RING1`	Create g8032 ring with name RING1
`Bridge2(g8032-ring-config)#east-interface xe8`	Associate xe8 interface as east-interface
`Bridge2(g8032-ring-config)#west-interface xe3`	Associate xe3 interface as west-interface
`Bridge2(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge2(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge2(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge2(g8032-profile-config)#timer guard-time 10`	Configure guard-time value as 10ms
`Bridge2(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge2(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge2(g8032-config-switch)#ring RING1`	Associate Physical ring RING1 to erp1 instance
`Bridge2(g8032-config-switch)#rpl role non-owner`	Configure the node as non-owner node
`Bridge2(g8032-config-switch)#g8032-profile profile1`	Associate Profile profile1 to erp1 instance
`Bridge2(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge2(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge2(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge2(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge2(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge2(g8032-config-switch)#end`	Exit g8032 erp instance mode

Bridge 3

`Bridge3#config terminal`	Enter configure mode
`Bridge3(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`Bridge3((config)#vlan database`	Configure VLAN database

`Bridge3(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge3(config-vlan)#interface xe3`	Configure interface xe3
`Bridge3(config-if)#switchport`	Configure xe3 as a layer 2 port
`Bridge3(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge3(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge3(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge3(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe3 interface
`Bridge3(config-if)#interface xe16`	Configure interface xe16
`Bridge3(config-if)#switchport`	Configure xe16 as a layer 2 port
`Bridge3(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge3(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge3(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge3(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe16 interface
`Bridge3(config-if)#ethernet cfm domain-type character-string domain-name nod23 level 7 mip-creation none`	Create cfm domain with type as character string with name nod23 and set mip creation criteria to default with level 7 on bridge 1
`Bridge3(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge3(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge3(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge3(config-ether-cfm-ma)#ethernet cfm mep down mpid 32 active true xe3`	Create down mep 32 for xe3 interface.
`Bridge3(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge3(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge3(config-ether-cfm-ma)#mep crosscheck mpid 23`	Configure crosscheck to remote MEP with value 23
`Bridge3(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge3(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge3(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod34 level 7 mip-creation none`	Create cfm domain with type as character string with name nod34 and set mip creation criteria to default with level 7 on bridge 1
`Bridge3(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge3(config-ether-cfm-ma)#ethernet cfm mep down mpid 34 active true xe16`	Create down mep 34 for xe16 interface

`Bridge3(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge3(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge3(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge3(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge3(config-ether-cfm-ma)#mep crosscheck mpid 43`	Configure crosscheck to remote MEP with value 43
`Bridge3(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge3(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge3(config-ether-cfm)#g8032 ring RING1`	Create g8032 ring with name RING1
`Bridge3(g8032-ring-config)#east-interface xe3`	Associate xe3 interface as east-interface
`Bridge3(g8032-ring-config)#west-interface xe16`	Associate xe16 interface as west-interface
`Bridge3(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge3(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge3(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge3(g8032-profile-config)#timer guard-time 10`	Configure guard-time value as 10ms
`Bridge3(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge3(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge3(g8032-config-switch)#ring RING1`	Associate Physical ring RING1 to erp1 instance
`Bridge3(g8032-config-switch)#rpl role neighbor west-interface`	Configure RPL node as neighbor node on west-interface
`Bridge3(g8032-config-switch)g8032-profile profile1`	Associate profile profile1 to erp1 instance
`Bridge3(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge3(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge3(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge3(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge3(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge3(g8032-config-switch)#end`	Exit g8032 erp instance mode

Bridge 4

`Bridge4#config term`	Enter configure mode
`Bridge4(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`Bridge4((config)#vlan database`	Configure VLAN database
`Bridge4(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge4(config-vlan)#interface xe6`	Configure interface xe6
`Bridge4(config-if)#switchport`	Configure xe6 as a layer 2 port
`Bridge4(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge4(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge4(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge4(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe6 interface
`Bridge4(config-if)#interface xe16`	Configure interface xe16
`Bridge4(config-if)#switchport`	Configure xe16 as a layer 2 port
`Bridge4(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge4(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge4(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge4(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on xe16 interface
`Bridge4(config-if)#ethernet cfm domain-type character-string domain-name nod34 level 7 mip-creation none`	Create cfm domain with type as character string with name nod34 and set mip creation criteria to default with level 7 on bridge 1
`Bridge4(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge4(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge4(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge4(config-ether-cfm-ma)#ethernet cfm mep down mpid 43 active true xe16`	Create down mep 43 with local vid 200 for xe16 interface
`Bridge4(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge4(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge4(config-ether-cfm-ma)#mep crosscheck mpid 34`	Configure crosscheck to remote MEP with value 34
`Bridge4(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge4(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode

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`Bridge4(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod41 level 7 mip-creation none`	Create cfm domain with type as character string with name nod41 and set mip creation criteria to default with level 7 on bridge 1
`Bridge4(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge4(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge4(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge4(config-ether-cfm-ma)#ethernet cfm mep down mpid 41 active true xe6`	Create down mep 41 for xe6 interface
`Bridge4(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge4(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge4(config-ether-cfm-ma)#mep crosscheck mpid 14`	Configure crosscheck to remote MEP with value 14
`Bridge4(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge4(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge4(config-ether-cfm)#g8032 ring RING1`	Create g8032 ring with name RING1
`Bridge4(g8032-ring-config)#east-interface xe16`	Associate xe16 interface as east-interface
`Bridge4(g8032-ring-config)#west-interface xe6`	Associate xe6 interface as west-interface
`Bridge4(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge4(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge4(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge4(g8032-profile-config)#timer guard-time 10`	Configure guard-timer value as 10ms
`Bridge4(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge4(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge4(g8032-config-switch)#ring RING1`	Associate Physical ring RING1 to erp1 instance
`Bridge4(g8032-config-switch)#rpl role owner east-interface`	Configure the node as owner node on east-interface
`Bridge4(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp1 instance
`Bridge4(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge4(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200

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`Bridge4(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge4(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge4(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge4(g8032-config-switch)#end`	Exit g8032 erp instance mode

Validation

Bridge1:

```
show g8032 aps-statistics erp1

Instance   : erp1
==========
Tx   : 3205
Rx   : 27

show g8032 physical-ring RING1

Ring          : RING1
===============
Description   :
East          : xe16
West          : xe6
ERP Inst      : erp1

show g8032 profile profile1

Profile : profile1
=========
 Wait-To-Restore : 1 mins
 Hold Off Timer  : 0.00 secs
 Guard Timer     : 10 ms
 Wait-To-Block   : 5010 ms
 Protection Type : Revertive

Bridge1:
show g8032 erp-instance erp1

Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : RING1
Ring Type       : MAJOR-RING
Role            : NON-OWNER
Node ID         : 3c:2c:99:26:e6:80
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  xe6                 xe8
State           :  Unblocked           Unblocked
Remote NodeId   :  34:17:eb:e4:af:11   -
```

```
Remote BPR      :  1                    -
Endpoint Info
-------------
Domain Name     :  nod41                nod12
MEP ID          :  14                   12
MA Name         :  43982                43982
============================================================
--------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
==========================
 (7,    200,   1)         |
==========================

DataTraffic vlan: 201-205
Profile : profile1

Bridge2:
show g8032 erp-instance erp1

Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : RING1
Ring Type       : MAJOR-RING
Role            : NON-OWNER
Node ID         : d8:9e:f3:5e:f8:29
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  xe8                  xe3
State           :  Unblocked            Unblocked
Remote NodeId   :  34:17:eb:e4:af:11    -
Remote BPR      :  1                    -
Endpoint Info
-------------
Domain Name     :  nod12                nod23
MEP ID          :  21                   23
MA Name         :  43982                43982
============================================================
--------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
==========================
 (7,    200,   1)         |
==========================

DataTraffic vlan: 201-205
Profile : profile1

sBridge3:
show g8032 erp-instance erp1
Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : RING1
Ring Type       : MAJOR-RING
```

```
Role            : NEIGHBOR (WEST)
Node ID         : 3c:2c:99:1a:da:7d
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  xe3                 xe16
State           :  Unblocked           Blocked
Remote NodeId   :  34:17:eb:e4:af:11   34:17:eb:e4:af:11
Remote BPR      :  1                   1
Endpoint Info
-------------
Domain Name     :  nod23               nod34
MEP ID          :  32                  34
MA Name         :  43982               43982
============================================================
---------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
===========================
 (7,    200,   1)         |
===========================

DataTraffic vlan: 201-205
Profile : profile1

Bridge4:
show g8032 erp-instance erp1

Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : RING1
Ring Type       : MAJOR-RING
Role            : OWNER (EAST)
Node ID         : 34:17:eb:e4:af:11
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  xe16                xe6
State           :  Blocked             Unblocked
Remote NodeId   :  -                   -
Remote BPR      :  -                   -
Endpoint Info
-------------
Domain Name     :  nod34               nod41
MEP ID          :  43                  41
MA Name         :  43982               43982
============================================================
---------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
===========================
 (7,    200,   1)         |
===========================

DataTraffic vlan: 201-205
Profile : profile1
```

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Sub-ring without Virtual Channel on a LAG interface

Figure 3 displays a sample Ring Protection topology on which protection switching is configured with 5 bridges on lag interfaces. The topology contains one major ring and one subring with non-virtual channel. The Ring Protection Link (RPL) for major ring is the link between Bridge 4 (owner) and Bridge 3 (neighbor) on lag interface po3. The subring is configured with no virtual channel and it's RPL link is configured between bridge 1 (neighbor) and bridge 5 (owner) on lag interface po6. The rest of the bridges are explicitly configured RPL non owner to enable ERPS in the ring in both major and subring.

Topology

Figure 1-2 displays a sample Ethernet Ring Protection Switching topology.

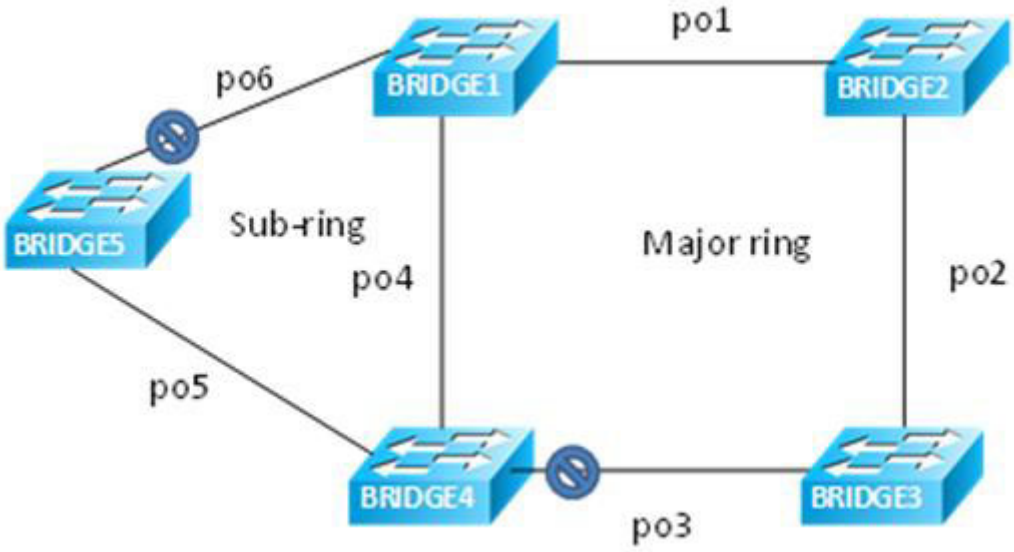


Figure 1-2: Major ring and sub-ring topology using LAG interface without a virtual channel

Bridge 1

`Bridge1#config term`	Enter configure mode
`Bridge1(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`Bridge1((config)#vlan database`	Configure VLAN database
`Bridge1(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge1(config-vlan)#interface po1`	Configure lag interface po1
`Bridge1(config-if)#switchport`	Configure po1 as a layer 2 port
`Bridge1(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge1(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge1(config-if)#switchport mode trunk`	Configure port as trunk port

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`Bridge1(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po1 interface
`Bridge1(config-if)#interface po4`	Configure lag interface po4
`Bridge1(config-if)#switchport`	Configure po4 as a layer 2 port
`Bridge1(config-if)#bridge-group 1 spanning-tree disable`	Configure interface in bridge group 1
`Bridge1(config-if)#switchport mode trunk`	Disable spanning tree for bridge group 1 on that interface
`Bridge1(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po4 interface
`Bridge1(config-if)#interface po6`	Configure lag interface po6
`Bridge1(config-if)#switchport`	Configure po6 as a layer 2 port
`Bridge1(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge1(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge1(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge1(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po6 interface
`Bridge1(config-if)#interface xe1`	Configure interface xe1
`Bridge1(config-if)#channel-group 6 mode active`	Configure xe1 as part of po6
`Bridge1(config-if)#interface xe2`	Configure interface xe2
`Bridge1(config-if)#channel-group 6 mode active`	Configure xe2 as part of po6
`Bridge1(config-if)#interface xe6`	Configure interface xe6
`Bridge1(config-if)#channel-group 4 mode active`	Configure xe6 as part of po4
`Bridge1(config-if)#interface xe7`	Configure interface xe7
`Bridge1(config-if)#channel-group 4 mode active`	Configure xe7 as part of po4
`Bridge1(config-if)#interface xe8`	Configure interface xe8
`Bridge1(config-if)#channel-group 1 mode active`	Configure xe8 as part of po1
`Bridge1(config-if)#interface xe9`	Configure interface xe9
`Bridge1(config-if)#channel-group 1 mode active`	Configure xe9 as part of po1
`Bridge1(config-if)#ethernet cfm domain-type character-string domain-name nod12 level 7 mip-creation none`	Create cfm domain with type as character string with name nod12 and set mip creation criteria to default with level 7 on bridge 1
`Bridge1(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge1(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge1(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none

`Bridge1(config-ether-cfm-ma)#ethernet cfm mep down mpid 12 active true po1`	Create down mep 12 with local vid 200 for po1 interface
`Bridge1(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge1(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge1(config-ether-cfm-ma)#mep crosscheck mpid 21`	Configure crosscheck to remote MEP with value 21
`Bridge1(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge1(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge1(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod41 level 7 mip-creation none`	Create cfm domain with type as character string with name nod41 and set mip creation criteria to default with level 7 on bridge 1
`Bridge1(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge1(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge1(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge1(config-ether-cfm-ma)#ethernet cfm mep down mpid 14 active true  po4`	Create down mep 14 with local vid 200 for po4 interface
`Bridge1(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge1(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge1(config-ether-cfm-ma)#mep crosscheck mpid 41`	Configure crosscheck to remote MEP with value 41
`Bridge1(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge1(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge1(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod15 level 7 mip-creation none`	Create cfm domain with type as character string with name nod15 and set mip creation criteria to default with level 7 on bridge 1
`Bridge1(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982.
`Bridge1(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge1(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge1(config-ether-cfm-ma)#ethernet cfm mep down mpid 51 active true  po6`	Create down mep 51 with local vid 200 for po6 interface
`Bridge1(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge1(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode

`Bridge1(config-ether-cfm-ma)#mep crosscheck mpid 15`	Configure crosscheck to remote MEP with value 15
`Bridge1(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with1s.
`Bridge1(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge1(config-ether-cfm)#g8032 ring lagring`	Create g8032 ring with name lagring
`Bridge1(g8032-ring-config)#east-interface po4`	Associate po4 interface as east-interface
`Bridge1(g8032-ring-config)#west-interface po1`	Associate po1 interface as west-interface
`Bridge1(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge1(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge1(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge1(g8032-profile-config)#timer guard-time 10`	Configure guard-timer value as 10ms
`Bridge1(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge1(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge1(g8032-config-switch)#ring lagring`	Associate Physical ring lagring to erp1 instance
`Bridge1(g8032-config-switch)#rpl role non-owner`	Configure the node as non-owner node
`Bridge1(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp1 instance
`Bridge1(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge1(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge1(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge1(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge1(g8032-config-switch)#g8032 ring lagsubring`	Create g8032 ring with name lagsubring
`Bridge1(g8032-ring-config)#east-interface po6`	Associate po6 interface as east-interface
`Bridge1(g8032-ring-config)#g8032 erp-instance erp2`	Create g8032 erp instance erp2
`Bridge1(g8032-config-switch)#ring-type sub-ring`	Configure ring-type as sub-ring
`Bridge1(g8032-config-switch)#ring lagsubring`	Associate Physical ring lagsubring to erp2 instance
`Bridge1(g8032-config-switch)#rpl role neighbor east-interface`	Configure the node as neighbor node on east interface
`Bridge1(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp2 instance

`Bridge1(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge1(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge1(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge1(g8032-config-switch)#ring-id 2`	Configure ring-id as 2
`Bridge1(g8032-config-switch)#non-virtual-channel`	Enable Non Virtual Channel
`Bridge1(g8032-config-switch)#enable-tcn-propagation`	Enable tcn propagation
`Bridge1(g8032-config-switch)# tcn-to-instance erp1`	Attach erp1 instance to erp2 instance to notify any changes in subring to major ring
`Bridge1(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge1(g8032-config-switch)#end`	Exit g8032 erp instance mode

Bridge 2

`Bridge2#config term`	Enter configure mode
`Bridge2(config)#bridge 1 protocol rstp vlan-bridge`	Enable CFM domain name as string
`Bridge2((config)#vlan database`	Configure VLAN database
`Bridge2(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge2(config-vlan)#interface po1`	Configure lag interface po1
`Bridge2(config-if)#switchport`	Configure po1 as a layer 2 port
`Bridge2(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge2(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge2(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge2(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po1 interface
`Bridge2(config-if)#interface po2`	Configure lag interface po2
`Bridge2(config-if)#switchport`	Configure po2 as a layer 2 port
`Bridge2(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge2(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge2(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge2(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po2 interface
`Bridge2(config-if)#interface xe8`	Configure interface xe8
`Bridge2(config-if)#channel-group 1 mode active`	Configure xe8 as part of po1
`Bridge2(config-if)#interface xe9`	Configure interface xe9

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`Bridge2(config-if)#channel-group 1 mode active`	Configure xe9 as part of po1
`Bridge2(config-if)#interface xe3`	Configure interface xe3
`Bridge2(config-if)#channel-group 2 mode active`	Configure xe3 as part of po2
`Bridge2(config-if)#interface xe4`	Configure interface xe4
`Bridge2(config-if)#channel-group 2 mode active`	Configure xe4 as part of po2
`Bridge2(config-if)#ethernet cfm domain-type character-string domain-name nod12 level 7 mip-creation none`	Create cfm domain with type as character string with name nod12 and set mip creation criteria to default with level 7 on bridge 1
`Bridge2(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge2(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge2(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge2(config-ether-cfm-ma)#ethernet cfm mep down mpid 21 active true  po1`	Create down mep 21 with local vid 200 for po1 interface
`Bridge2(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge2(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge2(config-ether-cfm-ma)#mep crosscheck mpid 12`	Configure crosscheck to remote MEP with value 12
`Bridge2(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s
`Bridge2(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit1sEthernet ma mode
`Bridge2(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod23 level 7 mip-creation none`	Create cfm domain with type as character string with name nod23 and set mip creation criteria to default with level 7 on bridge 1
`Bridge2(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge2(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge2(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge2(config-ether-cfm-ma)#ethernet cfm mep down mpid 23 active true  po2`	Create down mep 23 with local vid 200 for po2 interface
`Bridge2(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge2(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge2(config-ether-cfm-ma)#mep crosscheck mpid 32`	Configure crosscheck to remote MEP with value 32

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`Bridge2(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge2(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge2(config-ether-cfm)#g8032 ring lagring`	Create a g8032 ring with name lagring
`Bridge2(g8032-ring-config)#east-interface po1`	Associate po1 interface as east-interface
`Bridge2(g8032-ring-config)#west-interface po2`	Associate po2 interface as west-interface
`Bridge2(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge2(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge2(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge2(g8032-profile-config)#timer guard-time 10`	Configure guard-timer value as 10ms
`Bridge2(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge2(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge2(g8032-config-switch)#ring lagring`	Associate Physical ring lagring to erp1 instance
`Bridge2(g8032-config-switch)#rpl role non-owner`	Configure the node as non-owner node
`Bridge2(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp1 instance
`Bridge2(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge2(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge2(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge2(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge2(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge2(g8032-config-switch)#end`	Exit g8032 erp instance mode

Bridge 3

`Bridge3#config term`	Enter configuration mode
`Bridge3(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`Bridge3((config)#vlan database`	Configure VLAN database
`Bridge3(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge3(config-vlan)#interface po2`	Configure lag interface po2
`Bridge3(config-if)#switchport`	Configure po2 as a layer 2 port

`Bridge3(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge3(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge3(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge3(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po2 interface
`Bridge3(config-if)#interface po3`	Configure lag interface po3
`Bridge3(config-if)#switchport`	Configure po3 as a layer 2 port
`Bridge3(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge3(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge3(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge3(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po3 interface
`Bridge3(config-if)#interface xe3`	Configure interface xe3
`Bridge3(config-if)#channel-group 2 mode active`	Configure xe3 as part of po2
`Bridge3(config-if)#interface xe4`	Configure interface xe4
`Bridge3(config-if)#channel-group 2 mode active`	Configure xe4 as part of po2
`Bridge3(config-if)#interface xe15`	Configure interface xe3
`Bridge3(config-if)#channel-group 3 mode active`	Configure xe3 as part of po3
`Bridge3(config-if)#interface xe16`	Configure interface xe16
`Bridge3(config-if)#channel-group 3 mode active`	Configure xe16 as part of po3
`Bridge3(config-if)#ethernet cfm domain-type character-string domain-name nod23 level 7 mip-creation none 1`	Create cfm domain with type as character string with name nod23 and set mip creation criteria to default with level 7 on bridge 1
`Bridge3(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge3(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge3(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge3(config-ether-cfm-ma)#ethernet cfm mep down mpid 32 active true  po2`	Create down mep 32 with local vid 200 for po2 interface
`Bridge3(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge3(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge3(config-ether-cfm-ma)#mep crosscheck mpid 23`	Configure crosscheck to remote MEP with value 23
`Bridge3(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge3(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode

`Bridge3(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod34 level 7 mip-creation none`	Create cfm domain with type as character string with name nod34 and set mip creation criteria to default with level 7 on bridge 1
`Bridge3(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge3(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge3(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge3(config-ether-cfm-ma)#ethernet cfm mep down mpid 34 active true  po3`	Create down mep 34 with local vid 200 for po3 interface
`Bridge3(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge3(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge3(config-ether-cfm-ma)#mep crosscheck mpid 43`	Configure crosscheck to remote MEP with value 43
`Bridge3(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge3(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge3(config-ether-cfm)#g8032 ring lagring`	Create a g8032 ring with name lagring
`Bridge3(g8032-ring-config)#east-interface po2`	Associate po2 interface as east-interface
`Bridge3(g8032-ring-config)#west-interface po3`	Associate po3 interface as west-interface
`Bridge3(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge3(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge3(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge3(g8032-profile-config)#timer guard-time 10`	Configure guard-time value as 10ms
`Bridge3(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge3(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge3(g8032-config-switch)#ring lagring`	Associate Physical ring lagring to erp1 instance
`Bridge3(g8032-config-switch)#rpl role neighbor west-interface`	Configure the node as neighbor node on west interface
`Bridge3(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp1 instance
`Bridge3(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge3(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200

`Bridge3(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge3(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge3(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge3(g8032-config-switch)#end`	Exit g8032 erp instance mode

Bridge 4

`Bridge4#config term`	Enter configure mode
`Bridge4(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`Bridge4((config)#vlan database`	Configure VLAN database
`Bridge4(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge4(config-vlan)#interface po3`	Configure lag interface po3
`Bridge4(config-if)#switchport`	Configure po3 as a layer 2 port
`Bridge4(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge4(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge4(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge4(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po3 interface
`Bridge4(config-if)#interface po4`	Configure lag interface po4
`Bridge4(config-if)#switchport`	Configure po4 as a layer 2 port
`Bridge4(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge4(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge4(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge4(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po4 interface
`Bridge4(config-if)#interface po5`	Configure lag interface po5
`Bridge4(config-if)#switchport`	Configure po5 as a layer 2 port
`Bridge4(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge4(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge4(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge4(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po5 interface
`Bridge4(config-if)#interface xe6`	Configure interface xe6
`Bridge4(config-if)#channel-group 4 mode active`	Configure xe6 as part of po4
`Bridge4(config-if)#interface xe7`	Configure interface xe7
`Bridge4(config-if)#channel-group 4 mode active`	Configure xe7 as part of po4

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`Bridge4(config-if)#interface xe10`	Configure interface xe10
`Bridge4(config-if)#channel-group 5 mode active`	Configure xe10 as part of po5
`Bridge4(config-if)#interface xe11`	Configure interface xe11
`Bridge4(config-if)#channel-group 5 mode active`	Configure xe11 as part of po5
`Bridge4(config-if)#interface xe15`	Configure interface xe15
`Bridge4(config-if)#channel-group 3 mode active`	Configure xe15 as part of po3
`Bridge4(config-if)#interface xe16`	Configure interface xe16
`Bridge4(config-if)#channel-group 3 mode active`	Configure xe16 as part of po3
`Bridge4(config-if)#ethernet cfm domain-type character-string domain-name nod34 level 7 mip-creation none`	Create cfm domain with type as character string with name nod34 and set mip creation criteria to default with level 7 on bridge 1
`Bridge4(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge4(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge4(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge4(config-ether-cfm-ma)#ethernet cfm mep down mpid 43 active true  po3`	Create down mep 43 with local vid 200 for po3 interface
`Bridge4(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge4(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge4(config-ether-cfm-ma)#mep crosscheck mpid 34`	Configure crosscheck to remote MEP with value 34
`Bridge4(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge4(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge4(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod41 level 7 mip-creation none`	Create cfm domain with type as character string with name nod41 and set mip creation criteria to default with level 7 on bridge 1
`Bridge4(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge4(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge4(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge4(config-ether-cfm-ma)#ethernet cfm mep down mpid 41 active true  po4`	Create down mep 41 with local vid 200 for po4 interface
`Bridge4(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast

`Bridge4(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge4(config-ether-cfm-ma)#mep crosscheck mpid 14`	Configure crosscheck to remote MEP with value 14
`Bridge4(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s
`Bridge4(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge4(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod45 level 7 mip-creation none`	Create cfm domain with type as character string with name nod45 and set mip creation criteria to default with level 7 on bridge 1
`Bridge4(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge4(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge4(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge4(config-ether-cfm-ma)#ethernet cfm mep down mpid 54 active true  po5`	Create down mep 54 with local vid 200 for po5 interface
`Bridge4(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge4(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge4(config-ether-cfm-ma)#mep crosscheck mpid 45`	Configure crosscheck to remote MEP with value 45
`Bridge4(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge4(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge4(config-ether-cfm)#g8032 ring lagring`	Create a g8032 ring with name lagring
`Bridge4(g8032-ring-config)#east-interface po3`	Associate po3 interface as east-interface
`Bridge4(g8032-ring-config)#west-interface po4`	Associate po4 interface as west-interface
`Bridge4(g8032-ring-config)#g8032 ring lagsubring`	Create a g8032 ring with name lagsubring
`Bridge4(g8032-ring-config)#east-interface po5`	Associate po5 interface as east-interface
`Bridge4(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge4(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge4(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge4(g8032-profile-config)#timer guard-time 10`	Configure guard-time value as 10ms
`Bridge4(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode

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`Bridge4(g8032-profile-config)#g8032 erp-instance erp1`	Create g8032 erp instance erp1
`Bridge4(g8032-config-switch)#ring lagring`	Associate Physical ring lagring to erp1 instance
`Bridge4(g8032-config-switch)#rpl role owner east-interface`	Configure the node as owner node on east interface
`Bridge4(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp1 instance
`Bridge4(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge4(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge4(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge4(g8032-config-switch)#ring-id 1`	Configure ring-id as 1
`Bridge4(g8032-config-switch)#g8032 erp-instance erp2`	Create g8032 erp instance erp2
`Bridge4(g8032-config-switch)#ring-type sub-ring`	Configure ring-type as sub-ring
`Bridge4(g8032-config-switch)#ring lagsubring`	Associate Physical ring lagsubring to erp2 instance
`Bridge4(g8032-config-switch)#rpl role non-owner`	Configure the node as neighbor node on east interface
`Bridge4(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp2 instance
`Bridge4(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge4(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge4(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge4(g8032-config-switch)#ring-id 2`	Configure ring-id as 2
`Bridge4(g8032-config-switch)#non-virtual-channel`	Enable Non Virtual Channel
`Bridge4(g8032-config-switch)#enable-tcn-propagation`	Enable tcn propagation
`Bridge4(g8032-config-switch)# tcn-to-instance erp1`	Attach erp1 instance to erp2 instance to notify any changes in subring to major ring
`Bridge4(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge4(g8032-config-switch)#end`	Exit g8032 erp instance mode

Bridge 5

`Bridge5#config term`	Enter config mode
`Bridge5(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`Bridge5((config)#vlan database`	Configure VLAN database

`Bridge5(config-vlan)#vlan 200-205 bridge 1 state enable`	Create VLAN 200-205 on bridge 1
`Bridge5(config-vlan)#interface po5`	Configure lag interface po5
`Bridge5(config-if)#switchport`	Configure po5 as a layer 2 port
`Bridge5(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge5(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge5(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge5(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po3 interface
`Bridge5(config-if)#interface po6`	Configure lag interface po3
`Bridge5(config-if)#switchport`	Configure po3 as a layer 2 port
`Bridge5(config-if)#bridge-group 1`	Configure interface in bridge group 1
`Bridge5(config-if)#bridge-group 1 spanning-tree disable`	Disable spanning tree for bridge group 1 on that interface
`Bridge5(config-if)#switchport mode trunk`	Configure port as trunk port
`Bridge5(config-if)#switchport trunk allowed vlan add 200-205`	Allow vlan 200-205 on po3 interface
`Bridge5(config-if)#interface xe1`	Configure interface xe1
`Bridge5(config-if)#channel-group 6 mode active`	Configure xe1 as part of po6
`Bridge5(config-if)#interface xe2`	Configure interface xe2
`Bridge5(config-if)#channel-group 6 mode active`	Configure xe2 as part of po6
`Bridge5(config-if)#interface xe10`	Configure interface xe10
`Bridge5(config-if)#channel-group 5 mode active`	Configure xe10 as part of po5
`Bridge5(config-if)#interface xe11`	Configure interface xe11
`Bridge5(config-if)#channel-group 5 mode active`	Configure xe11 as part of po5
`Bridge5(config-if)#ethernet cfm domain-type character-string domain-name nod15 level 7 mip-creation none`	Create cfm domain with type as character string with name nod15 and set mip creation criteria to default with level 7 on bridge 1
`Bridge5(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge5(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge5(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge5(config-ether-cfm-ma)#ethernet cfm mep down mpid 15 active true  po6`	Create down mep 15 with local vid 200 for po6 interface
`Bridge5(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge5(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode

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`Bridge5(config-ether-cfm-ma)#mep crosscheck mpid 51`	Configure crosscheck to remote MEP with value 51
`Bridge5(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge5(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge5(config-ether-cfm)#ethernet cfm domain-type character-string domain-name nod45 level 7 mip-creation none`	Create cfm domain with type as character string with name nod45 and set mip creation criteria to default with level 7 on bridge 1
`Bridge5(config-ether-cfm)#service ma-type string ma-name 43982`	Create ma type as string with name 43982
`Bridge5(config-ether-cfm-ma)# vlan 200 bridge 1`	Add vlan 200
`Bridge5(config-ether-cfm-ma)# mip-creation none`	Set mip-creation creation criteria to none
`Bridge5(config-ether-cfm-ma)#ethernet cfm mep down mpid 45 active true po5`	Create down mep 45 with local vid 200 for po5 interface
`Bridge5(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast
`Bridge5(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit ethernet cfm ma-mep mode
`Bridge5(config-ether-cfm-ma)#mep crosscheck mpid 54`	Configure crosscheck to remote MEP with value 54
`Bridge5(config-ether-cfm-ma)#cc interval 1s`	Enable cc interval with 1s.
`Bridge5(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit Ethernet ma mode
`Bridge5(config-ether-cfm)#g8032 ring lagsubring`	Create a g8032 ring with name lagsubring
`Bridge5(g8032-ring-config)#east-interface po5`	Associate po5 interface as east-interface
`Bridge5(g8032-ring-config)#west-interface po6`	Associate po6 interface as west-interface
`Bridge5(g8032-ring-config)#g8032 profile profile1`	Create g8032 profile with profile name profile1
`Bridge5(g8032-profile-config)#timer wait-to-restore 1`	Configure wait to restore time as 1 min
`Bridge5(g8032-profile-config)#timer hold-off 0`	Configure hold-off timer value as 0
`Bridge5(g8032-profile-config)#timer guard-time 10`	Configure guard-time value as 10ms
`Bridge5(g8032-profile-config)#switching mode revertive`	Configure Switching mode as revertive Switching mode
`Bridge5(g8032-profile-config)#g8032 erp-instance erp2`	Create g8032 erp instance erp2
`Bridge5(g8032-config-switch)#ring lagsubring`	Associate Physical ring lagsubring to erp2 instance
`Bridge5(g8032-config-switch)#ring-type sub-ring`	Configure ring-type as subring

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`Bridge5(g8032-config-switch)#rpl role owner west-interface`	Configure the node as owner node on west interface
`Bridge5(g8032-config-switch)g8032-profile profile1`	Associate Profile profile1 to erp2 instance
`Bridge5(g8032-config-switch)#aps-channel level 7`	Configure level as 7
`Bridge5(g8032-config-switch)#aps-channel-vlan 200`	Configure RAPS channel vlan as 200
`Bridge5(g8032-config-switch)#data vlan 201-205`	Configure traffic vlan from 201-205
`Bridge5(g8032-config-switch)#ring-id 2`	Configure ring-id as 2
`Bridge5(g8032-config-switch)#commit`	Commit the candidate configuration to the running configuration
`Bridge5(g8032-config-switch)#end`	Exit g8032 erp instance mode

Validation

```
Bridge1#show g8032 erp-instance erp2

Inst Name       : erp2
Description     :
State           : G8032_ST_IDLE
Phy Ring        : lagsubring
Ring Type       : SUB-RING (NON VIRTUAL)
Role            : NEIGHBOR (EAST)
Node ID         : 3c:2c:99:26:e6:7b
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po6                 -
State           :  Blocked             -
Remote NodeId   :  6c:b9:c5:67:72:f6   -
Remote BPR      :  0                   -
Endpoint Info
-------------
Domain Name     :  nod15               -
MEP ID          :  51                  -
MA Name         :  43982               -
============================================================
TCN Propagation : Enabled
TCN Propagation List: erp1,

     Channel              |
 (LEVEL, VLAN, RING ID)   |
============================
 (7,    200,   2)         |
============================

Bridge1#show g8032 erp-instance erp1

Inst Name       : erp1
Description     :
```

```
State           : G8032_ST_IDLE
Phy Ring        : lagring
Ring Type       : MAJOR-RING
Role            : NON-OWNER
Node ID         : 3c:2c:99:26:e6:80
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po4                 po1
State           :  Unblocked           Unblocked
Remote NodeId   :  34:17:eb:e4:af:10   -
Remote BPR      :  1                   -
Endpoint Info
-------------
Domain Name     :  nod41               nod12
MEP ID          :  14                  12
MA Name         :  43982               43982
============================================================
---------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
===========================
 (7,    200,   1)         |
===========================

DataTraffic vlan: 201-205
Profile : profile1

Bridge2#show g8032 erp-instance erp1

Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : lagring
Ring Type       : MAJOR-RING
Role            : NON-OWNER
Node ID         : d8:9e:f3:5e:f8:29
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po1                 po2
State           :  Unblocked           Unblocked
Remote NodeId   :  34:17:eb:e4:af:10   -
Remote BPR      :  1                   -
Endpoint Info
-------------
Domain Name     :  nod12               nod23
MEP ID          :  21                  23
MA Name         :  43982               43982
============================================================
---------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
===========================
 (7,    200,   1)         |
===========================
```

```
DataTraffic vlan: 201-205
Profile : profile1

Bridge3#show  g8032 erp-instance erp1

Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : lagring
Ring Type       : MAJOR-RING
Role            : NEIGHBOR (WEST)
Node ID         : 3c:2c:99:1a:da:7d
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po2                 po3
State           :  Unblocked           Blocked
Remote NodeId   :  34:17:eb:e4:af:10   34:17:eb:e4:af:10
Remote BPR      :  1                   1
Endpoint Info
-------------
Domain Name     :  nod23               nod34
MEP ID          :  32                  34
MA Name         :  43982               43982
============================================================
---------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
===========================
 (7,    200,   1)         |
===========================

DataTraffic vlan: 201-205
Profile : profile1

Bridge4#show g8032 erp-instance erp2

Inst Name       : erp2
Description     :
State           : G8032_ST_IDLE
Phy Ring        : lagsubring
Ring Type       : SUB-RING (NON VIRTUAL)
Role            : NON-OWNER
Node ID         : 34:17:eb:e4:af:0b
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po5                 -
State           :  Unblocked           -
Remote NodeId   :  6c:b9:c5:67:72:f6   -
Remote BPR      :  0                   -
Endpoint Info
-------------
Domain Name     :  nod45               -
MEP ID          :  54                  -
MA Name         :  43982               -
============================================================
```

```
TCN Propagation : Enabled
TCN Propagation List: erp1,

     Channel              |
 (LEVEL, VLAN, RING ID)   |
==========================
 (7,    200,   2)         |
==========================

DataTraffic vlan: 201-205
Profile : profile1

Bridge4#show g8032 erp-instance erp1

Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : lagring
Ring Type       : MAJOR-RING
Role            : OWNER (EAST)
Node ID         : 34:17:eb:e4:af:10
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po3                 po4
State           :  Blocked             Unblocked
Remote NodeId   :  -                   -
Remote BPR      :  -                   -
Endpoint Info
-------------
Domain Name     :  nod34               nod41
MEP ID          :  43                  41
MA Name         :  43982               43982
============================================================
--------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
==========================
 (7,    200,   1)         |
==========================

DataTraffic vlan: 201-205
Profile : profile1

Bridge5#show g8032 erp-instance erp2

Inst Name       : erp2
Description     :
State           : G8032_ST_IDLE
Phy Ring        : lagsubring
Ring Type       : SUB-RING
Role            : OWNER (WEST)
Node ID         : 6c:b9:c5:67:72:f6
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po5                 po6
```

```
State           :  Unblocked           Blocked
Remote NodeId   :  -                   -
Remote BPR      :  -                   -
Endpoint Info
-------------
Domain Name     :  nod45               nod15
MEP ID          :  45                  15
MA Name         :  43982               43982
============================================================
---------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
===========================
 (7,    200,   2)         |
===========================

DataTraffic vlan: 201-205
Profile : profile1

Bridge3#show  g8032 erp-instance erp1

Inst Name       : erp1
Description     :
State           : G8032_ST_IDLE
Phy Ring        : lagring
Ring Type       : MAJOR-RING
Role            : NEIGHBOR (WEST)
Node ID         : 3c:2c:99:1a:da:7d
------------------------------------------------------------
                   East Link           West Link
============================================================
Interface       :  po2                 po3
State           :  Unblocked           Blocked
Remote NodeId   :  34:17:eb:e4:af:10   34:17:eb:e4:af:10
Remote BPR      :  1                   1
Endpoint Info
-------------
Domain Name     :  nod23               nod34
MEP ID          :  32                  34
MA Name         :  43982               43982
============================================================
---------------------------
     Channel              |
 (LEVEL, VLAN, RING ID)   |
===========================
 (7,    200,   1)         |
===========================

DataTraffic vlan: 201-205
Profile : profile1
```

CHAPTER 2 Ethernet CFM Configurations

This chapter contains examples of Ethernet Operations and Management (OAM) configurations using the Connectivity Fault Management (CFM) protocol.

Connectivity Fault Management detects, verifies, isolates and notifies connectivity failures on a Virtual Bridged LAN (B-VLAN) based on the protocol standard specified in IEEE 802.1ag 2007. It provides discovery and verification of paths through 802.1 bridges and LANs and is part of the Operation, Administration and Management (OAM) module. CFM is transparent to customer data being transported by a network and is capable of providing maximum fault management.

Note: CFM session flaps occur if the active LAG member transmitting and receiving CCM PDUs goes down and the LAG re-converges after hardware updates.

Continuity Check Message (CCM)

Topology

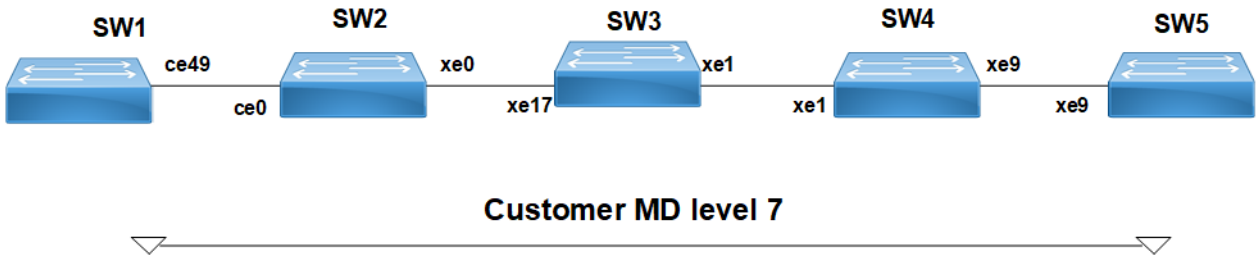


Figure 2-3: CFM Topology

Prerequisite

Configure below hardware-profile commands related to CFM in configuration mode and reboot the nodes.

```
hardware-profile statistics cfm-ccm enable
```

SW1

`SW1#configure terminal`	Enter configure mode.
`SW1(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`SW1(config)#vlan database`	Entering vlan database
`SW1(config-vlan)#vlan 512 bridge 1 state enable`	Create VLAN 512 on bridge 1.
`SW1(config-vlan)#exit`	Exit vlan database
`SW1(config)#interface ce49`	Configure interface ce49.
`SW1(config-if)#switchport`	Configure the interface as switch port.
`SW1(config-if)#bridge-group 1`	Configure interface in bridge group 1.

`SW1(config-if)#switchport mode trunk`	Configure interface mode as trunk.
`SW1(config-if)#switchport trunk allowed vlan all`	Allow all VLANs on interface ce49.
`SW1(config-if)#exit`	Exit config mode.
`SW1(config)#ethernet cfm domain-type character-string domain-name mdnam level 7 mip-creation default`	Create cfm domain with type as character string and set mip creation criteria to default.
`SW1(config-ether-cfm)#service ma-type string ma-name testtm`	Create ma type as string and configure the ma
`SW1(config-ether-cfm-ma)#vlan 25 bridge 1`	Configure vlan-id to associate the vlan to the MA
`SW1(config-ether-cfm-ma)#mip-creation default`	Set the mip creation criteria to default for the MA
`SW1(config-ether-cfm-ma)#ethernet cfm mep down mpid 2 active true ce49`	Create down mep on ce49.
`SW1(config-ether-cfm-ma-mep)#cc multicast state enable`	Enable cc multicast.
`SW1(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode`	Exit CFM MEP configuration mode.
`SW1(config-ether-cfm-ma)#mep crosscheck mpid 1`	Configure crosscheck to remote MEP in VLAN 512.
`SW1(config-ether-cfm-ma)#cc interval 10ms`	Enable cc interval for 10 millisecond.
`SW1(config-ether-cfm-ma)#exit-ether-ma-mode`	Exit CFM MA configuration mode.
`SW1(config-ether-cfm)#exit`	Exit ethernet CFM mode.
`SW1(config)#commit`	Commit the configuration
`SW1(config)#exit`	Exit the configure terminal mode

SW2

`SW2#configure terminal`	Enter configure mode.
`SW2(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`SW2(config)#vlan database`	Entering vlan database
`SW2(config-vlan)#vlan 512 bridge 1 state enable`	Create VLAN 512 on bridge 1.
`SW2(config-vlan)#exit`	Exit vlan database
`SW2(config)#interface ce0`	Configure interface ce0.
`SW2(config-if)#switchport`	Configure the interface as switch port.
`SW2(config-if)#bridge-group 1`	Configure interface in bridge group 1.
`SW2(config-if)#switchport mode trunk`	Configure interface mode as trunk.
`SW2(config-if)#switchport trunk allowed vlan all`	Allow all VLANs on interface ce0.
`SW2(config-if)#exit`	Exit config mode.
`SW2(config)#interface xe0`	Configure interface xe0.
`SW2(config-if)#switchport`	Configure the interface as switch port.
`SW2(config-if)#bridge-group 1`	Configure interface in bridge group 1.
`SW2(config-if)#switchport mode trunk`	Configure interface mode as trunk.

`SW2(config-if)#switchport trunk allowed vlan all`	Allow all VLANs on interface xe1.
`SW2(config-if)#exit`	Exit the interface mode
`SW2(config)#commit`	Commit the configuration
`SW2(config)#exit`	Exit the configure terminal mode

SW3

`SW3#configure terminal`	Enter configure mode.
`SW3(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`SW3(config)#vlan database`	Entering vlan database
`SW3(config-vlan)#vlan 512 bridge 1 state enable`	Create VLAN 512 on bridge 1.
`SW3(config-vlan)#exit`	Exit vlan database
`SW3(config)#interface xe17`	Configure interface xe17
`SW3(config-if)#switchport`	Configure the interface as switch port.
`SW3(config-if)#bridge-group 1`	Configure interface in bridge group 1.
`SW3(config-if)#switchport mode trunk`	Configure interface mode as trunk.
`SW3(config-if)#switchport trunk allowed vlan all`	Allow all VLANs on interface xe17.
`SW3(config-if)#exit`	Exit config mode.
`SW3(config)#interface xe1`	Configure interface xe1.
`SW3(config-if)#switchport`	Configure the interface as switch port.
`SW3(config-if)#bridge-group 1`	Configure interface in bridge group 1.
`SW3(config-if)#switchport mode trunk`	Configure interface mode as trunk.
`SW3(config-if)#switchport trunk allowed vlan all`	Allow all VLANs on interface xe1.
`SW3(config-if)#exit`	Exit the interface mode
`SW3(config)#commit`	Commit the configuration
`SW3(config)#exit`	Exit the configure terminal mode

SW4

`SW4#configure terminal`	Enter configure mode.
`SW4(config)#bridge 1 protocol rstp vlan-bridge`	Create bridge 1 as an RSTP VLAN-aware bridge.
`SW4(config)#vlan database`	Entering vlan database
`SW4(config-vlan)#vlan 512 bridge 1 state enable`	Create VLAN 512 on bridge 1.
`SW4(config-vlan)#exit`	Exit vlan database
`SW4(config)#interface xe1`	Configure interface xe1.
`SW4(config-if)#switchport`	Configure the interface as switch port.
`SW4(config-if)#bridge-group 1`	Configure interface in bridge group 1.

SW4(config-if)#switchport mode trunk	Configure interface mode as trunk.
SW4(config-if)#switchport trunk allowed vlan all	Allow all VLANs on interface xe1.
SW4(config-if)#exit	Exit config mode.
SW4(config)#interface xe9	Configure interface xe9.
SW4(config-if)#switchport	Configure the interface as switch port.
SW4(config-if)#bridge-group 1	Configure interface in bridge group 1.
SW4(config-if)#switchport mode trunk	Configure interface mode as trunk.
SW4(config-if)#switchport trunk allowed vlan all	Allow all VLANs on interface xe9.
SW4(config-if)#exit	Exit the interface mode
SW4(config)#commit	Commit the configuration
SW4(config)#exit	Exit the configure terminal mode

SW5

SW5#configure terminal	Enter configure mode.
SW5(config)#bridge 1 protocol rstp vlan-bridge	Create bridge 1 as an RSTP VLAN-aware bridge.
SW5(config)#vlan database	Entering vlan database
SW5(config-vlan)#vlan 512 bridge 1 state enable	Create VLAN 512 on bridge 1.
SW5(config-vlan)#exit	Exit vlan database
SW5(config)#interface xe9	Configure interface xe9.
SW5(config-if)#switchport	Configure the interface as switch port.
SW5(config-if)#bridge-group 1	Configure interface in bridge group 1.
SW5(config-if)#switchport mode trunk	Configure interface mode as trunk.
SW5(config-if)#switchport trunk allowed vlan all	Allow all VLANs on interface xe9.
SW5(config-if)#exit	Exit config mode.
SW5(config)#ethernet cfm domain-type character-string domain-name mdnam level 7 mip-creation default	Create cfm domain with type as character string and set mip creation criteria to default.
SW5(config-ether-cfm)#service ma-type string ma-name testtm	Create ma type as string and set mip creation criteria to default.
SW5(config-ether-cfm-ma)#vlan 25 bridge 1	Configure vlan-id to associate the vlan to the MA
SW5(config-ether-cfm-ma)#mip-creation default	Set the mip creation criteria to default for the MA
SW5(config-ether-cfm-ma)#ethernet cfm mep down mpid 1 active true xe9	Create down mep on xe9.
SW5(config-ether-cfm-ma-mep)#cc multicast state enable	Enable cc multicast.
SW5(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode	Exit CFM MEP configuration mode
SW5(config-ether-cfm-ma)#mep crosscheck mpid 2	Configure crosscheck to remote MEP in VLAN 512.

SW5(config-ether-cfm-ma)#cc interval 10ms	Enable cc interval for 10 millisecond.
SW5(config-ether-cfm-ma)#exit-ether-ma-mode	Exit CFM MA configuration mode.
SW5(config-ether-cfm)#exit	Exit ethernet CFM mode.
SW5(config)#commit	Commit the configuration
SW5(config)#exit	Exit the configure terminal mode

Validation

```
SW1#ping ethernet mac 3c2c.9926.e683 unicast source 2 domain mdnam vlan 512 bridge 1
success rate is 100 (5/5)


SW1#traceroute ethernet 3c2c.9926.e683 mepid 2 domain mdnam
MP Mac Hops  Relay-action    Ingress/Egress      Ingress/Egress      action
3c2c.9926.e683    1     RlyHit     Ingress     IngOK

SW1#show ethernet cfm maintenance-points local mep domain mdnam ma-name testtm
MPID Dir Lvl VLAN CC-Stat HW-Status     CC-Intvl MAC-Address     Def Port     MD Name
------------------------------------------------------------------------------
--
2     Dn     7     512     Enable     Installed     10 ms     6cb9.c567.721d F     ce49
mdnam

SW1#show ethernet cfm maintenance-points remote domain mdnam ma-name testtm  MEPID
RMEPID     LEVEL     VLAN     Rx CCM     RDI     PEER-MAC     TYPE
------------------------------------------------------------------------------
-2     1     7     512     Yes     False     3c2c.9926.e683 Configured

SW1#show ethernet cfm ma status domain mdnam ma testtm
MA NAME     VLAN     STATUS
-----------------------------------------
testtm     512     Active
```

Carrier Ethernet Command Reference

CHAPTER 1 CFM Commands

This chapter describes the commands used to manage the Connectivity Fault Management (CFM). CFM refers to the service OAM of Ethernet used to manage individual Layer 2 Ethernet services. The CFM protocol can discover and verify the path through 802.1 bridges and LANs. OcNOS adheres to the IEEE 802.1ag 2007 standard.

- cc interval
- cc multicast
- cfm snmp restart
- clear ethernet cfm maintenance-point remote
- clear ethernet cfm statistics
- clear ethernet cfm traceroute-cache
- ethernet cfm debug
- ethernet cfm domain-type
- ethernet cfm mep
- ethernet cfm mip
- exit-ether-ma-mep-mode
- exit-ether-ma-mode
- link-level
- mep crosscheck
- mep lowest-priority-defect
- mip-creation
- ping ethernet mac
- service ma-type
- show debugging ethernet cfm
- show ethernet cfm errors
- show ethernet cfm ma status
- show ethernet cfm maintenance-points count
- show ethernet cfm maintenance-points local mep
- show ethernet cfm maintenance-points local mip
- show ethernet cfm maintenance-points remote
- show ethernet cfm traceroute-cache
- show ethernet cfm statistics
- show running-config cfm
- traceroute ethernet
- vlan

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cc interval

Use this command to set the continuity checking (CC) message interval.

Note: It is recommend to configure CC interval as equal-to or higher than 100ms. System can not be scaled when CC interval is configured less than 100ms.

Command Syntax

```
cc interval (10ms|100ms|1s|10s|1min|10min)
```

Parameters

`10ms`	10 milliseconds
`100ms`	100 milliseconds
`1s`	1 seconds
`1min`	1 minute
`10s`	10 seconds
`10min`	10 minutes

Command Mode

Ethernet CFM MA mode

Applicability

This command was introduced in OcNOS version 4.2.

Examples

```
(config)#ethernet cfm domain-type character-string domain-name 12345 level 7
(config-ether-cfm)#service ma-type string ma-name 43982
OcNOS(config-ether-cfm-ma)#vlan 10 bridge 1
(config-ether-cfm-ma)#ethernet cfm mep down mpid 2331 active true xe2
OcnOS(config-ether-cfm-ma-mep)cc interval 1s
OcnOS(config-ether-cfm-ma-mep)#cc multicast state enable
```

cc multicast

Use this command to start or stop multicast continuity checking messages (CCMs) on a MEP.

Command Syntax

```
cc multicast state (enable|disable)
```

Parameters

`enable`	Start sending CCMs
`disable`	Stop sending CCMs

Command Mode

Ethernet CFM MA MEP mode

Applicability

This command was introduced in OcNOS version 4.2.

Examples

```
OcNOS(config)#ethernet cfm domain-type character-string domain-name 12345 level 7
OcNOS(config-ether-cfm)#service ma-type string ma-name 43982
OcNOS(config-ether-cfm-ma)#vlan 10
(config-ether-cfm-ma)#ethernet cfm mep down mpid 2331 active true xe2
(config-ether-cfm-ma-mep)#cc multicast state enable
```

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cfm snmp restart

Use this command to restart SNMP in CFM Protocol.

Command Syntax

```
cfm snmp restart
```

Parameters

None

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS Version 5.1.

Examples

```
OcNOS#cfm snmp restart
```

clear ethernet cfm maintenance-point remote

Use this command to remove a dynamically learned RMEP.

The RMEP is relearned if service ma-type is enabled and a CCM (Continuity Checking Message) is received.

Command Syntax

```
clear ethernet cfm maintenance-points remote domain <DOMAIN-NAME>
```

Parameters

DOMAIN_NAME	Enter the name of the domain.

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
#clear ethernet cfm maintenance-points remote domain abcde
```

clear ethernet cfm statistics

Use this command to clear the CFM statistics.

Command Syntax

```
clear ethernet cfm statistics
clear ethernet cfm statistics mep <MEPID> domain <DOMAIN_NAME> ma <MA_NAME>
```

Parameters

MEPID	MEP identifier <1-8191>
DOMAIN_NAME	Enter the name of the domain. Name must be of 5 characters if type is character-string otherwise no_name if domain-type is no-name1
MA_NAME	Enter maintenance association name. If ma-type is character string then maximum length of ma-name is 6 else if it's integer then maximum is 2-octets.

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

```
OcNOS#clear ethernet cfm statistics
```

clear ethernet cfm traceroute-cache

Use this command to clear the CFM traceroute cache entry.

Command Syntax

```
clear ethernet cfm traceroute-cache
```

Parameters

None

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

```
#clear ethernet cfm traceroute-cache
```

ethernet cfm debug

Use this command to enable debug for ethernet cfm .

Use `no` from of this command to disable debug for ethernet cfm

Command Syntax

```
ethernet cfm debug (events|rx|tx|loopback|traceroute)
no ethernet cfm debug (events|rx|tx|loopback|traceroute)
```

Parameters

`TIME`	Wait-to-restore-timer <0-86400>
`events`	Enable event debugs
`loopback`	Enable loopback debugs
`rx`	Enable receive debugs
`traceroute`	Enable traceroute debugs
`tx`	Enable transmit debugs

Default

None

Command Mode

Configure mode

Applicability

This command was introduced in OcNOS Version 5.0

Examples

```
OcNOS(config)#ethernet cfm debug events
OcNOS(config)#ethernet cfm debug loopback
OcNOS(config)#ethernet cfm debug rx
OcNOS(config)#ethernet cfm debug tx
OcNOS(config)#ethernet cfm debug traceroute
OcNOS(config)#no ethernet cfm debug events
OcNOS(config)#no ethernet cfm debug loopback
OcNOS(config)#no ethernet cfm debug rx
OcNOS(config)#no ethernet cfm debug tx
OcNOS(config)#no ethernet cfm debug traceroute
```

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ethernet cfm domain-type

Use this command to create a CFM Maintenance Domain (MD) in a bridge and enter Ethernet CFM mode.

Use the `no` form of this command to remove a domain.

Note: You can create up to 15 MDs in a bridge.

Only one domain can be created without any domain name in a bridge.

A domain name of type `character-string` can only created only after the mep crosscheck command is executed.

Command Syntax

```
ethernet cfm domain-type (no-name|character-string) domain-name DOMAIN_NAME level
<0-7>  mip-creation (none|default|explicit)
no ethernet cfm domain-name DOMAIN_NAME
```

Parameters

`domain-type`	Domain type (must match service ma-type setting)
`no-name`	No MD name. The `ma-type` must be `integer` or `itu-t` carrier code (ICC) format defined by Y.1731.
`character-string`	Character string name. The `ma-type` must be string.
`DOMAIN_NAME`	Enter the name of the domain.
`<0-7>`	MD level
`mip-creation`	Maintenance Intermediate Point (MIP) creation permission for this domain
`none`	No MIP can be created for this VLAN identifier
`default`	MIP can be created if no lower active level or MEP at next lower active level
`explicit`	Maintenance End Point (MEP) is needed at the next lower active level

Command Mode

Configure mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Examples

```
OcNOS(config)#
OcNOS(config)#ethernet cfm domain-type character-string domain-name 12347
level 7 mip-creation none
OcNOS(config-ether-cfm)#
```

ethernet cfm mep

Use this command to create a Maintenance End Point (MEP), make it active or inactive and enter Ethernet CFM MA MEP mode.

A MEP created with the `active false` option remains inactive and CFM functionality is suspended for such a MEP.

Note: VLAN parameters is supported only for sub-interface.

Use the `no` form of this command to delete a MEP.

Command Syntax

```
ethernet cfm mep (down|up) mpid <1-8191> active (false|true) (IFNAME ((vlan <1-
  4094> (inner-vlan <1-4094>)|)| evpn <1-16777215>)
no ethernet cfm mpid <1-8191>
```

Parameters

`down`	Down MEP
`up`	Up MEP
`active`	Administrative state of the MEP
`true`	Make the MEP active
`false`	Make the MEP inactive
`IFNAME`	Interface name
`vlan`	Outer vlan
`inner-vlan`	Inner vlan
`evpn <ID>`	EVPN instance ID

Command Mode

Ethernet CFM MA mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

Physical Interface:

```
OcNOS(config)#ethernet cfm domain-type character-string domain-name md001
level 7
OcNOS(config-ether-cfm)#service ma-type string ma-name ma001 vlan 11 bridge 1
OcNOS(config-ether-cfm-ma)#ethernet cfm mep down mpid 666 active true  ge9
```

Sub-interface:

```
OcNOS(config)#ethernet cfm domain-type character-string domain-name md001
level 7
OcNOS(config-ether-cfm)#service ma-type string ma-name ma001
OcNOS(config-ether-cfm-ma)#ethernet cfm mep down mpid 111 active true  ge9.1
vlan 100
```

ethernet cfm mip

Use this command to create a static MIP on an interface.

Use the `no` form of this command to remove a static MIP from an interface.

Command Syntax

```
ethernet cfm mip interface IFNAME
no ethernet cfm mip interface IFNAME
```

Parameters

`IFNAME`	Interface name of MIP

Command Mode

Ethernet CFM MA mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
OcNOS#con term
Enter configuration commands, one per line.  End with CNTL/Z.
OcNOS(config)#ethernet cfm domain-type character-string domain-name 12345
level 7
OcNOS(config-ether-cfm)# service ma-type string ma-name ma1
OcNOS(config-ether-cfm-ma)# vlan 25 bridge 1
OcNOS(config-ether-cfm-ma)# ethernet cfm mip interface ge5
OcNOS(config-ether-cfm-ma)#no ethernet cfm mip interface ge5
(config)#ethernet cfm domain-type character-string domain-name 12345 level 7
```

exit-ether-ma-mep-mode

Use this command to exit Ethernet CFM MA MEP mode and go back to Ethernet CFM MA mode.

Command Syntax

```
exit-ether-ma-mep-mode
```

Parameters

None

Command Mode

Ethernet CFM MA MEP mode

Applicability

This command was introduced in OcNOS version 4.2.

Examples

```
#configure terminal
(config)#ethernet cfm domain-type character-string domain-name 12345 level 7
(config-ether-cfm)#service ma-type string ma-name testtm
(config-ether-cfm-ma)#vlan 5 bridge 10
(config-ether-cfm-ma)#ethernet cfm mep down mpid 201 active true xe2
(config-ether-cfm-ma-mep)#exit-ether-ma-mep-mode
```

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exit-ether-ma-mode

Use this command to exit Ethernet CFM MA mode and go back to Ethernet CFM mode.

Command Syntax

```
exit-ether-ma-mode
```

Parameters

None

Command Mode

Ethernet CFM MA mode

Applicability

This command was introduced in OcNOS version 4.2.

Examples

```
#configure terminal
(config)#ethernet cfm domain-type character-string domain-name 12345 level 7 mi
(config-ether-cfm)#service ma-type string ma-name testtm
(config-ether-cfm-ma)#vlan 5 bridge 10
(config-ether-cfm-ma)#exit-ether-ma-mode
```

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link-level

Use this command to create a maintenance association for link-level MEPs (level 0) which do not listen on a VLAN.

Command Syntax

```
link-level  (bridge <1-32>|)
```

Parameters

<1-32>	Bridge id

Command Mode

Ethernet CFM MA mode

Applicability

This command was introduced in OcNOS-SP version 5.1.

Example

```
OcNOS#configure terminal
OcNOS(config)#ethernet cfm domain-type character-string domain-name 12345 level 0
OcNOS(config-ether-cfm)#service ma-type string ma-name ma1
OcNOS(config-ether-cfm-ma)#link-level bridge 1
OcNOS(config-ether-cfm-ma)#ethernet cfm mep down mpid 2331 active true xe2
```

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mep crosscheck

Use this command to configure a remote MEP crosscheck.

Use the `no` form of this command to delete a crosscheck MEP.

Command Syntax

```
mep crosscheck mpid MEPID
no mep crosscheck mpid MEPID
```

Parameters

`MEPID`	Remote host MEP identifier <1-8191>

Command Mode

Ethernet CFM MA or MEP mode.

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

Physical interface:

```
OcNOS#configure terminal
OcNOS(config)#ethernet cfm domain-type character-string domain-name 12345
level 7
OcNOS(config-ether-cfm)# service ma-type string ma-name testtm
OcNOS(config-ether-cfm-ma)#vlan 5 bridge 10
OcNOS(config-ether-cfm-ma)#mep crosscheck mpid 51
```

Sub-interface:

```
OcNOS#configure terminal
OcNOS(config)#ethernet cfm domain-type character-string domain-name md001
level 7
OcNOS(config-ether-cfm)# service ma-type string ma-name md001
OcNOS(config-ether-cfm-ma)# ethernet cfm mep down mpid 11 active true xe1.1
vlan 10 cc multicast state enable
OcNOS(config-ether-cfm-ma)#mep crosscheck mpid 2
```

mep lowest-priority-defect

Use this command to set the lowest-priority defect that can generate a fault alarm.

Use the `no` form of this command to set the lowest-priority defect to its default (`defMACstatus`).

Command Syntax

```
mep lowest-priority-defect
  (defRDICCM|defMACstatus|defRemoteCCM|defErrorCCM|defXconCCM)
no mep lowest-priority-defect
```

Parameters

`defRDICCM`	1 (lowest): At least one of the Remote MEP state machines is receiving valid CCMs from its remote MEP that has the Remote Defect Indication (RDI) bit set.
`defMACstatus`	2: One or more of the remote MEPs is reporting a failure in its Port Status Type-Length-Value (TLV) or Interface Status TLV: MEP Down.
`defRemoteCCM`	3: At least one of the remote MEP state machines is not receiving valid CCMs from its remote MEP.
`defErrorCCM`	4: One or more invalid CCMs has been received, and 3.5 times the CCMs' transmission interval has not yet expired.
`defXconCCM`	5: (highest): One or more cross-connect continuity check messages (CCMs) has been received, and 3.5 times at least one of those CCMs' transmission interval has not yet expired.

Default Value

defMACstatus

Command Mode

Ethernet CFM MA MEP mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
#configure terminal
(config)#ethernet cfm domain-type character-string domain-name 12345 level 7
(config-ether-cfm)#service ma-type string ma-name testtm
(config-ether-cfm-ma)#vlan 5 bridge 10
(config-ether-cfm-ma)#ethernet cfm mep down mpid 201 active true xe7
(config-ether-cfm-ma-mep)#mep lowest-priority-defect defRemoteCCM
```

mip-creation

Use this command for Maintenance domain Intermediate Point (MIP) creation permission for this domain.

Note: CFM MIP is not supported on Provider Bridge.

Command Syntax

```
mip-creation (none|default|explicit|defer))|
```

Parameters

`mip-creation`	Maintenance domain Intermediate Point (MIP) creation permission for this domain
`none`	No MIP can be created for this VLAN identifier
`default`	MIP can be created if no lower active level or MEP at the next lower active level
`explicit`	MEP is needed at the next lower active level
`defer`	Use the MIP creation permissions of the MD to which this MA belongs

Command Mode

Ethernet CFM MA mode

Applicability

This command was introduced in OcNOS-SP version 5.1.

Example

```
OcNOS#configure terminal
OcNOS(config)#ethernet cfm domain-type character-string domain-name 12345 level 7
(config-ether-cfm)#service ma-type string ma-name testtm
OcNOS(config-ether-cfm-ma)#mip-creation none
OcnOS(config-ether-cfm-ma)#ethernet cfm mep down mpid 2331 active true xe22
```

ping ethernet mac

Use this command to send a loopback message for a MAC address to a remote MEP for fault verification. Use either the `domain` or the `level` parameter with the `vlan` or `bridge` parameter to target a specific device.

Command Syntax

```
ping ethernet mac MACADDRESS unicast source MEPID domain DOMAIN_NAME ma MA_NAME
```

Parameters

`MACADDRESS`	Destination MAC address in HHHH.HHHH.HHHH format
`MEPID`	Source host MEP ID <1-8191>
`DOMAIN_NAME`	Enter the name of the domain.
`MA_NAME`	Enter maintenance association name. If ma-type is character string then maximum length of ma-name is 6 else if it's integer then maximum is 2-octets.

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Examples

```
#ping ethernet mac 0018.236e.5eb5 unicast source 201 domain 12345 ma 123
```

service ma-type

Use this command to create a service Maintenance Association (MA), and enter Ethernet CFM MA mode. This command allows creation of a maintenance association for link-level MEPs (level 0) which do not listen on a VLAN.

A VID can be associated with an MA after MA is created.

Use the `no` form of this command to remove an MA.

Command Syntax

Ethernet CFM mode

```
service ma-type (string|integer|itu-t) ma-name MA_NAME
no service ma-name MA_NAME
```

Command Mode

Ethernet CFM mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

```
OcNOS#con term
Enter configuration commands, one per line.  End with CNTL/Z.
OcNOS(config)#ethernet cfm domain-type character-string domain-name mdnam level 7
OcNOS(config-ether-cfm)#service ma-type string ma-name testtm
```

show debugging ethernet cfm

Use this command to display CFM debugging options.

Command Syntax

```
show debugging ethernet cfm
```

Parameters

None

Command Mode

Privileged Exec Mode and Exec Mode

Applicability

This command was introduced in OcNOS version 6.0.

Examples

```
OcNOS#show debugging ethernet cfm
CFM debugging status:
CFM transmit debugging is on
CFM loopback debugging is on
CFM traceroute debugging is on
```

show ethernet cfm errors

Use this command to verify the defects present in a MEP.

Command Syntax

```
show ethernet cfm errors domain DOMAIN_NAME
```

Parameters

DOMAIN_NAME	Enter the name of the domain.

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
#show ethernet cfm errors domain 12345
Domain Name      Level     Vlan      MEPID      Defects
-----------------------------------------------------------
12345             7        10        100        .....
```

Table 1-1 explains the output fields

Table 1-1: show ethernet cfm errors

Field	Description
Domain Name	Maintenance Domain name
Level	MD Level
Vlan	Vlan identifier
MEPID	Maintenance End Point identifier
Defects	Defects in current MEP

show ethernet cfm ma status

Use this command to display the connectivity status of Maintenance Associations (MAs) in a domain.

Command Syntax

```
show ethernet cfm ma status domain DOMAIN_NAME (vlan <2-4094>|)
  (mep <1-8191>| mep all|)
```

Parameters

DOMAIN_NAME	Enter the name of the domain.
<2-4094>	VLAN identifier
mep	Host MEP
<1-8191>	Host MEP identifier
all	All host MEPs

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
#show ethernet cfm ma status domain 12345 vlan 10
MA NAME         VLAN                    STATUS
-----------------------------------------
  43982           10                    Active
```

Table 1-2 explains the output fields.

Table 1-2: show ethernet cfm ma status

Field	Description
MA NAME	Maintenance Association name
VLAN	VLAN identifier
STATUS	Active: All connected MEPs in MA are receiving the CCM with no defect or alarm present Partially Active: One or more connected MEPs in MA is not receiving CCM or it is receiving CCM with defect or alarm present Not Active: None of the connected MEPS in MA are receiving CCM or it is receiving CCM with defect or alarm present

show ethernet cfm maintenance-points count

Use this command to display information about the Total CFM sessions Count on a given interface.

Command Syntax

```
show ethernet cfm maintenance-points count IFNAME
```

Parameters

IFNAME	Interface name

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS version 6.3.0.

Example

```
OcNOS#show ethernet cfm maintenance-points count xe6
-----------------------------------------

Total No of MIPs                : 3
Total No of MEPs                : 3
Total No of UP MEPs             : 0
Total No of Down MEPs           : 3
Total No of Active CCM sessions  : 3
Total No of UP CCM sessions      : 2
Total No of Active Test sessions : 0
Total No of Active LM sessions   : 0
Total No of Active DM sessions   : 0
-----------------------------------------
New: Total No of Active MEPs             : 6

Old : Total No of Active CCM sessions  : 6
```

show ethernet cfm maintenance-points local mep

Use this command to display information about the Maintenance End Points (MEPs) on a local interface.

Command Syntax

```
show ethernet cfm maintenance-points local (mep) (interface IFNAME|)(domain
  DOMAIN_NAME)(ma-name MA_NAME)
```

Parameters

IFNAME	Interface name. This token can be used only for Down MEPs on L2 bridge.
DOMAIN_NAME	Enter the name of the domain.
MA_NAME	Maintenance association name.

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
#show ethernet cfm maintenance-point local mep xe2
MPID  Dir Lvl  VLAN  CC-Stat  HW-Status  CC-Intvl  MAC-Address    Def  Port  MD Name
------------------------------------------------------------------------------
100   Dn   7    10    Enable   Installed  100 ms   3c2c.99f0.b0c1  F    xe2   12345

#show ethernet cfm maintenance-points local mep domain 12345 ma-name
MPID  Dir Lvl  VLAN  CC-Stat  HW-Status  CC-Intvl  MAC-Address    Def  Port  MD Name
------------------------------------------------------------------------------
100   Dn   7    10    Enable   Installed  100 ms   3c2c.99f0.b0c1  F    xe2   12345
```

Table 1-3 explains the output fields.

Table 1-3: show ethernet cfm maintenance-points local mep

Field	Description
MPID	MEP identifier
Dir	Up MEP or Down MEP
Lvl	MD level
Vlan	VLAN identifier
CC-Stat	Whether continuity checking (CC) is enabled or disabled
HW-Status	Installed or pending to install in hardware
CC-Intvl	CCM Interval

Table 1-3: show ethernet cfm maintenance-points local mep

Field	Description
MAC-Address	MAC address
Def	Defect present
Port	CFM interface
MD Name	MD name

show ethernet cfm maintenance-points local mip

Use this command to display information about the Maintenance Intermediate Points (MIPs) on a local interface.

Command Syntax

```
show ethernet cfm maintenance-points local (mip) (interface IFNAME| (level <0-7>)
  (ma-name MA_NAME)|)
```

Parameters

IFNAME	Interface name.
<0-7>	Maintenance level.
MA_NAME	Maintenance association name. If ma-type is character string then maximum length of ma-name is 6 else if it's integer then maximum is 2-octets

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
#show ethernet cfm maintenance-points local mip level 7
Level  VID   Type  Port   MAC-Address
------------------------------------------------------
7      10    MIP   xe3   0018.23ea.da36
7      10    MIP   xe5   0018.23ea.da38
```

Table 1-4 explains the output fields.

Table 1-4: show ethernet cfm maintenance-points local mip

Field	Description
Level	MD level
VID	VLAN identifier
Type	MIP
Port	Interface name
MAC-Address	MAC address

show ethernet cfm maintenance-points remote

Use this command to display information about a remote MEP.

Command Syntax

```
show ethernet cfm maintenance-points remote (mpid MEP_ID|) (domain DOMAIN_NAME)(ma-
  name MA_NAME)
```

Parameters

MEP_ID	Remote MEP identifier <1-8191>
DOMAIN_NAME	Enter the name of the domain.
MA_NAME	Enter maintenance association name. If ma-type is character string then maximum length of ma-name is 6 else if it's integer then maximum is 2-octets.

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

```
#show ethernet cfm maintenance-points remote domain 12345
MEPIDRMEPIDLEVELVLANRx CCMRDIPEER-MACTYPE

100 200 7   10  Yes Falsea82b.b579.fd2aConfigured
```

Table 1-5 explains the output fields.

Table 1-5: show ethernet cfm maintenance-points remote

Field	Description
MEPID	MEP identifier
RMEPID	Remote MEP identifier
LEVEL	MD level
VLAN	VLAN identifier
Rx CCM	Yes if CCM receives, no if CCM doesn't receive.
RDI	Whether Remote Defect Indication (RDI) is on or off
PEER-MAC	Remote MEP mac address
TYPE	Configured or auto learned

show ethernet cfm traceroute-cache

Use this command to display the ethernet cfm traceroute cache

Command Syntax

```
show ethernet cfm traceroute-cache
```

Parameters

None

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
OcNOS#show ethernet cfm traceroute-cache
 MEPID      Dest mac            Hops     Relay-action
 2          e8c5.7a91.f8c4      1        RlyHit
 2          e8c5.7a91.f8c4      1        RlyHit
```

show ethernet cfm statistics

Use this command to display CFM statistics: CCM sent and received, LBM sent and LBR received, LTM sent and LTR received.

Command Syntax

```
show ethernet cfm statistics mep MEPID domain DOMAIN_NAME ma-name MA_NAME
```

Parameters

MEPID	Host MEP identifier <1-8191>
MA_NAME	Maintenance association name. If ma-type is character string then maximum length of ma-name is 6 else if it's integer then maximum is 2-octets
DOMAIN_NAME	Enter the name of the domain. Name must be of 5 characters if type is character-string otherwise no_name if domain-type is no-name1

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

```
#show ethernet cfm statistics
Continuity Check Messages
   CCM Sent                : 168164
   CCM Received            : 165460

Loop Back Messages
   LBM Sent                : 5
   LBR Received(Valid)     : 5
   LBR Received(Bad msdu)  : 0
   LBR Received(Out-of-Seq): 0

Link Trace Messages
   LTM Sent                : 1
   LTR Sent                : 0
   LTR Received(Valid)     : 3
   LTR Received(unexpected): 0

Path Trace Messages
   PTM Sent                  :0
   PTM Received              :0
   PTM Received (bad)        :0
   PTR Sent                  :0
   PTR Received (Valid)      :0
   PTR received (Unexpected) :0
   PTM Drop                  :0
```

Table 1-6 explains the output fields.

Table 1-6: show ethernet cfm statistics

Field	Description
Continuity Check Messages	
CCM Sent	Number of continuity check messsages (CCMs) sent
CCM Received	Number of CCMs received
Loop Back Messages	
LBM Sent	Number of loopback messages (LBMs) sent
LBR Received(Valid)	Number of valid LBRs received
LBR Received(Bad msdu)	Number of LBRs received with bad MAC service data unit
LBR Received(Out-of-Seq)	Number of out-of-sequence LBRs received
Link Trace Messages	
LTM Sent	Number of link trace messages (LTMs) sent
LTR Received(Valid)	Number of link trace replies (LTRs) received
LTR Received(unexpected)	Number of unexpected LTRs received

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show running-config cfm

Use this command to display CFM running configuration alone.

Command Syntax

```
show running-config cfm
```

Parameters

None

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS version 4.2.

Example

```
#show running-config cfm
ethernet cfm domain-type character-string domain-name 12347 level 2 mip-
creation none
 service ma-type string ma-name 123
   vlan 10 bridge 10
   mip-creation default
   ethernet cfm mep down mpid 14 active true xe4
       message level 2
       interval 1s
       frame priority 3
       exit-ether-ma-mep-lck-mode
     ethernet cfm loss-measurement reply lmm
     exit-ether-ma-mep-mode
   mep crosscheck mpid 41
   exit-ether-ma-mode
    !
```

traceroute ethernet

Use this command to start traceroute messages on a remote MEP.

Command Syntax

```
traceroute ethernet MAC mepid MEPID domain DOMAIN (ma MA_NAME)
```

Parameters

MAC	MAC address of the remote MEP or MIP in HHHH.HHHH.HHHH format.
MEPID	Host MEP identifier <1-8191>.
DOMAIN_NAME	Enter the name of the domain.
MA_NAME	Enter maintenance association name. If ma-type is character string then maximum length of ma-name is 6 else if it's integer then maximum is 2-octets.

Command Mode

Exec mode and Privileged Exec mode

Applicability

This command was introduced in OcNOS-SP version 1.0.

Example

```
#traceroute ethernet 0018.236e.5eb8 mepid 201 domain 12345 ma 123
MP Mac         Hops  Relay-action          Ingress/Egress  Ingress/Egress
action
0018.23ea.da36   1     RlyFDB                Ingress         IngOK
0018.23ea.da38   2     RlyFDB                Egress          EgrOK
0018.236e.5eb8   3     RlyHit                Ingress         IngOK

#traceroute ethernet 0018.236e.5eb8 mepid 201 domain 12345
MP Mac         Hops  Relay-action          Ingress/Egress  Ingress/Egress
action
0018.23ea.da36   1     RlyFDB                Ingress         IngOK
0018.23ea.da38   2     RlyFDB                Egress          EgrOK
0018.236e.5eb8   3     RlyHit                Ingress         IngOK
```

vlan

Use this command to create a service Maintenance Association (MA), with a VLAN.

Command Syntax

```
vlan VLAN_ID (bridge <1-32> | inner-vlan VLAN_ID|)
```

Parameters

`<1-32>`	Bridge id
`VLAN_ID`	Inner VLAN identifier <1-4094>

Command Mode

Ethernet CFM MA mode

Applicability

This command was introduced in OcNOS-SP version 5.1

Example

```
#configure terminal
OcNOS(config)#ethernet cfm domain-type character-string domain-name 12345 level 7
OcNOS(config-ether-cfm)#service ma-type string ma-name 43982
OcNOS(config-ether-cfm-ma)#vlan 10 bridge 10
OcNOS(config-ether-cfm-ma)#ethernet cfm mep down mpid 2331 active true xe2
```

CHAPTER 2 G.8032 ERPS Version 2 Commands

This chapter contains the G.8032 (2012) Ethernet Ring Protection Switching (ERPS) version 2 commands.

- aps-channel level
- aps-channel vlan
- clear g8032 erp-instance
- data vlan
- debug g8032
- east-interface
- enable-tcn-propagation
- g8032 erp-instance
- g8032 erp-instance force-switch
- g8032 erp-instance manual-switch
- g8032 ring
- g8032-profile
- g8032 profile
- non-virtual-channel
- ring
- ring-id
- ring-type
- rpl role
- show g8032 all erp-instance
- show g8032 erp-instance
- show g8032 profile
- show g8032 ring
- switching mode
- tcn-to-instance
- timer
- virtual-channel
- west-interface

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aps-channel level

Use this command to set the maintenance entity group (MEG) level (MEL) to carry in R-APS messages.

Command Syntax

```
aps-channel level <0-7>
```

Parameters

<0-7>	Level.

Command Mode

G.8032 configure switch mode

Examples

```
(g8032-config-switch)#aps-channel level 2
```

aps-channel vlan

Use this command to configure APS channel VLAN-ID for this ERP instance.

Command Syntax

```
aps-channel vlan <2-4094>
no aps-channel vlan
```

Parameters

<2-4094>	VLANID

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-config-switch)#aps-channel vlan 10
```

clear g8032 erp-instance

Use this command at the Ethernet ring node for the following operations:

1.Clearing an active local administrative command (forced switch or manual switch).

2.Triggering reversion before the wait to restore (WTR) or wait to block (WTB) timer expires in the case of revertive operation.

3.Triggering reversion in the case of non-revertive operation.

Command Syntax

```
#clear g8032 erp-instance INSTANCENAME
```

Parameters

INSTANCENAME	Instance name (maximum 32 characters).

Command Mode

Exec mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
#clear g8032 erp-instance INST1
```

data vlan

Use this command to configure VLANs as data channels.

Use the `no` form of this command to remove the same.

Command Syntax

```
data vlan VLAN_RANGE
no data vlan VLAN_RANGE
```

Parameters

`VLAN_RANGE`	Enter VLAN ID 2-4094 or list of VLAN ID's separated by commas. Eg 2 or 2,4,5 or 50,51,52 etc.

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-config-switch)#data vlan 201,202,203
```

debug g8032

Use this command to debug configuration.

Command Syntax

```
debug g8032 (all|tx|rx|fsm|timers|events|external|hal)
no debug g8032 (all|tx|rx|fsm|timers|events|external|hal)
```

Parameters

`all`	All debugging options.
`events`	Protocol event.
`external`	External CFM and NSM events.
`fsm`	Instance Finite State Machine updates.
`hal`	HAL events.
`rx`	Received PDUs.
`timers`	Protocol timer events.
`tx`	Transmitted PDUs.

Command Mode

Configure mode.

Exec mode.

Applicability

This command was introduced in OcNOS version 6.0.0.

Examples

```
(config)#debug g8032 tx
(config)#debug g8032 all
```

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east-interface

Use this command to set the east port associated to the protection ring.

Command Syntax

```
east-interface IFNAME
no east-interface
```

Parameters

IFNAME	Interface name, such as xe1.

Command Mode

G8032 ring config mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(config-if)#g8032 ring RING1
(g8032-ring-config)# east-interface ce1
```

enable-tcn-propagation

Use this command to enable or disable TCN (topology change notification) propagation for an interconnected ring.

Command Syntax

```
enable-tcn-propagation
no enable-tcn-propagation
```

Parameters

None.

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced in OcNOS version 6.0.0.

Examples

```
(g8032-config-switch)#enable-tcn-propagation
```

g8032 erp-instance

Use this command to create an ERP instance and change to G.8032 configure switch mode.

Use the `no` form of this command to delete an ERP instance.

Command Syntax

```
g8032 erp-instance INSTANCENAME
no g8032 erp-instance INSTANCENAME
```

Parameters

`INSTANCENAME`	Instance name (maximum 32 characters).

Command Mode

Configure mode

Examples

```
#configure terminal
(config)#g8032 erp-instance instance1
(g8032-config-switch)#
```

g8032 erp-instance force-switch

Use this command to configure administrative commands.

Command Syntax

```
g8032 erp-instance INSTANCE-NAME force-switch (east-interface | west-interface)
```

Parameters

`INSTANCENAME`	Instance name (maximum 32 characters).
`east-interface`	Apply command to east interface.
`west-interface`	Apply command to west interface.

Command Mode

Exec mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
#g8032 erp-instance example force-switch east-interface
```

g8032 erp-instance manual-switch

Use this command to configure administrative commands.

Command Syntax

```
g8032 erp-instance INSTANCE-NAME manual-switch (east-interface | west-interface)
```

Parameters

`INSTANCENAME`	Instance name (maximum 32 characters).
`east-interface`	Apply command to east interface.
`west-interface`	Apply command to west interface.

Command Mode

Exec mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
#g8032 erp-instance example manual-switch west-interface
```

g8032 ring

Use this command to create a ring and associate east and west interfaces with it. All ERP instances on this ring have the same east and west interfaces,

Use the `no` form of this command to delete a ring.

Command Syntax

```
g8032 ring RINGNAME
no g8032 ring RINGNAME
```

Parameters

`ring`	Ring.
`RINGNAME`	Ring name (maximum 37 characters).

Command Mode

Configure mode

Examples

```
#configure terminal
(config)#g8032 ring ERPS123
(config)#no g8032 ring ERPS123
```

g8032-profile

Use this command to associate the ERP instance to a profile.

Command Syntax

```
g8032-profile PROFILENAME
```

Parameters

PROFILENAME	Profile name.

Command Mode

G.8032 configure switch mode

Examples

```
(g8032-config-switch)g8032-profile prof_1
```

g8032 profile

Use this command to associate the ERPS profile to an instance.

Use the `no` form of this command to delete the ERPS profile from an instance.

Command Syntax

```
g8032 profile PROFILENAME
```

Parameters

`PROFILENAME`	Profile name.

Command Mode

G.8032 configure switch mode

Examples

```
(g8032-config-switch)g8032-profile prof_1
```

non-virtual-channel

Use this command to make a sub-ring function without a virtual channel.

Use the `no` form of this command to delete a non-virtual channel.

Command Syntax

```
non-virtual-channel
no non-virtual-channel
```

Parameters

None.

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-config-switch)#non-virtual-channel
```

ring

Use this command to associate the ERP instance to a ring.

Command Syntax

```
ring RINGNAME
```

Parameters

RINGNAME	Ring name.

Command Mode

G.8032 configure switch mode

Examples

```
(g8032-config-switch)#ring ring1
```

ring-id

Use this command to set the ring identifier.

Command Syntax

```
ring-id <1-239>
```

Parameters

`<1-239>`	Ring identifier.

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-config-switch)#ring-id 1
```

ring-type

Use this command to specify the type of the ethernet ring for this ERP instance.

Command Syntax

```
ring-type (major-ring | sub-ring | sub-ring-vc)
no ring-type
```

Parameters

`major-ring`	G.8032 major ring. In this type of rings nodes are connected in full circular topology
`sub-ring`	G.8032 sub-ring without virtual channel
`sub-ring-vc`	G.8032 sub-ring with virtual channel

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-config-switch)#ring-type major-ring
(g8032-config-switch)#ring-type sub-ring-vc
```

rpl role

Use this command to set the RPL (Ring Protection Link) role of the ring node.

Command Syntax

```
rpl role ((owner | neighbor | next-neighbor)(east-interface | west-interface) |
  non-owner )
```

Parameters

`owner`	Ring node is the RPL owner.
`neighbor`	Ring node is neighbor to the RPL owner.
`next-neighbor`	Ring node is neighbor to the neighbor of the RPL owner.
`east-interface`	Role assigned to east interface.
`west-interface`	Role assigned to west interface.
`non-owner`	Ring node does not own the RPL.

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-config-switch)#rpl role owner east-interface
```

show g8032 all erp-instance

Use this command to display details about **all** ERP instances.

Command Syntax

```
show g8032 all erp-instance
```

Parameters

None

Command Mode

EXEC mode.

Applicability

This command was introduced in OcNOS version 6.0.0.

Example

```
(config)#show g8032 all erp-instance
Inst Name  : instance1
State      : G8032_ST_INIT
Phy Ring   : -
Role       : -
East Link  : -
West Link  : -
Attached   : -
Attached To: -
Virt Chan  : -
------------------------------------------------------------

     Channel         |    Interface           |  Profile
 (LEVL, VID, RID)    | (east,ver), (west,ver) |
=========================================================
 (7, 4065, 135)      | (eth11,1),  (eth2,2)   | PROF1
=========================================================
Data Traffic: 1,2,3,10,12...
```

show g8032 erp-instance

Use this command to display details about an ERP instance.

Command Syntax

```
show g8032 erp-instance INSTANCENAME
```

Parameters

INSTANCENAME	Instance name.

Command Mode

Exec mode.

Applicability

This command was introduced before OcNOS version 5.0.

Example

```
(config)#show g8032 erp-instance instance1
Inst Name  : instance1
State      : G8032_ST_INIT
Phy Ring   : -
Role       : -
East Link  : -
West Link  : -
Attached   : -
Attached To: -
Virt Chan  : -
------------------------------------------------------------

     Channel         |    Interface           |  Profile
 (LEVL, VID, RID)    | (east,ver), (west,ver) |
=========================================================
 (7, 4065, 135)      | (eth11,1),  (eth2,2)   | PROF1
=========================================================
Data Traffic: 1,2,3,10,12...
```

show g8032 profile

Use this command to display details about a profile.

Command Syntax

```
show g8032 profile PROFILENAME
```

Parameters

PROFILENAME	Profile name.

Command Mode

Exec mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(config)#show g8032 profile profile1
Profile : profile1
=========
 Wait-To-Restore : 5 mins
 Hold Off Timer  : 0 secs
 Guard Timer     : 500 ms
 Wait-To-Block   : 5500 ms
 Protection Type : Revertive
```

show g8032 ring

Use this command to display details about a ring.

Command Syntax

```
show g8032 ring RINGNAME
```

Parameters

RINGNAME	Ring name.

Command Mode

Exec mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(config)#show g8032 ring ring1
Ring     : ring1
==========
East     : eth1
West     : eth2
ERP Inst : inst1, inst2, inst3
```

switching mode

Use this command to set the revertive behavior of the ring node.

Command Syntax

```
switching mode (non-revertive | revertive)
```

Parameters

`revertive`	Represents revertive mode operation of a G.8032 ethernet ring.
`non-revertive`	Represents non-revertive mode operation of a G.8032 ethernet ring.

Command Mode

G.8032 profile configure mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-profile-config)# switching mode revertive
```

tcn-to-instance

Use this command to associate TCN instance (topology change notification) propagation for an interconnected ring when configured in non-virtual mode.

Command Syntax

```
tcn-to-instance INSTANCENANME
```

Parameters

INSTANCENAME	Instance name.

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(config)#tcn-to-instance erp1
```

timer

Use this command to set timers.

Command Syntax

```
timer (wait-to-restore <1-12> | hold-off <0-10000> | guard-time <10-2000>)
```

Parameters

`wait-to-restore`	Wait-to-restore timer used to verify that a signal failure is not intermittent.
`<1-12>`	Timer value in minutes.
`hold-off`	Hold-off timer used to filter intermittent link faults.
`<0-10000>`	Timer value in a multiple of 100 milliseconds.
`guard-time`	Guard timer that blocks latent outdated messages from causing unnecessary state changes.
`<1-20000>`	Timer value in a multiple of 10 milliseconds.

Command Mode

G.8032 profile configure mode

Examples

```
(g8032-profile-config)#timer wait-to-restore 7
(g8032-profile-config)#timer hold-off 50
(g8032-profile-config)#timer guard-time 300
s(g8032-profile-config)#timer guard-time 30
```

virtual-channel

Use this command on a sub-ring to attach it to a major instance.

Use the `no` form of this command to delete a virtual channel.

Command Syntax

```
virtual-channel (<2-4094>|) attached-to-instance INSTANCENAME
no virtual-channel
```

Parameters

`<2-4094>`	VLAN identifier.
`INSTANCENAME`	Major instance name.

Command Mode

G.8032 configure switch mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(g8032-config-switch)#virtual-channel 3 attached-to-instance inst1
```

west-interface

Use this command to set the west port associated to the protection ring.

Command Syntax

```
west-interface IFNAME
no west-interface
```

Parameters

IFNAME	Interface name

Command Mode

G8032 ring config mode.

Applicability

This command was introduced before OcNOS version 5.0.

Examples

```
(config-if)#g8032 ring RING1
(g8032-ring-config)# west-interface ce1
```

Index

B

begin modifier 15
BGP community value
  command syntax 13
braces
  command syntax 12

C

cc multicast 63
CFM commands
  cc multicast 63
  mep crosscheck mpid 75
  show ethernet cfm ma status 82
command abbreviations 10
command completion 10
command line
  errors 11
  help 9
  keyboard operations 13
command modes 17
  configure 17
  exec 17
  interface 17
  privileged exec 17
  router 17
command negation 11
command syntax
  ? 12
  . 12
  () 11, 12
  {} 12
  | 11
  A.B.C.D/M 12
  AA:NN 13
  BGP community value 13
  braces 12
  conventions 11
  curly brackets 12
  HH:MM:SS 12
  IFNAME 12
  interface name 12
  IPv4 address 12
  IPv6 address 12
  LINE 12
  lowercase 11
  MAC address 13
  monospaced font 11
  numeric range 13
  parantheses 12
  parentheses 11
  period 12
  question mark 12
  square brackets 12
  time 12
  uppercase 11
  variable placeholders 12
  vertical bars 11
  WORD 12
  X:X::X:X 12
  X:X::X:X/M 12
  XX:XX:XX:XX:XX:XX 13
configure mode 17
curly brackets
  command syntax 12

E

exec command mode 17

I

IFNAME 12
interface mode 17
IPv4 address
  command syntax 12
IPv6 address
  command syntax 12

L

LINE 12

M

MAC address
  command syntax 13

P

parantheses
  command syntax 12
parentheses
  command syntax 11
period
  command syntax 12
privileged exec mode 17

Q

question mark
  command syntax 12

R

router mode 17

S

show commands 15
  exclude modifier 16
  include modifier 15

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redirect modifier 16
square brackets
command syntax 12

T

time
command syntax 12

V

vertical bars
command syntax 11

W

WORD 12