

Configure Controllers

This chapter describes how to configure OTS and OTS OCH controllers.

- Controllers, on page 1
- Configure OTS Controller, on page 1
- Display Parameters of OTS Controllers, on page 4
- Span Loss Calculation, on page 6
- Configure Span Loss Calculation, on page 7
- Span Loss Calculation Use Cases , on page 9
- Display Span Loss Calculation, on page 12
- Dual IP Address, on page 13
- Configure OTS OCH Controller, on page 13
- Display Parameters of OTS OCH Controllers, on page 14
- LLDP over OSC, on page 17

Controllers

Controllers are represented in the Rack/Slot/Instance/Port format; for example, 0/1/0/1.

Rack	0
Slot	1 to 3. Slots for pluggable optical modules.
Instance	0
Port	Depends on the specific pluggable optical module.

Configure OTS Controller

The Optical Transport Section (OTS) controller holds all the optical parameters for the OTS optical interfaces. The optical interface has different capabilities depending on its hardware components such as photodiode, VOA, amplifier, and OCM. Hence, the parameters enabled or disabled on the OTS controller depend on the actual hardware capability on the specific optical interface. Each parameter might refer to RX or TX section. For example, if a photodiode is present, the OTS controller can read the total optical power. When the controller is created, each hardware capability is enabled or disabled.

You can configure parameters such as low power threshold, VOA attenuation setpoint, amplifier gain range, amplifier tilt, and amplifier gain set point for the OTS controller. The description on OTS interfaces cannot be added as they are on the optical amplifier module. To configure the OTS controller, use the following commands.

configure

controller *controllertype Rack/Slot/Instance/Port*

rx enable

rx-low-threshold *value*

tx enable

tx-low-threshold *value*

rx-voa-attenuation *value*

tx-voa-attenuation *value*

ampli-control-mode {**automatic** | **manual**}

ampli-gain-range {**normal** | **extended**}

ampli-gain *value*

ampli-tilt *value*

ampli-channel-power *value*

channel-power-max-delta *value*

osri {**on** | **off**}

safety-control-mode {**auto** | **disabled**}

commit

end

Example

The following is a sample in which the amplifier gain range is set to extended and amplifier gain set point is set to 29.0 dB.

```
configure
    controller ots 0/3/0/0
    ampli-gain-range extended
    ampli-gain 290
    commit
end
```

The following is a sample in which the safety control mode of the pre-amplifier is set to auto.

```
configure
    controller ots 0/3/0/0
    safety-control-mode auto
    commit
end
```

The following is a sample in which the safety control mode of the booster amplifier is set to disabled.

```
configure
    controller ots 0/3/0/1
    safety-control-mode disabled
    commit
end
```

OTS Controller Configuration Parameters

Table 1: OTS Controller Configuration Parameters

Parameter	Description	Hardware Capability	Range	Default	Notes
rx-low-threshold (0.1 dBm)	Low receive power threshold	Photodiode	-400 to +300	-40.0	
tx-low-threshold (0.1 dBm)	Low transmit power threshold	Photodiode	-400 to +300	-20.0	
rx-voa-attenuation (0.1 dBm)	RX VOA attenuation set point	VOA	0 to 200	0.0	
tx-voa-attenuation (0.1 dBm)	TX VOA attenuation set point	VOA	0 to 200	0.0	
ampli-control-mode	Amplifier control mode	Amplifier	automatic and manual	automatic	The Automatic value is compatible only when the grid is specified through the hw-module configuration.
ampli-gain-range	Amplifier gain range	Amplifier	normal and extended	normal	The amplifier gain range is configurable only when the controller is in shutdown state.
ampli-gain (0.1 dBm)	Amplifier gain set point	Amplifier	0 to 500	0.0	The actual range of amplifier gain set point depends on amplifier gain range.
ampli-tilt (0.1 dBm)	Amplifier tilt	Amplifier	-50 to +50	0.0	

Parameter	Description	Hardware Capability	Range	Default	Notes
channel-power-max-delta (0.1 dBm)	Maximum difference among all measured channel powers	Amplifier	0 to 200	3.0	
ampli-channel-power (0.1 dBm)	Amplifier per channel power set point	Amplifier	-400 to +300	0.0	
osri	Optical safety remote interlock	Amplifier	on and off	off	When osri is on, the laser is off and vice versa.
safety-control-mode	Safety control mode	Amplifier	auto and disabled	auto	If the safety control mode is disabled, the amplifier optical power is less than 20dB for safety.

Display Parameters of OTS Controllers

Use this procedure to display the parameters of OTS controllers.

show controllers *controllertype Rack/Slot/Instance/Port* [**summary**]

- The **show controllers** command displays all the configuration parameters, PM thresholds and alarms when keywords are not provided.
- The **show controllers** command displays the rx/tx power value and minimal information to understand port status when **summary** keyword is provided.
- A * wild card can be used to display all the controllers associated with a slot. For example, **show controllers ots 0/1/0/* summary**

Example

RP/0/RP0/CPU0:ios#**show controllers ots 0/3/0/1**

```
Wed Aug 23 09:08:27.962 UTC

 Controller State: Up

 Transport Admin State: In Service

 Port Type: Line

 Laser State: Off
```

```
Optics Status::


Alarm Status:
-------------
Detected Alarms:
RX-LOC

Alarm Statistics:
-----------------
LOW-RX-PWR = 0
LOW-TX-PWR = 0
RX-LOS-P = 0
RX-LOC = 1
AMPLI-GAIN-DEG-LOW = 0
AMPLI-GAIN-DEG-HIGH = 0
AUTO-LASER-SHUT = 0
AUTO-POW-RED = 89
AUTO-AMPLI-CTRL-DISABLED = 0
AUTO-AMPLI-CFG-MISMATCH = 0
SWITCH-TO-PROTECT = 0
AUTO-AMPLI-CTRL-RUNNING = 0

Parameter Statistics:
---------------------
TX Power = -40.00 dBm
RX Power = -40.00 dBm
Ampli Gain = -1.00 dB
Ampli Tilt = 0.00
Total TX Power = -40.00 dBm
Total RX Power = -40.00 dBm

Configured Parameters:
-------------
Rx Low Threshold = -25.0 dBm
Tx Low Threshold = -20.0 dBm
Ampli Gain = 1.00 dB
Ampli Tilt = 0.00
Ampli Channel power = 0.00 dBm
Channel Power Max Delta = 3.00 dBm
Ampli Control mode = Manual
Ampli Gain Range = Normal
Ampli Safety Control mode = auto
Osri = OFF
```

Example

RP/0/RP0/CPU0:ios#**show controllers ots 0/1/0/1**

```
Controller State: Down

Transport Admin State: In Service

Port Type: Line

Laser State: Apr

Optics Status::


         Alarm Status:
         -------------
```

```
Detected Alarms:
        AUTO-POW-RED

Alarm Statistics:
-----------------
LOW-RX-PWR = 0
LOW-TX-PWR = 0
RX-LOS-P = 0
RX-LOC = 1
AMPLI-GAIN-DEG-LOW = 0
AMPLI-GAIN-DEG-HIGH = 0
AUTO-LASER-SHUT = 0
AUTO-POW-RED = 1
AUTO-AMPLI-CTRL-DISABLED = 0
AUTO-AMPLI-CFG-MISMATCH = 0
SWITCH-TO-PROTECT = 0
AUTO-AMPLI-CTRL-RUNNING = 0

Parameter Statistics:
---------------------
TX Power = -40.00 dBm
RX Power = -11.90 dBm
Ampli Gain = -1.00 dB
Ampli Tilt = -90.00
Total TX Power = 7.99 dBm
Total RX Power = -11.90 dBm
Ampli Gain Range = Normal
Ampli Safety Control mode = disabled
Osri = OFF
TX Enable = Enabled
RX Enable = Enabled
RX Span Loss = N/A
TX Span Loss = N/A
Rx Low Threshold Current = -25.0 dBm
Back Reflection = -6.40 dBm

Configured Parameters:
-------------
Rx Low Threshold = -25.0 dBm
Tx Low Threshold = -20.0 dBm
Ampli Gain = 12.00 dB
Ampli Tilt = 0.00
Ampli Channel power = 0.00 dBm
Channel Power Max Delta = 3.00 dBm
Ampli Channel Psd = 31.250 nW/MHz
Rx Low Threshold Psd = 0.099 nW/MHz
Ampli Control mode = Manual
Ampli Safety Control mode = disabled
Osri = OFF
TX Enable = Enabled
RX Enable = Enabled
```

The **Back Reflection** parameter in 0.1 dBm is raised only on port 1. This parameter is raised on the line TX port of the booster amplifier.

Span Loss Calculation

The Span Loss Calculation is an automatic calculation of span losses between NCS 1001 systems. This feature applies to each topology such as protected or non-protected, linear with or without ILA nodes in the middle.

The Span Loss Calculation is a software functionality available for OTS controller and it can be statically enabled or disabled through `hw-module` configuration. Span Loss calculation is made using the TX and RX total power on EDFA ports.

For this feature 2 new parameters are managed in the show controller ots command for EDFA cards:

- RX Span Loss
- TX Span Loss

The Span Loss Calculation runs automatically every 5 minutes and when there is a configuration change. In the order of priority, the possible configurations are:

- Remote node.
- OSC through OSPF.

Limitation

- Span Loss calculation is done by considering the total power of the transmission end and receiver end on the EDFA ports. If the PSM card is connected to the span (for example, in case of Path Protection Topology), the span boundaries are assumed to be the closer EDFA ports.

Configure Span Loss Calculation

Table 2: Feature History

Feature Name	Release Information	Description
IPv6 Support for Span Loss Calculation	Cisco IOS XR Release 7.10.1	You can now perform span loss calculations on IPv6 spans connecting two NCS 1001 nodes. As a result, the advantages of larger address space can be leveraged by configuring IPv6 addresses on the management interfaces used for communication between the two nodes.

From Release 7.10.1, in addition to IPv4, span loss calculation is performed using IPv6 addresses. The IPv6 addresses must be configured on the management interfaces of IPv6-enabled NCS 1001 nodes.

The feature uses DCN or OSC (OSPF) to allow the exchange of power measurement between the NCS systems (that are required to make calculation of span losses). In both cases, you must enable the feature and node type (TERM or ILA) on each of the systems.

Limitation of IPv6 Support:

Span loss calculation with IPv6 is not supported on the OSC management interfaces of NCS 1001 nodes, because even with the OSPFv3 protocol, discovery of the neighbor returns the IPv4 router ID instead of the IPv6 router ID. This makes it difficult to automatically resolve the IPv6 addressing.



Note IPv4 and IPv6 must be configured in a mutually exclusive way.

To enable the feature for an EDFA equipped in the slot of a TERM node, use these commands:

#configure terminal

(config)#hw-module location 0/RP0/CPU0 *slot n* **ampli span-loss**

(config)#hw-module location 0/RP0/CPU0 *slot n* **ampli node-type TERM**

(config)#commit

(config)#end

Example:

```
#configure terminal
(config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#hw-module location 0/RP0/CPU0 slot 1 ampli  node-type TERM
(config)#commit
(config)#end
```

To enable the feature for an EDFA equipped in the slot of an ILA node, use these commands:

#configure terminal

(config)#hw-module location 0/RP0/CPU0 *slot n* **ampli span-loss**

(config)#hw-module location 0/RP0/CPU0 *slot n* **ampli node-type ILA**

(config)#commit

(config)#end

Example:

```
#configure terminal
(config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#hw-module location 0/RP0/CPU0 slot 1 ampli  node-type ILA
(config)#commit
(config)#end
```

For both OSC (OSPF) and DCN Span Loss Calculation, use the commands below to define the local node IP, remote node IP, and remote card slot coupled with the local node on each system involved:

The commands to perform span loss calculation using the IPv4 address:

#configure terminal

(config)# hw-module location 0/RP0/CPU0 *slot n* **ampli remote-node local-ipv4** *LocalIPv4 address* **remote-ipv4** *RemoteIPv4 address* **remote-slot-id** *m*

(config)#commit

(config)#end

where *n* is the slot number (1, 2 or 3) of the local EDFA involved.

m is the slot number (1, 2 or 3) of the EDFA equipped on the remote node.

localIPv4 is the IP address of local node.

remoteIPv4 is the IP address of remote node.

The commands to perform span loss calculation using the IPv6 address:

#configure terminal

(config)# hw-module location 0/RP0/CPU0 *slot n* **ampli remote-node local-ipv6** *LocalIPv6 address* **remote-ipv6** *RemoteIPv6 address* **remote-slot-id** *m*

(config)#commit

(config)#end

where *n* is the slot number (1, 2 or 3) of the local EDFA involved.

m is the slot number (1, 2 or 3) of the EDFA equipped on the remote node.

localIPv6 is the IP address of local node.

remoteIPv6 is the IP address of remote node.

You must wait for at least five minutes for the first automatic calculation to be triggered. To trigger the calculation, use this command:

#hw-module slot *n* **span-loss calculation**

For the examples for span loss calculation using the IPv4 or IPv6 address, see the Span Loss Calculation Use Cases , on page 9.

Span Loss Calculation Use Cases

A span loss calculation configuration is done based on these use cases:

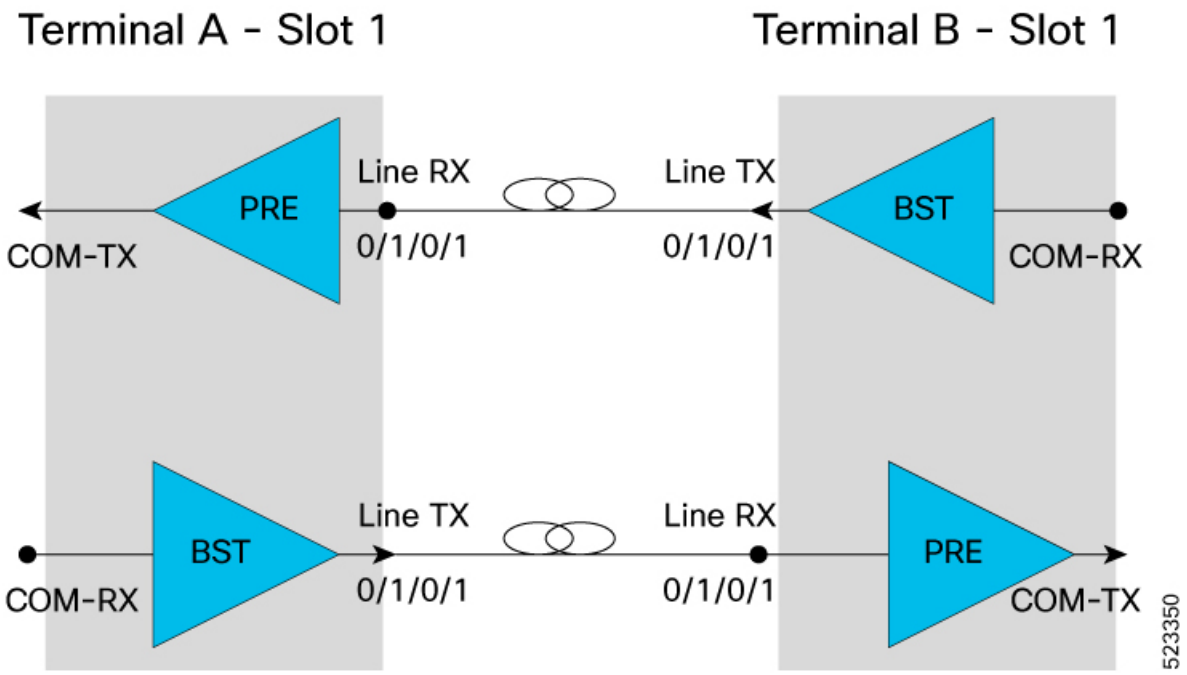
- Two terminal nodes connected to each other (Terminal to Terminal)
- Two terminal nodes connected through an ILA node (Terminal to ILA to Terminal)

Span Loss Calculation for local and remote nodes must be configured using either the IPv4 or IPv6 address. Both these addresses should not be used at the same time for the calculation.

Therefore, in the span loss calculation configuration examples below, even if the IPv4 and IPv6 addresses are used, these configurations are mutually exclusive.

Use Case 1: Terminal to Terminal

Terminal node A (IP address: 192.0.2.144(IPv4) or 2001:DB8:4491:2000::229:144(IPv6)) with a EDFA in slot number 1 connected to the EDFA in slot number 1 of Terminal node B (IP address: 192.0.2.146(IPv4) or 2001:DB8:4491:2000::229:146(IPv6)).



For each EDFA module, it is necessary to configure remote node feature and the span loss using these CLI commands:

Terminal A configurations using IPv4 and IPv6:

```
#configure terminal (IPv4)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv4 192.0.2.144
remote-ipv4 192.0.2.146 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

```
#configure terminal (IPv6)
config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv6
2001:DB8:4491:2000::229:144  remote-ipv6 2001:DB8:4491:2000::229:146 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

Terminal B Configurations using IPv4 and IPv6:

```
#configure terminal (IPv4)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv4 192.0.2.146
remote-ipv4 192.0.2.144 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

```
#configure terminal (IPv6)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv6
2001:DB8:4491:2000::229:146  remote-ipv6 2001:DB8:4491:2000::229:144 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

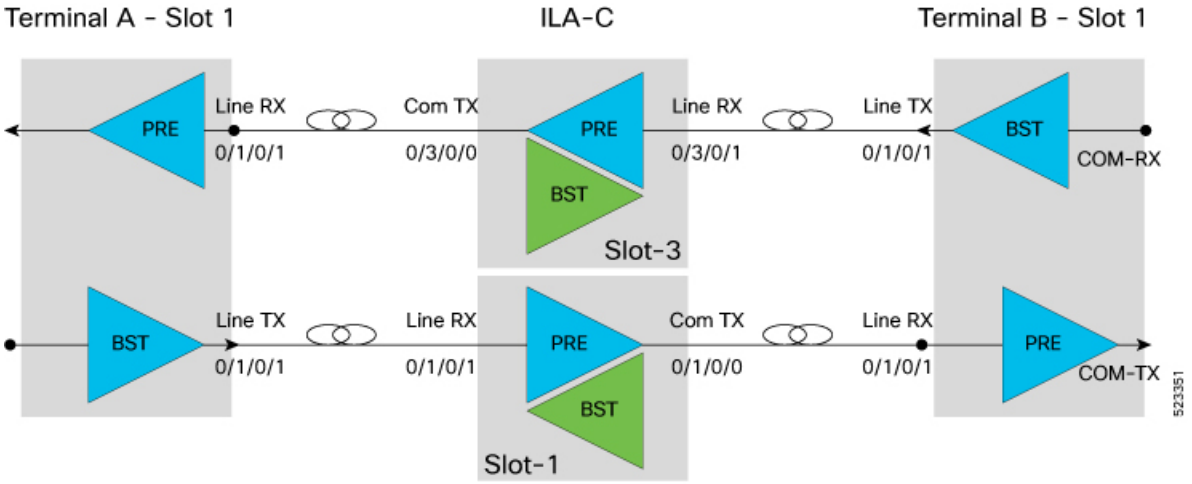
Use Case 2: Terminal to ILA to Terminal

Terminal A (IP address: 192.0.2.144(IPv4) or 2001:DB8:4491:2000::229:144(IPv6)) with a EDFA in slot number 1 with COM-TX port connected to LINE-RX EDFA in slot 1 ILA-C (IP address: 192.0.2.145(IPv4) or 2001:DB8:4491:2000::229:145(IPv6))

ILA C with a EDFA in slot number 1 with COM-TX port connected to LINE-RX EDFA in slot 1 of Terminal B (IP address: 192.0.2.146 (IPv4) or 2001:DB8:4491:2000::229:146)

ILA C with a EDFA in slot number 3 with COM-TX port connected to LINE-RX EDFA in slot 1 Terminal A

Terminal B with a EDFA in slot number 1 with COM-TX port connected to LINE-RX EDFA in slot 3 ILA.



Terminal A Configuration using IPv4 and IPv6:

```
#configure terminal (IPv4)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv4 192.0.2.144
remote-ipv4 192.0.2.145 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

```
#configure terminal (IPv6)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv6
2001:DB8:4491:2000::229:144  remote-ipv6 2001:DB8:4491:2000::229:145 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

ILA Configuration using IPv4 and IPv6:

```
#configure terminal (IPv4)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv4 192.0.2.145
remote-ipv4 192.0.2.146 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

```
#configure terminal (IPv6)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv6
2001:DB8:4491:2000::229:145  remote-ipv6 2001:DB8:4491:2000::229:146 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

```
#configure terminal (IPv4)
(config)# hw-module location 0/RP0/CPU0 slot 3 ampli remote-node local-ipv4 192.0.2.145
remote-ipv4 192.0.2.144 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end

#configure terminal (IPv6)
(config)# hw-module location 0/RP0/CPU0 slot 3 ampli remote-node local-ipv6
2001:DB8:4491:2000::229:145  remote-ipv6 2001:DB8:4491:2000::229:144 remote-slot-id 1
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end
```

Terminal B Configuration using IPv4 and IPv6:

```
#configure terminal (IPv4)
(config)# hw-module location 0/RP0/CPU0 slot 1 ampli remote-node local-ipv4 192.0.2.146
remote-ipv4 192.0.2.145 remote-slot-id 3
config)#hw-module location 0/RP0/CPU0 slot 1 ampli span-loss
(config)#commit
(config)#end

#configure terminal (IPv6)
(config)# hw-module location 0/RP0/CPU0 slot 3 ampli remote-node local-ipv6
2001:DB8:4491:2000::229:146  remote-ipv6 2001:DB8:4491:2000::229:145 remote-slot-id 3
config)#hw-module location 0/RP0/CPU0 slot 3 ampli span-loss
(config)#commit
(config)#end
```

Display Span Loss Calculation

Once the feature is enabled and after the first span loss calculation, the loss calculated (for both IPv4 and IPv6) can be retrieved using the `show controller ots` command. In the output RX Span Loss and TX Span Loss are added. RX Span Loss and TX Span Loss are obtained as a result of difference between **TX Total Power** and **RX Total Power** read on the edge of the span.

In case of a TERM node, the command is applied to LINE port. For example, in case of EDFA in slot 1, the span loss calculated are shown in the output of the following command:

```
#show controllers ots 0/1/0/1
…
…
 RX Span Loss = 15.20 dB
 TX Span Loss = 14.80 dB
…
…
```

In case of an ILA node, the command is applied to LINE port (`controller ots 0/slot/0/1`) to obtain RX Span Loss of related span, and to COM port (`controllers ots 0/slot/0/0`) to obtain TX Span Loss of related span.

For example, in case of an EDFA of ILA site equipped in slot 3:

```
show controllers ots 0/3/0/1
…
 RX Span Loss = 12.40 dB
show controllers ots 0/3/0/0
…
 TX Span Loss = 11.90 dB
```

Dual IP Address

Dual independent XR interfaces allows you to connect the two ethernet interfaces to two different switches of different subnet and also of the same subnet. From release 6.5.1, there are different ports from the ethernet switch MGMT RJ45, and Optical SFP MGMT to the CPU.

The two different Management Ethernet interfaces in to XR are:

- MgmtEth 0/RP0/CPU0/0 (already existing) representing the RJ45 port.
- MgmtEth 0/RP0/CPU0/1 (new one) representing the SFP port.

iPXE is not supported at power-on over the new optical interface.

Upgrades from previous releases using only SFP loses MGMT connectivity. In this case, you must configure through Console port.

Before using the two different interfaces, you must upgrade the BIOS and reload the 0/RP0 location.

The following example shows the output of the *show running-config* command:

Example

```
RP/0/RP0/CPU0:MYST-144#show running-config
….
 interface MgmtEth0/RP0/CPU0/0
 ipv4 address xxx.xxx.xxx.xxx yyy.yyy.yyy.yyy
!
interface MgmtEth0/RP0/CPU0/1
 ipv6 address xxxx:xxxx:xxxx:xxxx::xxx:xxx/yy
 ipv6 enable
!
interface MgmtEth0/RP0/OSC1/0
 shutdown
!
interface MgmtEth0/RP0/OSC2/0
 shutdown
!
interface MgmtEth0/RP0/OSC3/0
 shutdown
!
```

Configure OTS OCH Controller

The Optical Transport Section OCH (OTS OCH) controller represents the OCM device available on the OTS optical interface. This controller is created to have channel granularity over the OTS interface. The OTS OCH controller contains the wavelength information. The controller number starts from 1 and matches with the ITU channel identifier.

Several OTS OCH controllers are created for each OTS Controller depending on the grid configuration (ITU 100GHz or 50GHz Grid). 48 OTS OCH controllers are created for a 100GHz grid and 96 OTS OCH controllers are created for a 50GHz grid.

You can configure the parameters such as RX low power threshold and TX low power threshold for the OTS OCH controller. To configure the OTS OCH controller, use the following commands.

configure

controller *controllertype Rack/Slot/Instance/Port*

rx-low-threshold *value*

tx-low-threshold *value*

commit

end

Example

```
configure
    controller ots-och 0/1/0/0
    rx-low-threshold  -30
    tx-low-threshold  -35
    commit
end
```

OTS OCH Controller Configuration Parameters

Table 3: OTS OCH Controller Configuration Parameters

Parameter	Description	Hardware Capability	Range	Default
rx-low-threshold (0.1 dBm)	Low receive power threshold	OCM	-500 to +300	-25.0
tx-low-threshold (0.1 dBm)	Low transmit power threshold	OCM	-500 to +300	-25.0

Display Parameters of OTS OCH Controllers

Use this procedure to display the parameters of OTS OCH controllers.

show controllers *controllertype Rack/Slot/Instance/Port/Channel-number* [**summary**]

- The **show controllers** command displays all the configuration parameters, PM thresholds and alarms when keywords are not provided.
- The **show controllers** command displays the rx/tx power value and wavelength when **summary** keyword is provided.
- A * wild card can be used to display all the OTS OCH controllers associated with a OTS controller. For example, **show controllers ots-och 0/1/0/* summary**

Example

RP/0/RP0/CPU0:ios#**show controllers ots-och 0/3/0/1/1**

```
Fri Feb 24 13:20:18.456 CET

 Controller State: Up

 Transport Admin State: Maintenance
```

```
Port Type: Line

Laser State: Unnown

Optics Status::


        Alarm Status:
        -------------
        Detected Alarms:None


        Alarm Statistics:
        -----------------
         LOW-RX-PWR = 0
         LOW-TX-PWR = 0


        Parameter Statistics:
        ---------------------
        TX Power = -3.30 dBm
        RX Power = -21.10 dBm
        TX psd = 13.586 nW/MHz
        RX psd = 0.220 nW/MHz
        Channel Central Frequency = 196100.0 GHz
        Channel Width = 50.0 GHz

        Configured Parameters:
        -------------
        Rx Low Threshold = -25.0 dBm
        Tx Low Threshold = -25.0 dBm
```

RP/0/RP0/CPU0:ios#**show controllers ots-och 0/2/0/0/* summary**

```
Fri Oct  9 10:37:50.109 CEST

 Port               Type    Status       TX Power     RX Power      TX psd        RX psd
  Central Frequency Channel Width
                                               (dBm)        (dBm)      nW/MHz      (nW/MHz)
      (GHz)             (GHz)
 ------------------  ----    --------     ---------    ---------     ---------     -------
    ----------------   -------------
  Ots-Och0_2_0_0_1    Com      N/A      -18.30        -19.30         0.392         0.333
      196100.0          75.0
  Ots-Och0_2_0_0_2    Com      N/A      -19.10        -19.80         0.094         0.068
      196025.0          75.0
  Ots-Och0_2_0_0_3    Com      N/A      -18.00        -18.90         0.450         0.392
      195950.0          75.0
  Ots-Och0_2_0_0_4    Com      N/A      -16.90        -17.60         0.318         0.290
      195875.0          75.0
  Ots-Och0_2_0_0_5    Com      N/A      -18.10        -19.20         0.326         0.290
      195800.0          75.0
  Ots-Och0_2_0_0_6    Com      N/A      -19.50        -19.90         0.059         0.041
      195725.0          75.0
  Ots-Och0_2_0_0_7    Com      N/A      -18.60        -19.00         0.471         0.450
      195650.0          75.0
  Ots-Och0_2_0_0_8    Com      N/A      -17.00        -17.60         0.304         0.318
      195575.0          75.0
  Ots-Och0_2_0_0_9    Com      N/A      -18.50        -19.20         0.318         0.297
      195500.0          75.0
 Ots-Och0_2_0_0_10    Com      N/A      -17.60        -18.00         0.318         0.297
      195425.0          75.0
 Ots-Och0_2_0_0_11    Com      N/A      -18.50        -19.00         0.401         0.374
```

```
     195350.0          75.0
Ots-Och0_2_0_0_12    Com      N/A      -17.70         -18.00          0.188          0.253
     195275.0          75.0
Ots-Och0_2_0_0_13    Com      N/A      -18.90         -19.70          0.304          0.271
     195200.0          75.0
Ots-Och0_2_0_0_14    Com      N/A      -20.50         -20.90          0.242          0.236
     195125.0          75.0
Ots-Och0_2_0_0_15    Com      N/A      -24.00         -27.40          0.031          0.011
     195050.0          75.0
Ots-Och0_2_0_0_16    Com      N/A      -17.80         -18.40          0.215          0.242
     194975.0          75.0
Ots-Och0_2_0_0_17    Com      N/A      -18.50         -19.10          0.318          0.290
     194900.0          75.0
Ots-Och0_2_0_0_18    Com      N/A      -16.90         -17.30          0.333          0.297
     194825.0          75.0
Ots-Och0_2_0_0_19    Com      N/A      -18.10         -18.90          0.410          0.366
     194750.0          75.0
Ots-Och0_2_0_0_20    Com      N/A      -17.00         -17.50          0.357          0.366
     194675.0          75.0
Ots-Och0_2_0_0_21    Com      N/A      -18.50         -19.30          0.326          0.290
     194600.0          75.0
Ots-Och0_2_0_0_22    Com      N/A      -17.20         -17.70          0.259          0.265
     194525.0          75.0
Ots-Och0_2_0_0_23    Com      N/A      -18.40         -19.10          0.410          0.392
     194450.0          75.0
Ots-Och0_2_0_0_24    Com      N/A      -16.50         -16.90          0.450          0.430
     194375.0          75.0
Ots-Och0_2_0_0_25    Com      N/A      -24.30         -28.90          0.040          0.000
     194300.0          75.0
Ots-Och0_2_0_0_26    Com      N/A      -16.60         -16.90          0.326          0.297
     194225.0          75.0
Ots-Och0_2_0_0_27    Com      N/A      -18.10         -18.70          0.420          0.410
     194150.0          75.0
Ots-Och0_2_0_0_28    Com      N/A      -16.80         -16.90          0.383          0.392
     194075.0          75.0
Ots-Och0_2_0_0_29    Com      N/A      -19.10         -19.80          0.333          0.311
     194000.0          75.0
Ots-Och0_2_0_0_30    Com      N/A      -16.90         -17.10          0.284          0.311
     193925.0          75.0
Ots-Och0_2_0_0_31    Com      N/A      -18.70         -19.20          0.374          0.383
     193850.0          75.0
Ots-Och0_2_0_0_32    Com      N/A      -17.20         -17.40          0.374          0.392
     193775.0          75.0
Ots-Och0_2_0_0_33    Com      N/A      -18.60         -19.10          0.410          0.410
     193700.0          75.0
Ots-Och0_2_0_0_34    Com      N/A      -17.30         -17.60          0.311          0.311
     193625.0          75.0
Ots-Och0_2_0_0_35    Com      N/A      -18.90         -19.10          0.392          0.401
     193550.0          75.0
Ots-Och0_2_0_0_36    Com      N/A      -18.00         -18.20          0.265          0.265
     193475.0          75.0
Ots-Och0_2_0_0_37    Com      N/A      -19.50         -20.00          0.304          0.318
     193400.0          75.0
Ots-Och0_2_0_0_38    Com      N/A      -17.80         -17.90          0.265          0.311
     193325.0          75.0
Ots-Och0_2_0_0_39    Com      N/A      -18.60         -19.00          0.383          0.392
     193250.0          75.0
Ots-Och0_2_0_0_40    Com      N/A      -16.80         -17.00          0.383          0.392
     193175.0          75.0
Ots-Och0_2_0_0_41    Com      N/A      -18.70         -19.10          0.440          0.450
     193100.0          75.0
Ots-Och0_2_0_0_42    Com      N/A      -16.80         -17.10          0.374          0.349
     193025.0          75.0
Ots-Och0_2_0_0_43    Com      N/A      -18.90         -19.40          0.401          0.420
```

```
     192950.0          75.0
Ots-Och0_2_0_0_44    Com       N/A       -17.00         -17.40          0.450          0.440
     192875.0          75.0
Ots-Och0_2_0_0_45    Com       N/A       -18.50         -18.80          0.392          0.392
     192800.0          75.0
Ots-Och0_2_0_0_46    Com       N/A       -17.40         -17.60          0.284          0.271
     192725.0          75.0
Ots-Och0_2_0_0_47    Com       N/A       -24.40         -31.50          0.064          0.000
     192650.0          75.0
Ots-Och0_2_0_0_48    Com       N/A       -19.20         -19.60          0.410          0.430
     192575.0          75.0
Ots-Och0_2_0_0_49    Com       N/A       -18.70         -19.40          0.392          0.383
     192500.0          75.0
Ots-Och0_2_0_0_50    Com       N/A       -17.10         -17.60          0.374          0.326
     192425.0          75.0
Ots-Och0_2_0_0_51    Com       N/A       -19.10         -19.50          0.401          0.401
     192350.0          75.0
Ots-Och0_2_0_0_52    Com       N/A       -20.40         -20.50          0.357          0.311
     192275.0          75.0
Ots-Och0_2_0_0_53    Com       N/A       -24.70         -34.20          0.042          0.000
     192200.0          75.0
Ots-Och0_2_0_0_54    Com       N/A       -17.60         -18.10          0.201          0.236
     192125.0          75.0
Ots-Och0_2_0_0_55    Com       N/A       -18.50         -19.10          0.401          0.392
     192050.0          75.0
Ots-Och0_2_0_0_56    Com       N/A       -17.20         -17.80          0.341          0.284
     191975.0          75.0
Ots-Och0_2_0_0_57    Com       N/A       -25.60         -30.40          0.050          0.000
     191900.0          75.0
Ots-Och0_2_0_0_58    Com       N/A       -17.40         -17.90          0.220          0.188
     191825.0          75.0
Ots-Och0_2_0_0_59    Com       N/A       -19.40         -20.40          0.333          0.290
     191750.0          75.0
Ots-Och0_2_0_0_60    Com       N/A       -27.10         -38.90          0.023          0.000
     191675.0          75.0
Ots-Och0_2_0_0_61    Com       N/A       -26.00         -38.90          0.031          0.000
     191600.0          75.0
Ots-Och0_2_0_0_62    Com       N/A       -19.50         -20.10          0.133          0.045
     191525.0          75.0
Ots-Och0_2_0_0_63    Com       N/A       -19.20         -19.90          0.401          0.392
     191450.0          75.0
Ots-Och0_2_0_0_64    Com       N/A       -17.30         -17.60          0.333          0.333
     191375.0          75.0
```

From R7.3.1, a decimal place is introduced for Central Frequency and Channel Width columns.

LLDP over OSC

Table 4: Feature History

Feature Name	Release	Description
LLDP over OSC	Cisco IOS XR Release 7.3.1	LLDP is supported on the OSC management interface for point-to-point local link discovery through OSC channel. This helps you to gather information about the neighboring devices in the network.

The output of **show lldp neighbors** command, when you enable LLDP on a OSC interface is as follows:

```
RP/0/RP0/CPU0:MYS-130#show lldp neighbors
Mon Feb 22 08:29:20.189 UTC
Capability codes:
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

Device ID Local Intf Hold-time Capability Port ID

MYS-131 MgmtEth0/RP0/OSC3/1 120 R MgmtEth0/RP0/OSC1/0
```