



## Configuring the Card Mode

This chapter lists the supported configurations and the procedures to configure the card mode on the line cards.



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**Note** Unless otherwise specified, “line cards” refers to 1.2T and 1.2TL line cards.

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- [1.2T and 1.2TL Line Cards, on page 1](#)
- [OTN-XP Card, on page 14](#)
- [2-QDD-C Line Card, on page 51](#)

## 1.2T and 1.2TL Line Cards

The following section describes the supported configurations and procedures to configure the card modes on the line cards.

### Card Modes

The line cards support module and slice configurations.

The line cards have two trunk ports (0 and 1) and 12 client ports (2 through 13) each. You can configure the line card in two modes:

- Muxponder—In this mode, both trunk ports are configured with the same trunk rate. The client-to-trunk mapping is in a sequence.
- Muxponder slice—In this mode, each trunk port is configured independent of the other with different trunk rates. The client-to-trunk mapping is fixed. For Trunk 0, the client ports are 2 through 7. For Trunk 1, the client ports are 8 through 13.

### Sub 50G Configuration

You can configure the sub 50G or coupled mode on the line card only in the muxponder mode. The following table displays the port configuration for the supported data rates.

Trunk Data Rate (per trunk)	Total Configured Data rate	Card Support	Trunk Ports	Client Ports for Trunk 0 (100G)	Shared Client Port (50G per trunk)	Client Ports for Trunk 1 (100G)
50G	100G	1.2T, 1.2TL	0, 1	-	2	-
150G	300G	1.2T, 1.2TL	0, 1	2	3	4
250G	500G	1.2T, 1.2TL	0, 1	2, 3	4	5, 6
350G	700G	1.2T, 1.2TL	0, 1	2, 3, 4	5	6, 7, 8
450G	900G	1.2T	0, 1	2, 3, 4, 5	6	7, 8, 9, 10
550G	1.1T	1.2T	0, 1	2, 3, 4, 5, 6	7	8, 9, 10, 11, 12



**Note** In all x50G configurations, client traffic on the middle port is affected with ODUK-BDI and LF alarms after the **power cycle or link flap** on the trunk side. This issue is raised when the two network lanes work in coupled mode and move from low to high power. To solve this issue, create a new frame either at the near-end or far-end by performing **shut** or **no shut** of the trunk ports.

### Coupled Mode Restrictions

The following restrictions apply to the coupled mode configuration:

- Both trunk ports must be configured with the same bits-per-symbol or baud rate and must be sent over same fiber and direction.
- The chromatic dispersion must be configured to the same value for both trunk ports.
- When trunk internal loopback is configured, it must be done for both trunk ports. Configuring internal loopback on only one trunk results in traffic loss.
- Fault on a trunk port of a coupled pair may cause errors on all clients including those running only on the unaffected trunk port.

## Supported Data Rates

The following data rates are supported on the line card.

In R7.0.1, you can configure the client port to OTU4 only in the muxponder mode. In R7.1.1 and later releases, you can configure the client port to OTU4 in both the muxponder and muxponder slice modes. In muxponder slice mode, both the slices must be configured with either OTU4 or 100GE Ethernet client rates in R7.1.1. In R7.2.0, a mixed configuration of OTU4 and 100GE is supported in the muxponder slice mode. LLDP drop, L1 encryption, and AINS are not supported on the OTU4 configuration.

The following table displays the client and trunk ports that are enabled for the muxponder configuration.

Trunk Data Rate	Card Support	Client Data Rate (100GE, OTU4)	Trunk Ports	Client Ports
100	1.2T, 1.2TL	100GE, OTU4	0	2
200	1.2T, 1.2TL	100GE, OTU4	0, 1	2, 3, 4, 5
300	1.2T, 1.2TL	100GE, OTU4	0, 1	2, 3, 4, 5, 6, 7
400	1.2T, 1.2TL	100GE, OTU4	0, 1	2, 3, 4, 5, 6, 7, 8, 9
500	1.2T	100GE, OTU4	0, 1	2, 3, 4, 5, 6, 7, 8, 9, 10, 11
600	1.2T	100GE, OTU4	0, 1	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

The following table displays the client and trunk ports that are enabled for the muxponder slice 0 configuration.

Trunk Data Rate	Card Support	Client Data Rate	Trunk Ports	Client Ports
100	1.2T, 1.2TL	100, OTU4	0	2
200	1.2T, 1.2TL	100, OTU4	0	2, 3
300	1.2T, 1.2TL	100, OTU4	0	2, 3, 4
400	1.2T, 1.2TL	100, OTU4	0	2, 3, 4, 5
500	1.2T	100, OTU4	0	2, 3, 4, 5, 6
600	1.2T	100, OTU4	0	2, 3, 4, 5, 6, 7

The following table displays the client and trunk ports that are enabled for the muxponder slice 1 configuration.

Trunk Data Rate	Card Support	Client Data Rate	Trunk Ports	Client Ports
100	1.2T, 1.2TL	100, OTU4	1	8
200	1.2T, 1.2TL	100, OTU4	1	8, 9
300	1.2T, 1.2TL	100, OTU4	1	8, 9, 10
400	1.2T, 1.2TL	100, OTU4	1	8, 9, 10, 11
500	1.2T	100, OTU4	1	8, 9, 10, 11, 12
600	1.2T	100, OTU4	1	8, 9, 10, 11, 12, 13

All configurations can be accomplished by using appropriate values for client bitrate and trunk bitrate parameters of the **hw-module** command.

The following table displays the trunk parameter ranges for the 1.2T card.

Trunk Payload	FEC	Min BPS	Max BPS	Min GBd	Max GBd
50G	15%	1	1.3125	24.0207911	31.5272884
50G	27%	1	1.4453125	24.0207911	34.7175497
100G	15%	1	2.625	24.0207911	63.0545768
100G	27%	1	2.890625	24.0207911	69.4350994
150G	15%	1.3203125	3.9375	24.0207911	71.6359689
150G	27%	1.453125	4.3359375	24.0207911	71.6749413
200G	15%	1.7578125	5.25	24.0207911	71.7420962
200G	27%	2	4.40625	31.51	69.43
250G	15%	2.1953125	6	26.2727403	71.8059237
250G	27%	2.4140625	6	28.9312914	71.9068991
300G	15%	2.6328125	6	31.5272884	71.8485385
300G	27%	2.8984375	6	34.7175497	71.8681352
350G	15%	3.0703125	6	36.7818364	71.8790086
350G	27%	3.3828125	6	40.503808	71.8404724
400G	15%	3.5078125	6	42.0363845	71.9018782
400G	27%	3.8671875	6	46.2900663	71.8197392
450G	15%	3.9453125	6	47.2909326	71.9196757
450G	27%	4.34375	6	52.0763245	71.9327648
500G	15%	4.3828125	6	52.5454806	71.93392
500G	27%	4.8281250	6	57.8625828	71.9068991
550G	15%	4.8203125	6	57.8000287	71.9455787
550G	27%	5.3125	6	63.6488411	71.88575
600G	15%	5.2578125	-	-	71.9552971

The following table displays the trunk parameter ranges for the 1.2TL card.

Trunk Payload	FEC	Min BPS	Max BPS	Min GBd	Max GBd
100G	15%	1	2.625	24.0207911	63.0545768
100G	27%	1	2.890625	24.0207911	69.4350994
150G	15%	1.3203125	3.9375	24.0207911	71.6359689

Trunk Payload	FEC	Min BPS	Max BPS	Min GBd	Max GBd
150G	27%	1.453125	4.3359375	24.0207911	71.6749413
200G	15%	2	4	31.5272884	63.0545768
200G	27%	2	4.40625	31.51664088	69.43509943
250G	15%	2.1953125	4.5	35.0303204	71.8059237
250G	27%	2.4140625	4.5	38.5750552	71.9068991
300G	15%	2.6328125	4.5	42.0363845	71.8485385
300G	27%	2.8984375	4.5	46.2900662857142	71.86813526
350G	15%	3.0703125	4.5	49.0424486	71.8790086
350G	27%	3.3828125	4.5	54.0050773	71.8404724
400G	15%	3.5078125	4.5	56.0485127	71.9018782
400G	27%	3.8671875	4.5	61.72008838	71.81973921

To configure the BPS, see [Configuring the BPS, on page 11](#).

## Configuring the Card Mode

You can configure the line card in the module (muxponder) or slice configuration (muxponder slice).

To configure the card in the muxponder mode, use the following commands.

**configure**

**hw-module location** *location* **mxponder client-rate** {100GE | OTU4}

**hw-module location** *location* **mxponder trunk-rate** {50G | 100G150G | 200G | 250G | 300G | 350G | 400G | 450G | 500G | 550G | 600G }

**commit**

To configure the card in the muxponder slice mode, use the following commands.

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number* **client-rate** { 100GE|OTU4}

**hw-module location** *location* **mxponder-slice trunk-rate** { 100G | 200G | 300G | 400G | 500G | 600G }

**commit**

### Examples

The following is a sample in which the card is configured in the muxponder mode with a 550G trunk payload.

```
RP/0/RP0/CPU0:ios#config
Tue Oct 15 01:24:56.355 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder client-rate 100GE
```

```
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder trunk-rate 550G
RP/0/RP0/CPU0:ios(config)#commit
```

The following is a sample in which the card is configured in the muxponder mode with a 500G trunk payload.

```
RP/0/RP0/CPU0:ios#config
Sun Feb 24 14:09:33.989 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/2 mxponder client-rate OTU4
RP/0/RP0/CPU0:ios(config)#hw-module location 0/2 mxponder trunk-rate 500G
RP/0/RP0/CPU0:ios(config)#commit
```

The following is a sample in which the card is configured in the muxponder slice 0 mode with a 500G trunk payload.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0 client-rate 100GE
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0 trunk-rate 500G
RP/0/RP0/CPU0:ios(config)#commit
```

The following is a sample in which the card is configured in the muxponder slice 1 mode with a 400G trunk payload.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 1 client-rate 100GE
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 1 trunk-rate 400G
RP/0/RP0/CPU0:ios(config)#commit
```

The following is a sample in which the card is configured with mixed client rates in the muxponder slice mode.

```
RP/0/RP0/CPU0:ios#configure
Mon Mar 23 06:10:22.227 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0 client-rate OTU4 trunk-rate
 500G
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 1 client-rate 100GE trunk-rate
 500G
RP/0/RP0/CPU0:ios(config)#commit
```

### Verifying the Card Configuration

```
RP/0/RP0/CPU0:ios#show hw-module location 0/2 mxponder
Fri Mar 15 11:48:48.344 IST
```

```
Location:                0/2
Client Bitrate:          100GE
Trunk Bitrate:           500G
Status:                  Provisioned
LLDP Drop Enabled:      FALSE
Client Port              Mapper/Trunk Port  CoherentDSP0/2/0/0  CoherentDSP0/2/0/1
Traffic Split Percentage
```

HundredGigECtrlr0/2/0/2	ODU40/2/0/0/1	100	0
HundredGigECtrlr0/2/0/3	ODU40/2/0/0/2	100	0
HundredGigECtrlr0/2/0/4	ODU40/2/0/0/3	100	0
HundredGigECtrlr0/2/0/5	ODU40/2/0/0/4	100	0
HundredGigECtrlr0/2/0/6	ODU40/2/0/0/5	100	0
HundredGigECtrlr0/2/0/7	ODU40/2/0/1/1	0	100
HundredGigECtrlr0/2/0/8	ODU40/2/0/1/2	0	100
HundredGigECtrlr0/2/0/9	ODU40/2/0/1/3	0	100
HundredGigECtrlr0/2/0/10	ODU40/2/0/1/4	0	100
HundredGigECtrlr0/2/0/11	ODU40/2/0/1/5	0	100

The following is a sample output of the coupled mode configuration where the shared client port is highlighted.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Tue Oct 15 01:25:57.358 UTC

Location:                0/1
Client Bitrate:          100GE
Trunk Bitrate:           550G
Status:                  Provisioned
LLDP Drop Enabled:      FALSE
Client Port              Mapper/Trunk Port      CoherentDSP0/1/0/0 CoherentDSP0/1/0/1
                        Traffic Split Percentage

HundredGigEctr0/1/0/2   ODU40/1/0/0/1           100                0
HundredGigEctr0/1/0/3   ODU40/1/0/0/2           100                0
HundredGigEctr0/1/0/4   ODU40/1/0/0/3           100                0
HundredGigEctr0/1/0/5   ODU40/1/0/0/4           100                0
HundredGigEctr0/1/0/6   ODU40/1/0/0/5           100                0
HundredGigEctr0/1/0/7   ODU40/1/0/0/6           50                 50
HundredGigEctr0/1/0/8   ODU40/1/0/1/1           0                  100
HundredGigEctr0/1/0/9   ODU40/1/0/1/2           0                  100
HundredGigEctr0/1/0/10  ODU40/1/0/1/3           0                  100
HundredGigEctr0/1/0/11  ODU40/1/0/1/4           0                  100
HundredGigEctr0/1/0/12  ODU40/1/0/1/5           0                  100
```

The following is a sample output of all the muxponder slice 0 configurations.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder-slice 0
Fri Mar 15 06:04:18.348 UTC

Location:                0/1
Slice ID:                0
Client Bitrate:          100GE
Trunk Bitrate:           500G
Status:                  Provisioned
LLDP Drop Enabled:      FALSE
Client Port              Mapper/Trunk Port      CoherentDSP0/1/0/0
                        Traffic Split Percentage

HundredGigEctr0/1/0/2   ODU40/1/0/0/1           100
HundredGigEctr0/1/0/3   ODU40/1/0/0/2           100
HundredGigEctr0/1/0/4   ODU40/1/0/0/3           100
HundredGigEctr0/1/0/5   ODU40/1/0/0/4           100
HundredGigEctr0/1/0/6   ODU40/1/0/0/5           100
```

The following is a sample output of all the muxponder slice 1 configurations.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder-slice 1
Fri Mar 15 06:11:50.020 UTC

Location:                0/1
Slice ID:                1
Client Bitrate:          100GE
Trunk Bitrate:           400G
Status:                  Provisioned
LLDP Drop Enabled:      TRUE
Client Port              Mapper/Trunk Port      CoherentDSP0/1/0/1
                        Traffic Split Percentage

HundredGigEctr0/1/0/8   ODU40/1/0/1/1           100
HundredGigEctr0/1/0/9   ODU40/1/0/1/2           100
HundredGigEctr0/1/0/10  ODU40/1/0/1/3           100
HundredGigEctr0/1/0/11  ODU40/1/0/1/4           100
```

The following is a sample output of the muxponder slice 1 configuration with client configured as OTU4.

```
RP/0/RP0/CPU0:ios#sh hw-module location 0/0 mxponder-slice 1
Wed Mar 11 13:59:11.073 UTC

Location:          0/0
Slice ID:          1
Client Bitrate:    OTU4
Trunk Bitrate:     200G
Status:           Provisioned
Client Port                Peer/Trunk Port                CoherentDSP0/0/0/1
                        Traffic Split Percentage
OTU40/0/0/8                ODU40/0/0/1/1                100
OTU40/0/0/9                ODU40/0/0/1/2                100
```

The following is a sample to verify the mixed client rate configuration in the muxponder slice mode.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Mon Mar 23 06:20:22.227 UTC

Location:          0/1
Slice ID:          0
Client Bitrate:    OTU4
Trunk Bitrate:     500G
Status:           Provisioned
Client Port                Peer/Trunk Port                CoherentDSP0/1/0/0
                        Traffic Split Percentage
OTU40/1/0/2                ODU40/1/0/0/1                100
OTU40/1/0/3                ODU40/1/0/0/2                100
OTU40/1/0/4                ODU40/1/0/0/3                100
OTU40/1/0/5                ODU40/1/0/0/4                100
OTU40/1/0/6                ODU40/1/0/0/5                100
```

```
Location:          0/1
Slice ID:          1
Client Bitrate:    100GE
Trunk Bitrate:     500G
Status:           Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port                Mapper/Trunk Port                CoherentDSP0/1/0/1
                        Traffic Split Percentage
HundredGigEctrlr0/1/0/8    ODU40/1/0/1/1                100
HundredGigEctrlr0/1/0/9    ODU40/1/0/1/2                100
HundredGigEctrlr0/1/0/10   ODU40/1/0/1/3                100
HundredGigEctrlr0/1/0/11   ODU40/1/0/1/4                100
HundredGigEctrlr0/1/0/12   ODU40/1/0/1/5                100
```

Use the following command to clear alarm statistics on the optics or coherent DSP controller.

**clear counters controller *controllertype* R/S/I/P**

The following is a sample in which the alarm statistics are cleared on the coherent DSP controller.

```
RP/0/RP0/CPU0:ios#show controller coherentDSP 0/1/0/0
Tue Jun 11 05:15:12.540 UTC

Port                : CoherentDSP 0/1/0/0
Controller State    : Up
Inherited Secondary State : Normal
```



```

Configured Secondary State      : Normal
Derived State                   : In Service
Loopback mode                   : None
BER Thresholds                  : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring          : Enable

Alarm Information:
LOS = 1 LOF = 1 LOM = 0
OOF = 1 OOM = 1 AIS = 0
IAE = 0 BIAE = 0              SF_BER = 0
SD_BER = 2      BDI = 2 TIM = 0
FECMISMATCH = 0 FEC-UNC = 0
Detected Alarms                 : None

Bit Error Rate Information
PREFEC BER                      : 8.8E-03
POSTFEC BER                     : 0.0E+00

TTI :
    Remote hostname              : P2B8
    Remote interface             : CoherentDSP 0/1/0/0
    Remote IP addr               : 0.0.0.0

FEC mode                        : Soft-Decision 15

AINS Soak                       : None
AINS Timer                      : 0h, 0m
AINS remaining time             : 0 seconds
RP/0/RP0/CPU0:ios#clear counters controller coherentDSP 0/1/0/0
Tue Jun 11 05:17:07.271 UTC
All counters are cleared
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/1/0/1
Tue Jun 11 05:20:55.199 UTC

Port                            : CoherentDSP 0/1/0/1
Controller State                : Up
Inherited Secondary State       : Normal
Configured Secondary State      : Normal
Derived State                   : In Service
Loopback mode                   : None
BER Thresholds                  : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring          : Enable

Alarm Information:
LOS = 0 LOF = 0 LOM = 0
OOF = 0 OOM = 0 AIS = 0
IAE = 0 BIAE = 0              SF_BER = 0
SD_BER = 0      BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 0
Detected Alarms                 : None

Bit Error Rate Information
PREFEC BER                      : 1.2E-02
POSTFEC BER                     : 0.0E+00

TTI :
    Remote hostname              : P2B8
    Remote interface             : CoherentDSP 0/1/0/1
    Remote IP addr               : 0.0.0.0

FEC mode                        : Soft-Decision 15

AINS Soak                       : None

```

```
AINS Timer : 0h, 0m
AINS remaining time : 0 seconds
```

## Regeneration Mode

In an optical transmission system, 3R regeneration helps extend the reach of the optical communication links by reamplifying, reshaping, and retiming the data pulses. Regeneration helps to correct any distortion of optical signals by converting it to an electrical signal, processing that electrical signal, and then retransmitting it again as an optical signal.

In Regeneration (Regen) mode, the OTN signal is received on a trunk port and the regenerated OTN signal is sent on the other trunk port of the line card and the other way round. In this mode, only the trunk optics controller and coherentDSP controllers are created.

## Configuring the Card in Regen Mode

The supported trunk rates for the different cards are:

- 1.2T card—100G to 600G in multiples of 100G
- 1.2TL card—200G to 400G in multiples of 100G
- 2-QDD-C card—200G to 400G in multiples of 100G

To configure regen mode on 1.2T, 1.2TL, and 2-QDD-C cards, use the following commands:

**configure**

**hw-module location** *location*

**regen**

**trunk-rate** *trunk-rate*

**commit**

**exit**

### Example

The following is a sample to configure the regen mode on 1.2T, 1.2TL, and 2-QDD-C line cards with the trunk-rate 300.

```
RP/0/RP0/CPU0:ios#configure
RP/0/RP0/CPU0:ios(config)#hw-module location 0/0
RP/0/RP0/CPU0:ios(config-hwmod)#regen
RP/0/RP0/CPU0:ios(config-regen)#trunk-rate 300
RP/0/RP0/CPU0:ios(config-regen)#commit
RP/0/RP0/CPU0:ios(config-regen)#exit
```

## Verifying the Regen Mode

The following is a sample to verify the regen mode.

**show hw-module location** *location* **regen**

```
RP/0/RP0/CPU0:ios#show hw-module location 0/0 regen
Mon Mar 25 09:50:42.936 UTC
```

```

Location:                0/0
Trunk Bitrate:          400G
Status:                 Provisioned
East Port               West Port
CoherentDSP0/0/0/0     CoherentDSP0/0/0/1

```

The terms, East Port and West Port are used to represent OTN signal regeneration at the same layer.

## Configuring the BPS

You can configure the Bits per Symbol (BPS) to 3.4375 to support 300G trunk configurations on 75 GHz networks using the following commands:

**configure**

**controller optics R/S/I/P bits-per-symbol 3.4375**

**commit**

The following is a sample in which the BPS is configured to 3.4375.

```

RP/0/RP0/CPU0:ios#configure
Wed Mar 27 14:12:49.932 UTC
RP/0/RP0/CPU0:ios(config)#controller optics 0/3/0/0 bits-per-symbol 3.4375
RP/0/RP0/CPU0:ios(config)#commit

```

### Viewing BPS and Baud Rate Ranges

To view the the BPS for a specific range use the following command:

**show controller optics R/S/I/P bps-range bps-range | include data-rate | include fec-type**

```

RP/0/RP0/CPU0:ios#show controllers optics 0/3/0/0 bps-range 3 3.05 | include 300G | include
SD27
Thu Mar 28 03:01:39.751 UTC
300G          SD27          3.0000000      69.4350994
300G          SD27          3.0078125      69.2547485
300G          SD27          3.0156250      69.0753320
300G          SD27          3.0234375      68.8968428
300G          SD27          3.0312500      68.7192736
300G          SD27          3.0390625      68.5426174
300G          SD27          3.0468750      68.3668671

```

To view the baud for a specific range use the following command:

**show controller optics R/S/I/P baud-rate-range baud-range | include data-rate | include fec-type**

```

RP/0/RP0/CPU0:ios#show controllers optics 0/3/0/0 baud-rate-range 43 43.4 | include 300G |
include SD27
Thu Mar 28 03:12:36.521 UTC
300G          SD27          4.8046875      43.3545986
300G          SD27          4.8125000      43.2842178
300G          SD27          4.8203125      43.2140651
300G          SD27          4.8281250      43.1441394
300G          SD27          4.8359375      43.0744397
300G          SD27          4.8437500      43.0049648

```

## Configuring the Trunk Rate for BPSK

From R7.2.1 onwards, you can configure trunk rates of 50G, 100G, and 150G to support Binary Phase-Shift Keying (BPSK) modulation. The BPSK modulation enables information to be carried over radio signals more efficiently.

You can configure trunk rates for BPSK using CLI, NetConf YANG, and OC models.

The following table lists the 50G, 100G, and 150G trunk rates with the supported BPSK modulation:

Trunk Rate	BPSK Modulation
50G	1 to 1.4453125
100G	1 to 2.890625
150G	1.453125 to 4.3359375

To configure the trunk rate for BPSK modulation, enter the following commands:

**configure**

**hw-module location** *location* **mxponder**

**trunk-rate** {50G | 100G | 150G}

**commit**

The following example shows how to configure trunk rate to 50G:

```
RP/0/RP0/CPU0:(config)#hw-module location 0/0 mxponder
RP/0/RP0/CPU0:(config-hwmod-mp)#trunk-rate 50G
RP/0/RP0/CPU0:(config-hwmod-mp)#commit
```

## Viewing the BPSK Trunk Rate Ranges

To view the trunk rate configured for the BPSK modulation, use the following **show** commands:

```
RP/0/RP0/CPU0:ios(hwmod-mp)#show hw-module location 0/0 mxponder

Tue Feb 25 11:13:41.934 UTC

Location:                0/0
Client Bitrate:          100GE
Trunk Bitrate:           50G
Status:                  Provisioned
LLDP Drop Enabled:      FALSE
ARP Snoop Enabled:      FALSE
Client Port              Mapper/Trunk Port          CoherentDSP0/0/0/0
CoherentDSP0/0/0/1

                               Traffic Split Percentage

HundredGigECtrlr0/0/0/2    ODU40/0/0/0                50
50

RP/0/RP0/CPU0:ios#show controllers optics 0/0/0/0
```

Thu Mar 5 07:12:55.681 UTC

Controller State: Up

Transport Admin State: In Service

Laser State: On

LED State: Green

Optics Status

Optics Type: DWDM optics  
 DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,  
 Wavelength=1552.524nm

Alarm Status:

-----

Detected Alarms: None

LOS/LOL/Fault Status:

Alarm Statistics:

-----

HIGH-RX-PWR = 0                      LOW-RX-PWR = 2  
 HIGH-TX-PWR = 0                      LOW-TX-PWR = 0  
 HIGH-LBC = 0                         HIGH-DGD = 0  
 OOR-CD = 0                           OSNR = 0  
 WVl-OOL = 0                         MEA = 0

IMPROPER-REM = 0  
 TX-POWER-PROV-MISMATCH = 0  
 Laser Bias Current = 0.0 %  
 Actual TX Power = 1.97 dBm  
 RX Power = 1.58 dBm  
 RX Signal Power = 0.60 dBm  
 Frequency Offset = 386 MHz

Performance Monitoring: Enable

THRESHOLD VALUES

-----

Parameter	High Alarm	Low Alarm	High Warning	Low Warning
Rx Power Threshold(dBm)	4.9	-12.0	0.0	0.0
Tx Power Threshold(dBm)	3.5	-10.1	0.0	0.0
LBC Threshold(mA)	N/A	N/A	0.00	0.00

Configured Tx Power = 2.00 dBm  
 Configured CD High Threshold = 180000 ps/nm  
 Configured CD lower Threshold = -180000 ps/nm  
 Configured OSNR lower Threshold = 0.00 dB  
 Configured DGD Higher Threshold = 180.00 ps  
 Baud Rate = 34.7175521851 GBd  
 Bits per Symbol = 1.0000000000 bits/symbol  
 Modulation Type: BPSK  
 Chromatic Dispersion -9 ps/nm  
 Configured CD-MIN -180000 ps/nm CD-MAX 180000 ps/nm  
 Polarization Mode Dispersion = 0.0 ps  
 Second Order Polarization Mode Dispersion = 125.00 ps^2  
 Optical Signal to Noise Ratio = 34.60 dB  
 SNR = 20.30 dB

```

Polarization Dependent Loss = 0.20 dB
Polarization Change Rate = 0.00 rad/s
Differential Group Delay = 2.00 ps
Filter Roll Off Factor : 0.100
Rx VOA Fixed Ratio : 15.00 dB
Enhanced Colorless Mode : 0
Enhanced SOP Tolerance Mode : 0
NLEQ Compensation Mode : 0
Cross Polarization Gain Mode : 0
Cross Polarization Weight Mode : 0
Carrier Phase Recovery Window : 0
Carrier Phase Recovery Extended Window : 0

```

```

AINS Soak           : None
AINS Timer          : 0h, 0m
AINS remaining time : 0 seconds

```

## OTN-XP Card

The following section describes the supported configurations and procedures to configure the card modes on the line card.

### LC Mode on OTN-XP Card

When you install the OTN-XP card in the Cisco NCS 1004 chassis, it is in the POWERED\_ON state. The **LCMODE is not configured for line card** alarm is present on the card and the LED status is AMBER.

```

sysadmin-vm:0_RP0# show platform
Thu Mar 26 21:38:07.305 UTC+00:00
Location  Card Type                HW State    SW State    Config State
-----
0/0      NCS1K4-LC-FILLER            PRESENT     N/A         NSHUT
0/1      NCS1K4-OTN-XP                POWERED_ON  N/A         NSHUT
0/RP0    NCS1K4-CNTLR-K9             OPERATIONAL OPERATIONAL NSHUT
0/FT0    NCS1K4-FAN                  OPERATIONAL N/A         NSHUT
0/FT1    NCS1K4-FAN                  OPERATIONAL N/A         NSHUT
0/FT2    NCS1K4-FAN                  OPERATIONAL N/A         NSHUT
0/PM0    NCS1K4-AC-PSU               OPERATIONAL N/A         NSHUT
0/SC0    NCS1004                      OPERATIONAL N/A         NSHUT

sysadmin-vm:0_RP0# show alarms brief system active
Thu Mar 26 21:38:34.394 UTC+00:00

-----
Active Alarms
-----
Location      Severity    Group        Set time          Description
-----
0              major       environ      03/26/20 20:23:11  Power Module redundancy
lost.
0              critical    environ      03/26/20 20:23:29  Fan: One or more LCs
missing, running fans at max speed.
0/1          not_alarmed shelf        03/26/20 21:38:26  LCMODE is not configured
for line card
sysadmin-vm:0_RP0#

sysadmin-vm:0_RP0# show led location 0/1
Thu Mar 26 21:39:05.101 UTC+00:00

```

```

=====
Location  LED Name                               Mode           Color
=====
0/1
          0/1-Status LED                     WORKING        AMBER
sysadmin-vm:0_RP0#
    
```

You must select a datapath mode by configuring the LC mode. OTN-XP does not have a default LC mode. After the LC mode is configured using the CLI, the card transitions to the OPERATIONAL state, the alarm clears, and the LED status turns to GREEN.

The LC modes supported on the OTN-XP card are:

- 10G-GREY-MXP
- 4x100G-MXP-400G-TXP
- 40x10G-4x100G-MXP
- 4x100GE-MXP-DD




---

**Note** 100G-TXP LC mode is not supported.

---

Only one LC mode can be configured on the OTN-XP card at a time. When the LC mode is changed using the CLI, the **LCMODE changed, delete the datapath config and reload line card** alarm is present on the card and the DP FPD is in disabled state. To clear the alarm and enable the DP FPD, delete the existing datapath configuration and reload the line card to apply the new LC mode to make the card operational.

If a LC mode requires a different FPGA configuration, and the package is not available, the **OTN\_XP\_DP\_FPD\_PKG is missing, please install the package to proceed** alarm is present on the card. To clear the alarm, install the OTN\_XP\_DP\_FPD\_PKG file. After the package installation is complete, the required FPGA image is copied from the OTN\_XP\_DP\_FPD\_PKG file to the card, the card is automatically reloaded, and the card becomes operational.




---

**Note** The LC mode configuration is a shared plane configuration. The configuration does not enter the preconfigured state when the line card is not available.

---

## Configuring the LC Mode



### Note

- Ensure the OTN\_XP\_DP\_FPD\_PKG file is installed before configuring the LC mode.
- When you insert an OTN-XP line card having a lower FPD version, you must configure a LC mode which is supported on the software release that the line card is loaded with. You cannot upgrade the FPD of a line card if you configure a LC mode supported only in a higher software release.
- The LC\_CPU\_MOD\_FW version on a new OTN-XP line card is 7.3.1. Support for new LC modes or features from version 7.5.1 or higher, such as OTUCn-REGEN mode in 7.5.2, is not available in this line card software. When you install an OTN-XP card for the first time in an NCS 1004 chassis with the controller card software version of 7.5.1 or higher, you must upgrade LC\_CPU\_MOD\_FW, to ensure the availability and support for the LC modes or features that are supported supported in the XR software version. You must configure an LC mode which is supported in the 7.3.1 XR software, such as 4x100G-MXP-400G-TXP, and bring the card to OPERATIONAL state to upgrade the line card software.

To configure the LC mode on the OTN-XP card, use the following commands:

```
configure
```

```
lc-module location location lcmode mode
```

```
commit
```

### Example

To view the LC modes available on the OTN-XP card, use the following command:

```
RP/0/RP0/CPU0:ios#sh lc-module location 0/0 lcmode all
Wed Sep 29 14:41:51.487 UTC
States: A-Available      R-Running      C-Configured

Node   Lcmode_Supported   Owner   Options(State)                               HW_Ver
-----
0/0    Yes                None    10G-GREY-MXP (A)                            3.0
                          4x100G-MXP-400G-TXP (A)                    2.0
```

From Release 7.3.2 onwards, you can view the hybrid mode options that are supported on the OTN-XP card.

To view the LC modes supported on the OTN-XP card, use the following command:

```
RP/0/RP0/CPU0:ios#show lc-module location 0/3 lcmode all
Wed Aug 11 17:06:29.538 UTC
States: A-Available      R-Running      C-Configured

Node   Lcmode_Supported   Owner   Options(State)                               HW_Ver
-----
0/3    Yes                CLI     10G-GREY-MXP (A)                            3.0
                          4x100G-MXP-400G-TXP (A)                    2.0
                          40x10G-4x100G-MXP (A)                    3.0
                          4x100GE-MXP-DD (R/C)                    7.0
```





**Note** The 100G-TXP mode is listed when using the **show lc-module location lcmode all** command, but the configuration on 100G-TXP mode is not supported.

The following is a sample in which the OTN-XP card is configured in the 10G-GREY-MXP mode.

```
RP/0/RP0/CPU0:ios#configure
Thu Mar 26 21:40:51.495 UTC
RP/0/RP0/CPU0:ios(config)#lc-module location 0/1 lcmode 10G-GREY-MXP
RP/0/RP0/CPU0:ios(config)#commit
```

**Verifying the LC Mode Configuration**

The following is a sample output of a successful 10G-GREY-MXP LC mode configuration after which the card transitions to the OPERATIONAL state, the alarm clears, and the LED status turns to GREEN.

```
RP/0/RP0/CPU0:ios(config)#do show platform
Thu Mar 26 21:41:17.206 UTC
```

Node	Type	State	Config state
0/0	NCS1K4-LC-FILLER	PRESENT	NSHUT
<b>0/1</b>	<b>NCS1K4-OTN-XP</b>	<b>OPERATIONAL</b>	<b>NSHUT</b>
0/RP0/CPU0	NCS1K4-CNTRLR-K9 (Active)	IOS XR RUN	NSHUT
0/FT0	NCS1K4-FAN	OPERATIONAL	NSHUT
0/FT1	NCS1K4-FAN	OPERATIONAL	NSHUT
0/FT2	NCS1K4-FAN	OPERATIONAL	NSHUT
0/PM0	NCS1K4-AC-PSU	OPERATIONAL	NSHUT
0/SC0	NCS1004	OPERATIONAL	NSHUT

```
RP/0/RP0/CPU0:ios(config)#do show alarms brief system active
Thu Mar 26 21:41:29.641 UTC
```

-----  
Active Alarms

Location	Severity	Group	Set Time	Description
0	Major	Environ	03/26/2020 20:23:11 UTC	Power Module redundancy lost.
0	Critical	Environ	03/26/2020 20:23:29 UTC	Fan: One or more LCs missing, running fans at max speed.

```
RP/0/RP0/CPU0:ios(config)#end
RP/0/RP0/CPU0:ios#show lc-module location 0/1 lcmode all
Thu Mar 26 21:41:58.780 UTC
States: A-Available      R-Running      C-Configured
```

Node	Lcmode_Supported	Owner	Options(State)	HW_Ver
0/1	Yes	CLI	<b>10G-GREY-MXP (R/C)</b> 4x100G-MXP-400G-TXP (A)	<b>3.0</b> 2.0

```
RP/0/RP0/CPU0:ios#show lc-module location 0/1 lcmode
Thu Mar 26 21:42:18.997 UTC
```

Node	Lcmode_Supported	Owner	Running	Configured
0/1	Yes	CLI	<b>10G-GREY-MXP</b>	<b>10G-GREY-MXP</b>

```
RP/0/RP0/CPU0:ios#admin
```

```
Thu Mar 26 21:42:38.525 UTC

root connected from 192.0.2.3 using ssh on sysadmin-vm:0_RP0
sysadmin-vm:0_RP0# show led location 0/1
Thu Mar 26 21:42:45.337 UTC+00:00
=====
Location  LED Name                    Mode           Color
=====
0/1
          0/1-Status LED                WORKING       GREEN
```

### Example

The following is a sample in which the LC mode is changed from 10G-GREY-MXP to the 4x100G-MXP-400G-TXP mode. In this sample, the datapath configuration is deleted and the card is reloaded to apply the new LC mode.

```
RP/0/RP0/CPU0:ios#show lc-module location all lcmode
Thu Sep 30 10:19:29.853 UTC
```

Node	Lcmode_Supported	Owner	Running	Configured
0/0	Yes	CLI	10G-GREY-MXP	10G-GREY-MXP
0/1	No	N/A	N/A	N/A
0/2	No	N/A	N/A	N/A
0/3	No	N/A	N/A	N/A

```
RP/0/RP0/CPU0:ios#configure
Thu Sep 30 10:19:32.818 UTC
Current Configuration Session Line      User      Date              Lock
00001000-000051f7-00000000 vty1     root        Wed Sep 29 15:26:00 2021
RP/0/RP0/CPU0:ios(config)#no lc-module location 0/0 lcmode 10g-GREY-MXP
RP/0/RP0/CPU0:ios(config)#commit
Thu Sep 30 10:20:34.086 UTC
RP/0/RP0/CPU0:ios(config)#do show alarms brief system active
Thu Sep 30 10:20:52.950 UTC
```

#### Active Alarms

Location	Severity	Group	Set Time	Description
0/PMO Disabled	Major	Environ	09/29/2021 14:41:59 UTC	Power Module Output
0	Major	Environ	09/29/2021 14:42:15 UTC	Power Module redundancy lost.
0	Critical	Environ	09/29/2021 14:42:25 UTC	Fan: One or more LCs missing, running fans at max speed.
0/0	NotAlarmed	Shelf	09/30/2021 10:20:34 UTC	LCMODE changed, delete the datapath config and reload line card

```
RP/0/RP0/CPU0:ios#configure
Thu Sep 30 10:21:41.281 UTC
Current Configuration Session Line User Date Lock
00001000-000051f7-00000000 vty1 root Wed Sep 29 15:26:00 2021
RP/0/RP0/CPU0:ios(config)#no hw-module location 0/0
RP/0/RP0/CPU0:ios(config)#commit
Thu Sep 30 10:21:49.982 UTC
RP/0/RP0/CPU0:ios(config)#
```

```
RP/0/RP0/CPU0:ios#show platform
Thu Sep 30 10:22:08.482 UTC
```

Node	Type	State	Config state
0/0	<b>NCS1K4-OTN-XP</b>	<b>OPERATIONAL</b>	<b>NSHUT</b>
0/2	NCS1K4-LC-FILLER	PRESENT	NSHUT
0/3	NCS1K4-LC-FILLER	PRESENT	NSHUT
0/RP0/CPU0	NCS1K4-CNTRLR-K9 (Active)	IOS XR RUN	NSHUT
0/FT0	NCS1K4-FAN	OPERATIONAL	NSHUT
0/FT1	NCS1K4-FAN	OPERATIONAL	NSHUT
0/FT2	NCS1K4-FAN	OPERATIONAL	NSHUT
0/PM0	NCS1K4-AC-PSU	OPERATIONAL	NSHUT
0/SC0	NCS1004	OPERATIONAL	NSHUT

```
RP/0/RP0/CPU0:ios#
RP/0/RP0/CPU0:ios#admin
Thu Sep 30 10:23:55.937 UTC
Last login: Thu Sep 30 04:32:57 2021 from 192.0.2.3
root connected from 192.0.2.3 using ssh on sysadmin-vm:0_RP0
sysadmin-vm:0_RP0# hw-module location 0/0 reload
Thu Sep 30 10:24:17.938 UTC+00:00
Reloading the module will be traffic impacting if not properly drained. Continue to Reload
hardware module ? [no,yes] yes
result Card graceful reload request on 0/0 succeeded.
```

```
sysadmin-vm:0_RP0#show platform
Thu Sep 30 10:25:16.876 UTC+00:00
```

Location	Card Type	HW State	SW State	Config State
0/0	<b>NCS1K4-OTN-XP</b>	<b>POWERED_ON</b>	<b>N/A</b>	<b>NSHUT</b>
0/2	NCS1K4-LC-FILLER	PRESENT	N/A	NSHUT
0/3	NCS1K4-LC-FILLER	PRESENT	N/A	NSHUT
0/RP0	NCS1K4-CNTRLR-K9	OPERATIONAL	OPERATIONAL	NSHUT
0/FT0	NCS1K4-FAN	OPERATIONAL	N/A	NSHUT
0/FT1	NCS1K4-FAN	OPERATIONAL	N/A	NSHUT
0/FT2	NCS1K4-FAN	OPERATIONAL	N/A	NSHUT
0/PM0	NCS1K4-2KW-AC	OPERATIONAL	N/A	NSHUT
0/SC0	NCS1004-K9	OPERATIONAL	N/A	NSHUT

```
sysadmin-vm:0_RP0#exit
RP/0/RP0/CPU0:ios#show lc-module location all lcmode
Thu Sep 30 10:29:08.183 UTC
```

Node	Lcmode_Supported	Owner	Running	Configured
0/0	Yes	None	Not running	Not configured
0/1	No	N/A	N/A	N/A
0/2	No	N/A	N/A	N/A
0/3	No	N/A	N/A	N/A

```
RP/0/RP0/CPU0:ios#show platform
Thu Sep 30 10:29:36.075 UTC
```

Node	Type	State	Config state
------	------	-------	--------------

```

-----
0/0          NCS1K4-OTN-XP          POWERED_ON    NSHUT
0/2          NCS1K4-LC-FILLER       PRESENT        NSHUT
0/3          NCS1K4-LC-FILLER       PRESENT        NSHUT
0/RP0/CPU0  NCS1K4-CNTRLR-K9 (Active)       IOS XR RUN     NSHUT
0/FT0       NCS1K4-FAN                   OPERATIONAL    NSHUT
0/FT1       NCS1K4-FAN                   OPERATIONAL    NSHUT
0/FT2       NCS1K4-FAN                   OPERATIONAL    NSHUT
0/PM0       NCS1K4-AC-PSU                  OPERATIONAL    NSHUT
0/SC0       NCS1004                       OPERATIONAL    NSHUT
RP/0/RP0/CPU0:ios#
RP/0/RP0/CPU0:ios#configure
Thu Sep 30 10:29:57.997 UTC
Current Configuration Session Line      User      Date                               Lock
00001000-000051f7-00000000      vty1     root      Wed Sep 29 15:26:00 2021
RP/0/RP0/CPU0:ios(config)#lc-module location 0/0 lcmode 4x100G-MXP-400G-TXP
RP/0/RP0/CPU0:ios(config)#commit
Thu Sep 30 10:30:11.312 UTC
RP/0/RP0/CPU0:ios(config)#end
RP/0/RP0/CPU0:ios#show lc-module location all lcmode
Thu Sep 30 10:40:56.480 UTC

Node      Lcmode_Supported  Owner      Running      Configured
-----
0/0       Yes              CLI        4x100G-MXP-400G-TXP  4x100G-MXP-400G-TXP
0/1       No               N/A        N/A           N/A
0/2       No               N/A        N/A           N/A
0/3       No               N/A        N/A           N/A

RP/0/RP0/CPU0:ios# RP/0/RP0/CPU0:ios#show platform
Thu Sep 30 10:41:25.093 UTC
Node      Type              State          Config state
-----
0/0       NCS1K4-OTN-XP    OPERATIONAL    NSHUT
0/2       NCS1K4-LC-FILLER PRESENT        NSHUT
0/3       NCS1K4-LC-FILLER PRESENT        NSHUT
0/RP0/CPU0 NCS1K4-CNTRLR-K9 (Active) IOS XR RUN     NSHUT
0/FT0     NCS1K4-FAN       OPERATIONAL    NSHUT
0/FT1     NCS1K4-FAN       OPERATIONAL    NSHUT
0/FT2     NCS1K4-FAN       OPERATIONAL    NSHUT
0/PM0     NCS1K4-AC-PSU    OPERATIONAL    NSHUT
0/SC0     NCS1004          OPERATIONAL    NSHUT
RP/0/RP0/CPU0:ios#

```

### Example: 4x100GE-MXP-DD LC Mode

To view the LC modes available on the OTN-XP card, use the following command: The following is a sample in which the OTN-XP card is configured in the 4x100GE-MXP-DD mode.

```

RP/0/RP0/CPU0:ios#show lc-module location all lcmode all
Thu Sep 30 10:43:47.536 UTC
States: A-Available      R-Running      C-Configured

Node      Lcmode_Supported  Owner      Options(State)          HW_Ver
-----
0/0       Yes              CLI        100G-TXP (A)            3.0
          10G-GREY-MXP (A)      3.0
          4x100G-MXP-400G-TXP (A) 2.0
          40x10G-4x100G-MXP (A)  3.0
          4x100GE-MXP-DD (R/C)   7.0
          400GE-TXP-DD (A)      1.0

```

			FC-MXP (A)	4.0
			OTUCn-REGEN (A)	8.0
0/1	No	N/A	N/A	N/A
0/2	No	N/A	N/A	N/A
0/3	No	N/A	N/A	N/A

## Supported Pluggables for OTN-XP Card

The OTN-XP card supports the following trunk and client pluggables:

### Trunk Pluggables

- ONS-CFP2D-400G-C
- QDD-400G-ZRP-S

### Client Pluggables

- QSFP-100G-LR4
- QSFP-100G-FR-S
- QSFP-100G-SR4-S
- QSFP-100G-CWDM4-S
- QSFP-100G-LR4-S
- QSFP-100G-AOC
- QSFP-100G-PSM4
- QSFP-100G-DR-S
- QSFP-4x10-MLR
- QSFP-40G-SR4=
- ONS-QSFP28-LR4

See [Supported Pluggables](#), for the complete list of pluggables supported by NCS 1004.

## Muxponder Configuration on OTN-XP Card

The OTN-XP card has two trunk ports and 12 client ports. The muxponder configuration supports two slices, 0 and 1. You can configure muxponder-slice 0, muxponder-slice 1, or both. Each muxponder-slice supports 10 client interfaces.

From Release 7.3.1 onwards, the OTN-XP card supports two trunk ports for CFP2 DCO on port 12 and port 13, and 8 client ports. For configuration, see [Configuring the Muxponder Mode for 4x100G MXP](#), on page 26.

From Release 7.3.2 onwards, the OTN-XP card supports two trunk ports for QDD ZRP on port 9 and port 11, and 8 client ports. For configuration, see [Configuring the Muxponder Mode for 4x100GE-MXP-DD](#), on page 46.

Table 1: Feature History

Feature Name	Release Information	Description
400 TXP or MXP modes with CFP2 DCO for OTN-XP Card	Cisco IOS XR Release 7.3.1	<p>On the OTN-XP card, you can configure a single 400GE or 4x100G payload that is received over the client port as a 400G signal over DWDM on the line side.</p> <p>The card improves efficiency, performance, and flexibility for customer networks allowing 400GE or 4x100G client transport over 400G WDM wavelength.</p> <p>Commands modified:</p> <ul style="list-style-type: none"> <li>• <b>controller coherentDSP</b></li> <li>• <b>show controller coherentDSP</b></li> </ul>

Table 2: Hardware Module Configuration with Client to Trunk Mapping

Hardware Module Configuration	Line Card Mode	Client Port Rate	Client to Trunk Mapping	Trunk Rate
10G Grey Muxponder	10G-GREY-MXP	OTU2, OTU2e, or 10 GE	<p>Mxponder-slice 0—Client ports 4, 5, and 2 are mapped to the trunk port 0.</p> <p>Mxponder-slice 1—Client ports 7, 6, and 11 are mapped to the trunk port 1.</p> <p>Each client port consists of four lanes, 1, 2, 3, and 4. The lanes 3 and 4 can only be configured for ports 2 and 11. It is not mandatory to configure all 10 client lanes for a slice.</p>	100G

Hardware Module Configuration	Line Card Mode	Client Port Rate	Client to Trunk Mapping	Trunk Rate
400G-MXP	4x100G-MXP -400G-TXP	100GE, OTU4	<p>Mxponder-slice 0—Client ports 1, 6, 7, and 10 are mapped to the trunk port 12.</p> <p>Mxponder-slice 1—Client ports 0, 4, 5, and 8 are mapped to the trunk port 13.</p>	400G
400G-TXP	4x100G-MXP -400G-TXP	400GE	<p>Mxponder-slice 0—Client port 10 is mapped to the trunk port 12.</p> <p>Mxponder-slice 1—Client port 8 is mapped to the trunk port 13.</p>	400G
40x10G	40x10G-4x100G-MXP	OTU2, OTU2e, or 10 GE	<p>Mxponder-slice 0—10G Client ports 0, 1, 2, 3, 4, 5, 6, 7, 9, and 11 mapped to the trunk port 12.</p> <p>Each client port consists of four lanes, 1, 2, 3, and 4.</p>	400G CFP2
30x10G	40x10G-4x100G-MXP	OTU2, OTU2e, or 10 GE	<p>Mxponder-slice 0—10G Client ports 0, 1, 2, 3, 4, 5, 9, and 11 are mapped to the trunk port 12.</p> <p>The client ports 0, 1, 2, 3, 4, 5, and 9 are configured for all four lanes, 1, 2, 3, and 4.</p> <p>The client port 11 is configured for lanes 1 and 2.</p>	300G CFP2

Hardware Module Configuration	Line Card Mode	Client Port Rate	Client to Trunk Mapping	Trunk Rate
20x10G + 2x100G	40x10G-4x100G-MXP	10 GE, 100 GE, OTU2, OTU2e, or OTU4	<p>Mxponder-slice 0—The following 100G and 10G client ports are mapped to trunk port 12.</p> <ul style="list-style-type: none"> <li>• 100G client port—0 and 1</li> <li>• 10G client port—4, 5, 6, and 7 are configured for all four lanes, 1, 2, 3, and 4.</li> <li>• 10G client port—11 and 2 are configured for lanes 3 and 4.</li> </ul>	300G CFP2
10x10G + 3 x 100G	40x10G-4x100G-MXP	10GE, 100GE, OTU4, OTU2, or OTU2e	<p>Mxponder-slice 0—The following 100G and 10G client ports are mapped to a trunk port 12.</p> <ul style="list-style-type: none"> <li>• 100G client port—0, 1, and 6</li> <li>• 10G client port—4 and 5 are configured for all four lanes, 1, 2, 3, and 4.</li> <li>• 10G client port—2 are configured for lanes 3 and 4.</li> </ul>	400G CFP2
200G Muxponder	200G-FOIC2-oFEC-QPSK-1-S 200G-FOIC2-oFEC-8QAM-1-E	OTU4, 100GE	<p>Mxponder-slice 0—Client ports 7 and 10 mapped to the trunk port 12.</p> <p>Mxponder-slice1—Client ports 5 and 8 mapped to the trunk port 13.</p>	200G CFP2



Hardware Module Configuration	Line Card Mode	Client Port Rate	Client to Trunk Mapping	Trunk Rate
QDD ZRP	4x100GE-MXP-DD	100GE	Mxponder-slice 0—Client ports 1, 6, 7, and 10 are mapped to the trunk port 11.  Mxponder-slice 1—Client ports 0, 4, 5, and 8 are mapped to the trunk port 9.	400G

## Configuring the Muxponder Mode for 10G Grey Muxponder



**Note** The LC mode must be configured to 10G-GREY-MXP on the OTN-XP card before you perform this configuration.

To configure the OTN-XP card in the muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate** 100G

**client-port-rate** *client-port-number* **lane** *lane-number* **client-type** { 10GE | OTU2 | OTU2e}

**commit**

**Example**

The following is a sample in which the OTN-XP card is configured with mixed client rates in the mxponder-slice 0 mode.

```
RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 100G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 4 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

**Verifying the Muxponder Configuration**

The following is a sample to verify the muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Tue Apr 21 09:26:12.308 UTC

Location:                0/1
Slice ID:                 0
Client Bitrate:          MIXED
Trunk Bitrate:           100G
```

```

Status:                Provisioned
LLDP Drop Enabled:    FALSE
ARP Snoop Enabled:    FALSE
Client Port Mapper/Trunk Port Peer/Trunk Port OTU40/0/0/0
Traffic Split Percentage
OTU20/0/0/2/3         NONE          ODU20/0/0/0/2/3      100
OTU20/0/0/2/4         NONE          ODU20/0/0/0/2/4      100
TenGigEctr1r0/0/0/4/1 ODU2E0/0/0/0/4/1    NONE                  100

```

## Configuring the Muxponder Mode for 4x100G MXP



**Note** The LC mode must be configured to 4x100G-MXP-400G-TXP on the OTN-XP card before you perform this configuration. See [Configuring the LC Mode](#), on page 16.

To configure the OTN-XP card in the 4x100 muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate** 400G

**client-port-rate** *client-port-number* **client-type** {100GE | OTU4}

**commit**

### Example

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 0 mode.

```

RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/2 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit

```

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 1 mode.

```

RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/2 mxponder-slice 1
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 8 client-type OTU4
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit

```

### Verifying the Muxponder Configuration

The following is a sample to verify the muxponder configuration in the OTN-XP card.

```

RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Mon Nov 30 01:32:57.338 UTC

Location: 0/1
Slice ID: 0
Client Bitrate: 100GE

```

```

Trunk Bitrate: 400G
Status: Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port Mapper/Trunk Port CoherentDSP0/1/0/12
Traffic Split Percentage

HundredGigECtrlr0/1/0/1 ODU40/1/0/12/1 100

Location: 0/1
Slice ID: 1
Client Bitrate: OTU4
Trunk Bitrate: 400G
Status: Provisioned
Client Port Peer/Trunk Port CoherentDSP0/1/0/13
Traffic Split Percentage

OTU40/1/0/8 ODUC40/1/0/13 100

```

## Configuring the Muxponder Mode for 400G TXP



**Note** The LC mode must be configured to 4x100G-MXP-400G-TXP on the OTN-XP card before you perform this configuration.

To configure the OTN-XP card in the 400G TXP mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate 400G**

**client-port-rate** *client-port-number* **client-type 400GE**

**commit**

### Example

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 0 mode.

```

RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/2 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 10 client-type 400GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit

```

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 1 mode.

```

RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/2 mxponder-slice 1
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 8 client-type 400GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit

```

## Verifying the Muxponder Configuration

The following is a sample to verify the muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Mon Nov 30 01:36:14.514 UTC
```

```
Location: 0/1
Slice ID: 0
Client Bitrate: 400GE
Trunk Bitrate: 400G
Status: Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port Mapper/Trunk Port CoherentDSP0/1/0/12
Traffic Split Percentage
```

```
FourHundredGigECtrlr0/1/0/10 ODU-FLEX0/1/0/12/10 100
```

```
Location: 0/1
Slice ID: 1
Client Bitrate: 400GE
Trunk Bitrate: 400G
Status: Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port Mapper/Trunk Port CoherentDSP0/1/0/13
Traffic Split Percentage
```

```
FourHundredGigECtrlr0/1/0/8 ODU-FLEX0/1/0/13/8 100
```

## Static TPN and TS Allocation for TXP-MXP-Grey Muxponder Modes

The OTN-XP card uses the following mapping of tributary port numbers, tributary slots, and clients for the various TXP and MXP configurations.

**Table 3: TPN-TS Mapping in 400GE TXP Configuration**

Slice	Client Port	Client Rate	Trunk Port	Trunk Rate	TPN	TS
0	10	400GE	12	400G	1	1.1 to 4.20
1	8	400GE	13	400G	1	1.1 to 4.20

**Table 4: TPN-TS Mapping in 4 X 100G MXP Configuration**

Slice	Client Port	Client Rate	Trunk Port	Trunk Rate	TPN	TS
0	10	100GE/OTU4	12	400G	1	1.1 to 1.20
	7	100GE/OTU4			2	2.1 to 2.20
	6	100GE/OTU4			3	3.1 to 3.20
	1	100GE/OTU4			4	4.1 to 4.20

Slice	Client Port	Client Rate	Trunk Port	Trunk Rate	TPN	TS
1	8	100GE/OTU4	13	400G	1	1.1 to 1.20
	5	100GE/OTU4			2	2.1 to 2.20
	4	100GE/OTU4			3	3.1 to 3.20
	0	100GE/OTU4			4	4.1 to 4.20

Table 5: TPN-TS Mapping in 10 X 10G Grey Muxponder Configuration

Slice	Client Port	Client Lane	Client Rate	Trunk Port	Trunk Rate	TPN	TS				
0	4	1	10GE/OTU2/OTU2e	0	100G	1	1-8				
		2	10GE/OTU2/OTU2e			2	9-16				
		3	10GE/OTU2/OTU2e			3	17-24				
		4	10GE/OTU2/OTU2e			4	25-32				
	5	1	10GE/OTU2/OTU2e			5	33-40				
		2	10GE/OTU2/OTU2e			6	41-48				
		3	10GE/OTU2/OTU2e			7	49-56				
		4	10GE/OTU2/OTU2e			8	57-64				
	2	3	10GE/OTU2/OTU2e			9	65-72				
		4	10GE/OTU2/OTU2e			10	73-80				
		1	7			1	10GE/OTU2/OTU2e	1	100G	1	1-8
						2	10GE/OTU2/OTU2e			2	9-16
3	10GE/OTU2/OTU2e			3	17-24						
4	10GE/OTU2/OTU2e			4	25-32						
6	1		10GE/OTU2/OTU2e	5	33-40						
	2		10GE/OTU2/OTU2e	6	41-48						
	3		10GE/OTU2/OTU2e	7	49-56						
	4		10GE/OTU2/OTU2e	8	57-64						
11	3	10GE/OTU2/OTU2e	9	65-72							
	4	10GE/OTU2/OTU2e	10	73-80							

## Configuring the Muxponder Mode for 40x10G Muxponder

To configure the OTN-XP card in the 40x10G muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate 400G**

**client-port-rate** *client-port-number* **lane** *lane-number* **client-type** {10GE | OTU2 | OTU2E}

**commit**

### Example

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 0 mode.

```
RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/3 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 3 client-type 10GE
```

```
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

### Verifying the Muxponder Configuration

The following is a sample to verify the 40x10G muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/3 muxponder
Wed Jun 2 17:57:36.647 UTC
```

```
Location:                0/3
Slice ID:                 0
Client Bitrate:          10GE
Trunk Bitrate:           400G
Status:                  Provisioned
LLDP Drop Enabled:       FALSE
ARP Snoop Enabled:       FALSE
Client Port              Mapper/Trunk Port          CoherentDSP0/3/0/12
                          Traffic Split Percentage

TenGigEctr0/3/0/0/1      ODU2E0/3/0/12/0/1      100
TenGigEctr0/3/0/0/2      ODU2E0/3/0/12/0/2      100
TenGigEctr0/3/0/0/3      ODU2E0/3/0/12/0/3      100
TenGigEctr0/3/0/0/4      ODU2E0/3/0/12/0/4      100
TenGigEctr0/3/0/1/1      ODU2E0/3/0/12/1/1      100
TenGigEctr0/3/0/1/2      ODU2E0/3/0/12/1/2      100
TenGigEctr0/3/0/1/3      ODU2E0/3/0/12/1/3      100
TenGigEctr0/3/0/1/4      ODU2E0/3/0/12/1/4      100
TenGigEctr0/3/0/2/1      ODU2E0/3/0/12/2/1      100
TenGigEctr0/3/0/2/2      ODU2E0/3/0/12/2/2      100
TenGigEctr0/3/0/2/3      ODU2E0/3/0/12/2/3      100
TenGigEctr0/3/0/2/4      ODU2E0/3/0/12/2/4      100
TenGigEctr0/3/0/3/1      ODU2E0/3/0/12/3/1      100
TenGigEctr0/3/0/3/2      ODU2E0/3/0/12/3/2      100
TenGigEctr0/3/0/3/3      ODU2E0/3/0/12/3/3      100
TenGigEctr0/3/0/3/4      ODU2E0/3/0/12/3/4      100
TenGigEctr0/3/0/4/1      ODU2E0/3/0/12/4/1      100
TenGigEctr0/3/0/4/2      ODU2E0/3/0/12/4/2      100
TenGigEctr0/3/0/4/3      ODU2E0/3/0/12/4/3      100
TenGigEctr0/3/0/4/4      ODU2E0/3/0/12/4/4      100
TenGigEctr0/3/0/5/1      ODU2E0/3/0/12/5/1      100
TenGigEctr0/3/0/5/2      ODU2E0/3/0/12/5/2      100
TenGigEctr0/3/0/5/3      ODU2E0/3/0/12/5/3      100
TenGigEctr0/3/0/5/4      ODU2E0/3/0/12/5/4      100
TenGigEctr0/3/0/6/1      ODU2E0/3/0/12/6/1      100
TenGigEctr0/3/0/6/2      ODU2E0/3/0/12/6/2      100
TenGigEctr0/3/0/6/3      ODU2E0/3/0/12/6/3      100
TenGigEctr0/3/0/6/4      ODU2E0/3/0/12/6/4      100
TenGigEctr0/3/0/7/1      ODU2E0/3/0/12/7/1      100
TenGigEctr0/3/0/7/2      ODU2E0/3/0/12/7/2      100
TenGigEctr0/3/0/7/3      ODU2E0/3/0/12/7/3      100
TenGigEctr0/3/0/7/4      ODU2E0/3/0/12/7/4      100
TenGigEctr0/3/0/9/1      ODU2E0/3/0/12/9/1      100
TenGigEctr0/3/0/9/2      ODU2E0/3/0/12/9/2      100
TenGigEctr0/3/0/9/3      ODU2E0/3/0/12/9/3      100
TenGigEctr0/3/0/9/4      ODU2E0/3/0/12/9/4      100
TenGigEctr0/3/0/11/1     ODU2E0/3/0/12/11/1     100
TenGigEctr0/3/0/11/2     ODU2E0/3/0/12/11/2     100
TenGigEctr0/3/0/11/3     ODU2E0/3/0/12/11/3     100
TenGigEctr0/3/0/11/4     ODU2E0/3/0/12/11/4     100
```

## Configuring the Muxponder Mode for 30x10G

To configure the OTN-XP card in the 30x10G muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate 300G**

**client-port-rate** *client-port-number* **lane** *lane-number* **client-type** {10GE | OTU2E | OTU2}

**commit**

### Example

The following is a sample in which the OTN-XP card is configured with 300G trunk rate on the mxponder-slice 0 mode.

```
RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 300G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 3 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 3 client-type OTU2
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 9 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

### Verifying the Muxponder Configuration

The following is a sample to verify the 30x10G muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Wed Jun 2 17:56:40.574 UTC
```



```

Location:                0/1
Slice ID:                0
Client Bitrate:         MIXED
Trunk Bitrate:         300G
Status:                 Provisioned
LLDP Drop Enabled:     FALSE
ARP Snoop Enabled:     FALSE
Client Port
Mapper/Trunk Port      Peer/Trunk Port      CoherentDSP0/1/0/12
Traffic Split Percentage
OTU20/1/0/0/3          NONE          ODU20/1/0/12/0/3
  100
OTU20/1/0/1/3          NONE          ODU20/1/0/12/1/3
  100
OTU20/1/0/2/3          NONE          ODU20/1/0/12/2/3
  100
OTU20/1/0/3/3          NONE          ODU20/1/0/12/3/3
  100
OTU20/1/0/4/3          NONE          ODU20/1/0/12/4/3
  100
OTU20/1/0/5/3          NONE          ODU20/1/0/12/5/3
  100
OTU20/1/0/9/3          NONE          ODU20/1/0/12/9/3
  100
OTU2E0/1/0/0/2         NONE          ODU2E0/1/0/12/0/2
  100
OTU2E0/1/0/1/2         NONE          ODU2E0/1/0/12/1/2
  100
OTU2E0/1/0/2/2         NONE          ODU2E0/1/0/12/2/2
  100
OTU2E0/1/0/3/2         NONE          ODU2E0/1/0/12/3/2
  100
OTU2E0/1/0/4/2         NONE          ODU2E0/1/0/12/4/2
  100
OTU2E0/1/0/5/2         NONE          ODU2E0/1/0/12/5/2
  100
OTU2E0/1/0/9/2         NONE          ODU2E0/1/0/12/9/2
  100
TenGigEctr0/1/0/0/1    ODU2E0/1/0/12/0/1    NONE
  100
TenGigEctr0/1/0/0/4    ODU2E0/1/0/12/0/4    NONE
  100
TenGigEctr0/1/0/1/1    ODU2E0/1/0/12/1/1    NONE
  100
TenGigEctr0/1/0/1/4    ODU2E0/1/0/12/1/4    NONE
  100
TenGigEctr0/1/0/2/1    ODU2E0/1/0/12/2/1    NONE
  100
TenGigEctr0/1/0/2/4    ODU2E0/1/0/12/2/4    NONE
  100
TenGigEctr0/1/0/3/1    ODU2E0/1/0/12/3/1    NONE
  100
TenGigEctr0/1/0/3/4    ODU2E0/1/0/12/3/4    NONE
  100
TenGigEctr0/1/0/4/1    ODU2E0/1/0/12/4/1    NONE
  100
TenGigEctr0/1/0/4/4    ODU2E0/1/0/12/4/4    NONE
  100
TenGigEctr0/1/0/5/1    ODU2E0/1/0/12/5/1    NONE
  100
TenGigEctr0/1/0/5/4    ODU2E0/1/0/12/5/4    NONE
  100

```

TenGigECtrlr0/1/0/9/1 100	ODU2E0/1/0/12/9/1	NONE
TenGigECtrlr0/1/0/9/4 100	ODU2E0/1/0/12/9/4	NONE

## Configuring Hybrid Modes Using 40x10G-4x100G-MXP

**Table 6: Feature History**

Feature Name	Release Information	Description
Hybrid Modes Using 40x10G-4x100G-MXP	Cisco IOS XR Release 7.3.2	<p>With the 40x10G-4x100G-MXP muxponder mode support, you can configure the following hybrid modes:</p> <ul style="list-style-type: none"> <li>• 20x10G + 2x100G</li> <li>• 10x10G + 3 x 100G</li> </ul> <p>With the 40x10G-4x100G-MXP muxponder mode support, you have flexibility to choose a combination of 10G and 100G client rates across different OTN and Ethernet client rates.</p>

With the 40x10G-4x100G-MXP muxponder mode support, you can configure the following hybrid modes:

- 20x10G + 2x100G
- 10x10G + 3 x 100G

For more information on the client to trunk mapping for each of the mode, see [#unique\\_6 unique\\_6\\_Connect\\_42\\_table\\_yft\\_mn1\\_srb](#).

### Configuring the Muxponder Mode for 20x10G-2x100G

To configure the OTN-XP card in the 20x10G-2x100G muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate** 400G

**client-port-rate** *client-port-number* **client-type** {100GE | OTU4}

**client-port-rate** *client-port-number* **lane** *lane-number* **client-type** {10GE | OTU2 | OTU2E}

**commit**

#### Example

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 0 mode.

```
RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 client-type OTU4
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 3 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 4 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 1 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 3 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 4 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 1 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 3 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 4 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 1 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 2 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 3 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 11 lane 4 client-type 10GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

### Verifying the Muxponder Configuration

The following is a sample to verify the 20x10G-2x100G muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder
Wed Jun 2 18:00:58.201 UTC
```

```
Location:                0/1
Slice ID:                 0
Client Bitrate:          MIXED
Trunk Bitrate:           400G
Status:                  Provisioned
LLDP Drop Enabled:      FALSE
ARP Snoop Enabled:      FALSE
Client Port              Mapper/Trunk Port   Peer/Trunk Port           CoherentDSP0/1/0/12
                        Traffic Split Percentage
OTU40/1/0/1              NONE          ODU40/1/0/12/1           100
OTU2E0/1/0/2/3          NONE          ODU2E0/1/0/12/2/3
    100
OTU2E0/1/0/2/4          NONE          ODU2E0/1/0/12/2/4
    100
OTU2E0/1/0/4/1          NONE          ODU2E0/1/0/12/4/1
    100
OTU2E0/1/0/4/2          NONE          ODU2E0/1/0/12/4/2
    100
OTU2E0/1/0/4/3          NONE          ODU2E0/1/0/12/4/3
    100
OTU2E0/1/0/4/4          NONE          ODU2E0/1/0/12/4/4
    100
OTU2E0/1/0/5/1          NONE          ODU2E0/1/0/12/5/1
    100
OTU2E0/1/0/5/2          NONE          ODU2E0/1/0/12/5/2
    100
```

OTU2E0/1/0/5/3 100	NONE	ODU2E0/1/0/12/5/3	
OTU2E0/1/0/5/4 100	NONE	ODU2E0/1/0/12/5/4	
TenGigEctrler0/1/0/6/1	ODU2E0/1/0/12/6/1		100
TenGigEctrler0/1/0/6/2	ODU2E0/1/0/12/6/2		100
TenGigEctrler0/1/0/6/3	ODU2E0/1/0/12/6/3		100
TenGigEctrler0/1/0/6/4	ODU2E0/1/0/12/6/4		100
TenGigEctrler0/1/0/7/1	ODU2E0/1/0/12/7/1		100
TenGigEctrler0/1/0/7/2	ODU2E0/1/0/12/7/2		100
TenGigEctrler0/1/0/7/3	ODU2E0/1/0/12/7/3		100
TenGigEctrler0/1/0/7/4	ODU2E0/1/0/12/7/4		100
TenGigEctrler0/1/0/11/3	ODU2E0/1/0/12/11/3		100
TenGigEctrler0/1/0/11/4	ODU2E0/1/0/12/11/4		100
HundredGigEctrler0/1/0/0	ODU40/1/0/12/0	NONE	100

### Configuring the Muxponder Mode for 10 x 10G-3 x 100G

To configure the OTN-XP card in the 10 x 10G and 3 x 100G muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate** 400G

**client-port-rate** *client-port-number* **client-type** {100GE | OTU4}

**client-port-rate** *client-port-number* **lane** *lane-number* **client-type** {10GE | OTU2 | OTU2E}

**commit**

#### Example

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 0 mode.

```
RP/0/RP0/CPU0:ios#config
Tue Apr 21 09:21:44.460 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 client-type OTU4
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 3 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 2 lane 4 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 1 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 3 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 lane 4 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 1 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 2 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 3 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 lane 4 client-type OTU2E
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

#### Verifying the Muxponder Configuration

The following is a sample to verify the 10 x 10G and 3 x 100G muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 muxponder
Wed Jun 2 18:00:58.201 UTC
```

```
Location:          0/1
Slice ID:          0
Client Bitrate:    MIXED
Trunk Bitrate:     400G
Status:            Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port                               Mapper/Trunk Port   Peer/Trunk Port     CoherentDSP0/1/0/12
Traffic Split Percentage

OTU40/1/0/1                NONE                ODU40/1/0/12/1     100
OTU2E0/1/0/2/3            NONE                ODU2E0/1/0/12/2/3 100
OTU2E0/1/0/2/4            NONE                ODU2E0/1/0/12/2/4 100
OTU2E0/1/0/4/1            NONE                ODU2E0/1/0/12/4/1 100
OTU2E0/1/0/4/2            NONE                ODU2E0/1/0/12/4/2 100
OTU2E0/1/0/4/3            NONE                ODU2E0/1/0/12/4/3 100
OTU2E0/1/0/4/4            NONE                ODU2E0/1/0/12/4/4 100
OTU2E0/1/0/5/1            NONE                ODU2E0/1/0/12/5/1 100
OTU2E0/1/0/5/2            NONE                ODU2E0/1/0/12/5/2 100
OTU2E0/1/0/5/3            NONE                ODU2E0/1/0/12/5/3 100
OTU2E0/1/0/5/4            NONE                ODU2E0/1/0/12/5/4 100
HundredGigEctrlr0/1/0/0    ODU40/1/0/12/0     NONE                100
HundredGigEctrlr0/1/0/6    ODU40/1/0/12/6     NONE                100
```

## Configuring the Muxponder Mode for 200G on OTN-XP Card

Table 7: Feature History

Feature Name	Release Information	Description
Muxponder Configuration for 200G Trunk with QPSK and 8QAM Modulation	Cisco IOS XR Release 7.3.2	The OTN-XP card supports up to 200G trunk rate with QPSK and 8QAM modulation using CFP2. This feature enhances the signal reachability with reduced noise and can support the 50GHz network.  Commands modified: <ul style="list-style-type: none"><li>hw-module (OTN-XP Card)</li></ul>

To configure the OTN-XP card in the 200G muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate** 200G

**commit**

The following is a sample configuration of 200G trunk rate on the mxponder-slice 0 mode for OTN-XP card:

```
RP/0/RP0/CPU0:ios#config
Wed Jun  2 17:17:59.409 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 200G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 10 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

The following is a sample configuration of 200G trunk rate on the mxponder-slice 1 mode for OTN-XP card:

```
RP/0/RP0/CPU0:ios#config
Wed Jun  2 17:17:59.409 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 1
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 200G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 8 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

The following is the sample output for verifying the supported client rates for each trunk rate configured in muxponder slice 0:

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 xponder-capabilities mxponder-slice 0
Wed Jun  2 17:02:33.088 UTC
```

Location: 0/1

Trunk-Port(s): 12

```
Port Group Restrictions:
Shared-Client-Group-Bandwidth      Shared-Group-Client-Ports
      400G                          1, 6, 7, 10
```

```
Trunk-bandwidth: 400G
Client-port      Supported client rates
      1          OTU4, 100GE
      6          OTU4, 100GE
      7          OTU4, 100GE
      10         OTU4, 100GE, 400GE
```

```
Trunk-bandwidth: 300G
Client-port      Supported client rates
      6          OTU4, 100GE
      7          OTU4, 100GE
      10         OTU4, 100GE
```

```
Trunk-bandwidth: 200G
Client-port      Supported client rates
      7          OTU4, 100GE
      10         OTU4, 100GE
```

The following is the sample output for verifying the supported client rates for each trunk rate configured in muxponder slice 1:

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 xponder-capabilities mxponder-slice 1
Wed Jun  2 17:02:50.133 UTC
```

```

Location: 0/1

Trunk-Port(s): 13

Port Group Restrictions:
Shared-Client-Group-Bandwidth      Shared-Group-Client-Ports
    400G                             0, 4, 5, 8

Trunk-bandwidth: 400G
Client-port                          Supported client rates
    0                                 OTU4, 100GE
    4                                 OTU4, 100GE
    5                                 OTU4, 100GE
    8                                 OTU4, 100GE, 400GE

Trunk-bandwidth: 300G
Client-port                          Supported client rates
    4                                 OTU4, 100GE
    5                                 OTU4, 100GE
    8                                 OTU4, 100GE

Trunk-bandwidth: 200G
Client-port                          Supported client rates
    5                                 OTU4, 100GE
    8                                 OTU4, 100GE
    
```

### Configuring 8QAM Modulation for 200G Muxponder Mode

By default, QPSK is the modulation format, when you configure 200G trunk rate.

The following operating modes are supported on the DP04CFP2 coherent pluggable module:

**Table 8: DP04CFP2 Supported Modes**

Network Configuration Mode	Client Type	Trunk Rate	Data Path	Line Framing	FEC Type	Modulation Format	BPS	Baud Rate (GBd)	Pulse Shaping	Mode Type
200G-FOIC2-oFEC-QPSK-1-S (Default mode)	2xFOIC1.2	200G	FlexO Str	FlexO-2	oFEC	QPSK	2	63.1	1	Standard
200G-FOIC2-oFEC-8QAM-1-E	2xFOIC1.2	200G	FlexO Str	FlexO-2	oFEC	8QAM	3	42.1	1	Enhanced

Use the following commands to change the modulation format to 8QAM:

```

configure
controller optics Rack/Slot/Instance/Port bits-per-symbol 3
commit
    
```

The following is a sample in which 8QAM modulation is configured.

```

RP/0/RP0/CPU0:ios#config
Wed Jun 2 17:21:59.409 UTC
RP/0/RP0/CPU0:ios(config)#controller optics0/1/0/12 bits-per-symbol 3
RP/0/RP0/CPU0:ios(config-optics)#commit
    
```

## Verifying the 8QAM Modulation Configuration

```
RP/0/RP0/CPU0:ios#show controllers optics 0/1/0/12
Wed Jun  2 17:17:29.652 UTC
```

```
Controller State: Up
```

```
Transport Admin State: In Service
```

```
Laser State: On
```

```
LED State: Green
```

```
Optics Status
```

```
Optics Type: <Unknown> DWDM
DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,
Wavelength=1552.524nm
```

```
Alarm Status:
```

```
-----
Detected Alarms: None
```

```
LOS/LOL/Fault Status:
```

```
Alarm Statistics:
```

```
-----
HIGH-RX-PWR = 0          LOW-RX-PWR = 1
HIGH-TX-PWR = 0          LOW-TX-PWR = 1
HIGH-LBC = 0             HIGH-DGD = 0
OOR-CD = 0               OSNR = 1
WVL-OOL = 0              MEA = 0
IMPROPER-REM = 0
TX-POWER-PROV-MISMATCH = 0
Laser Bias Current = 0.0 %
Actual TX Power = 0.97 dBm
RX Power = 1.47 dBm
RX Signal Power = 17.67 dBm
Frequency Offset = 82 MHz
```

```
Performance Monitoring: Enable
```

```
THRESHOLD VALUES
```

```
-----
```

Parameter	High Alarm	Low Alarm	High Warning	Low Warning
Rx Power Threshold(dBm)	3.0	-31.5	0.0	0.0
Tx Power Threshold(dBm)	3.0	-12.0	0.0	0.0
LBC Threshold(mA)	N/A	N/A	0.00	0.00

```
-----
```

```
LBC High Threshold = 90 %
Configured Tx Power = 1.00 dBm
Configured CD High Threshold = 96000 ps/nm
Configured CD lower Threshold = -96000 ps/nm
Configured OSNR lower Threshold = 13.70 dB
Configured DGD Higher Threshold = 67.00 ps
Baud Rate = 42.2082633972 GBd
Bits per Symbol = 3.0000000000 bits/symbol
Modulation Type: 8QAM
Chromatic Dispersion 2 ps/nm
```



```
Configured CD-MIN -48000 ps/nm CD-MAX 48000 ps/nm
Polarization Mode Dispersion = 0.0 ps
Second Order Polarization Mode Dispersion = 72.00 ps^2
Optical Signal to Noise Ratio = 34.10 dB
SNR = 18.40 dB
Polarization Dependent Loss = 1.20 dB
Polarization Change Rate = 0.00 rad/s
Differential Group Delay = 2.00 ps
```

Transceiver Vendor Details

```
Form Factor           : Not set
Fiber Connector Type: Not Set
Otn Application Code: Not Set
Sonet Application Code: Not Set
Ethernet Compliance Code: Not set
```

Transceiver Temperature : 46 Celsius

```
AINS Soak           : None
AINS Timer          : 0h, 0m
AINS remaining time : 0 seconds
```

## Configuring the Muxponder Mode for 300G on OTN-XP Card

Table 9: Feature History

Feature Name	Release Information	Description
Muxponder Configuration for 300G Trunk with 8QAM Modulation	Cisco IOS XR Release 7.3.2	The OTN-XP card supports up to 300G trunk rate with 8QAM modulation using CFP2. This feature improves the signal reachability with decreased noise.  Commands modified: <ul style="list-style-type: none"><li>hw-module (OTN-XP Card)</li></ul>

To configure the OTN-XP card in the 300G muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate 300G**

**commit**

The following is a sample configuration of 300G trunk rate on the mxponder-slice 0 mode for OTN-XP card:

```
RP/0/RP0/CPU0:ios#config
Wed Jun  2 17:17:59.409 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 300G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 client-type 100GE
```

```
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 10 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

The following is a sample configuration of 300G trunk rate on the mxponder-slice 1 mode for OTN-XP card:

```
RP/0/RP0/CPU0:ios#config
Wed Jun  2 17:17:59.409 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 1
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 300G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 8 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

The following is the sample output for verifying the supported client rates for each trunk rate configured in muxponder slice 0:

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 xponder-capabilities mxponder-slice 0
Wed Jun  2 17:02:33.088 UTC
```

Location: 0/1

Trunk-Port(s): 12

```
Port Group Restrictions:
Shared-Client-Group-Bandwidth      Shared-Group-Client-Ports
      400G                          1, 6, 7, 10
```

```
Trunk-bandwidth: 400G
Client-port      Supported client rates
  1              OTU4, 100GE
  6              OTU4, 100GE
  7              OTU4, 100GE
 10              OTU4, 100GE, 400GE
```

```
Trunk-bandwidth: 300G
Client-port      Supported client rates
  6                OTU4, 100GE
  7                OTU4, 100GE
 10                OTU4, 100GE
```

```
Trunk-bandwidth: 200G
Client-port      Supported client rates
  7              OTU4, 100GE
 10              OTU4, 100GE
```

The following is the sample output for verifying the supported client rates for each trunk rate configured in muxponder slice 1:

```
RP/0/RP0/CPU0:ios#show hw-module location 0/1 xponder-capabilities mxponder-slice 1
Wed Jun  2 17:02:50.133 UTC
```

Location: 0/1

Trunk-Port(s): 13

```
Port Group Restrictions:
Shared-Client-Group-Bandwidth      Shared-Group-Client-Ports
      400G                          0, 4, 5, 8
```

```
Trunk-bandwidth: 400G
Client-port      Supported client rates
  0              OTU4, 100GE
  4              OTU4, 100GE
```

```

5 OTU4, 100GE
8 OTU4, 100GE, 400GE

Trunk-bandwidth: 300G
Client-port Supported client rates
4 OTU4, 100GE
5 OTU4, 100GE
8 OTU4, 100GE

Trunk-bandwidth: 200G
Client-port Supported client rates
5 OTU4, 100GE
8 OTU4, 100GE
    
```

By default, 8QAM is the modulation format, when you configure 300G trunk rate.

The following operating mode is supported on the DP04CFP2 coherent pluggable module:

**Table 10: DP04CFP2 Supported Modes**

Network Configuration Mode	Client Type	Trunk Rate	Data Path	Line Framing	FEC Type	Modulation Format	BPS	Baud Rate (GBd)	Pulse Shaping	Mode Type
300G-FOIC3-oFEC-8QAM-1-S (Default mode)	3xFOIC1.2	300G	FlexO Str	FlexO-3	oFEC	8QAM	3	63.1	1	Standard

The following sample shows the supported client rates for 300G trunk rate and the provisioning status of slice 1:

```

RP/0/RP0/CPU0:ios#show hw-module location 0/1 mxponder-slice 1
Fri Jul 23 16:04:42.279 UTC

Location: 0/1
Slice ID: 1
Client Bitrate: 100GE
Trunk Bitrate: 300G
Status: Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port Mapper/Trunk Port CoherentDSP0/1/0/13
Traffic Split Percentage
HundredGigECtrlr0/1/0/4 ODU40/1/0/13/8 100
HundredGigECtrlr0/1/0/5 ODU40/1/0/13/5 100
HundredGigECtrlr0/1/0/8 ODU40/1/0/13/8 100
    
```

The following sample shows the default 8QAM modulation format for the 300G trunk rate:

```

RP/0/RP0/CPU0:ios#show controllers optics 0/1/0/12
Wed Jun 2 17:17:29.652 UTC

Controller State: Up

Transport Admin State: In Service

Laser State: On

LED State: Green

Optics Status
    
```

Optics Type: <Unknown> DWDM  
 DWDM carrier Info: C BAND, MSA ITU Channel=61, Frequency=193.10THz,  
 Wavelength=1552.524nm

Alarm Status:

-----  
 Detected Alarms: None

LOS/LOL/Fault Status:

Alarm Statistics:

-----  
 HIGH-RX-PWR = 0                      LOW-RX-PWR = 1  
 HIGH-TX-PWR = 0                      LOW-TX-PWR = 1  
 HIGH-LBC = 0                         HIGH-DGD = 0  
 OOR-CD = 0                            OSNR = 1  
 WVLOOL = 0                            MEA = 0  
 IMPROPER-REM = 0  
 TX-POWER-PROV-MISMATCH = 0  
 Laser Bias Current = 0.0 %  
 Actual TX Power = 0.97 dBm  
 RX Power = 1.47 dBm  
 RX Signal Power = 17.67 dBm  
 Frequency Offset = 82 MHz

Performance Monitoring: Enable

THRESHOLD VALUES

Parameter	High Alarm	Low Alarm	High Warning	Low Warning
Rx Power Threshold(dBm)	3.0	-31.5	0.0	0.0
Tx Power Threshold(dBm)	3.0	-12.0	0.0	0.0
LBC Threshold(mA)	N/A	N/A	0.00	0.00

LBC High Threshold = 90 %  
 Configured Tx Power = 1.00 dBm  
 Configured CD High Threshold = 96000 ps/nm  
 Configured CD lower Threshold = -96000 ps/nm  
 Configured OSNR lower Threshold = 13.70 dB  
 Configured DGD Higher Threshold = 67.00 ps  
 Baud Rate = 42.2082633972 GBd  
**Bits per Symbol = 3.0000000000 bits/symbol**  
**Modulation Type: 8QAM**  
 Chromatic Dispersion 2 ps/nm  
 Configured CD-MIN -48000 ps/nm CD-MAX 48000 ps/nm  
 Polarization Mode Dispersion = 0.0 ps  
 Second Order Polarization Mode Dispersion = 72.00 ps^2  
 Optical Signal to Noise Ratio = 34.10 dB  
 SNR = 18.40 dB  
 Polarization Dependent Loss = 1.20 dB  
 Polarization Change Rate = 0.00 rad/s  
 Differential Group Delay = 2.00 ps

Transceiver Vendor Details

Form Factor                            : Not set  
 Fiber Connector Type: Not Set  
 Otn Application Code: Not Set  
 Sonet Application Code: Not Set  
 Ethernet Compliance Code: Not set

Transceiver Temperature : 46 Celsius

AINS Soak : None  
 AINS Timer : 0h, 0m  
 AINS remaining time : 0 seconds

## Configuring the Muxponder Mode for 4x100GE-MXP-DD

**Table 11: Feature History**

Feature Name	Release Information	Description
4X100GE MXP modes with QDD ZRP for OTN-XP Card	Cisco IOS XR Release 7.3.2	On the OTN-XP card, you can configure a single 4x100GE payload that is received over the client port as a 400GE signal over DWDM on the line side.  The card improves efficiency, performance, and flexibility for customer networks allowing 4x100GE client transport over 400GE WDM wavelength.

From Release 7.3.2 onwards, you can configure the 4x100GE-MXP-DD muxponder mode on the OTN-XP card.

### Restrictions for Port Group Mapping - 4X100GE-MXP-DD

The following table explains about the port mapping when the mxponder-slice 0 is at the near end and is connected to the mxponder-slice 1 at the far end:

**Table 12: Port Group Mapping**

Slice Configuration - Client Port	Shared-Client-Group-Bandwidth	Shared-Group-Client-Ports
Slice 0	400G	1, 6, 7, 10
Slice 1	400G	8, 0, 4, 5

The traffic flows from the near-end slice-0 to the far-end slice-1 client ports:

- The port 1 traffic reaches port 8
- The port 6 traffic reaches port 0
- The port 7 traffic reaches port 4
- The port 10 traffic reaches port 5

The following table describes the QSFP DD trunk port to the slice-0 client port and slice-1 client port mapping:

Table 13: QSFP DD Trunk Port to the Slice-0 and Slice-1 Client Port Mapping

QSFP-DD Trunk Port	Slice 0 - Client Port	Slice 1 - Client Port
0	Port 10	Port 5
1	Port 7	Port 4
2	Port 6	Port 0
3	Port 1	Port 8

### Configuring the Muxponder Mode for 4x100GE-MXP-DD

To configure the OTN-XP card in the 4x100GE-MXP-DD muxponder mode, use the following commands:

**configure**

**hw-module location** *location* **mxponder-slice** *mxponder-slice-number*

**trunk-rate** 400G

**client-port-rate** *client-port-number* **client-type** 100GE

**commit**

#### Example

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 0 mode.

```
RP/0/RP0/CPU0:ios#configure
Tue Jun 15 20:20:17.227 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/0 mxponder-slice 0
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 1 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 6 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 7 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 10 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
Tue Jun 15 20:20:57.532 UTC
```

#### Verifying the Muxponder Configuration

The following is a sample to verify the 4x100GE-MXP-DD muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/0 mxponder
Tue Jun 15 20:21:46.587 UTC

Location:                0/0
Slice ID:                0
Client Bitrate:          100GE
Trunk Bitrate:           400G
Status:                  Provisioned
LLDP Drop Enabled:      FALSE
ARP Snoop Enabled:       FALSE
Client Port              Mapper/Trunk Port      CoherentDSP0/0/0/11
                        Traffic Split Percentage
```

```
HundredGigECtrlr0/0/0/1      -      100
HundredGigECtrlr0/0/0/6      -      100
HundredGigECtrlr0/0/0/7      -      100
HundredGigECtrlr0/0/0/10     -      100
```

The following is a sample in which the OTN-XP card is configured with 400G trunk rate on the mxponder-slice 1 mode.

```
RP/0/RP0/CPU0:ios#configure
Tue Jun 15 20:22:13.981 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/0 mxponder-slice 1
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 400G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 0 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 4 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 5 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 8 client-type 100GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit
```

### Verifying the Muxponder Configuration

The following is a sample to verify the 4x100GE-MXP-DD muxponder configuration in the OTN-XP card.

```
RP/0/RP0/CPU0:ios#show hw-module location 0/0 mxponder-slice 1
Tue Jun 15 20:23:06.217 UTC

Location:          0/0
Slice ID:          1
Client Bitrate:    100GE
Trunk Bitrate:     400G
Status:           Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port                               Mapper/Trunk Port      CoherentDSP0/0/0/9
                                           Traffic Split Percentage

HundredGigECtrlr0/0/0/0                   -                      100
HundredGigECtrlr0/0/0/4                   -                      100
HundredGigECtrlr0/0/0/5                   -                      100
HundredGigECtrlr0/0/0/8                   -                      100
```

```
RP/0/RP0/CPU0:ios#show hw-module location 0/0 mxponder
Tue Jun 15 20:23:46.650 UTC

Location:          0/0
Slice ID:          0
Client Bitrate:    100GE
Trunk Bitrate:     400G
Status:           Provisioned
LLDP Drop Enabled: FALSE
ARP Snoop Enabled: FALSE
Client Port                               Mapper/Trunk Port      CoherentDSP0/0/0/11
                                           Traffic Split Percentage

HundredGigECtrlr0/0/0/1                   -                      100
HundredGigECtrlr0/0/0/6                   -                      100
HundredGigECtrlr0/0/0/7                   -                      100
HundredGigECtrlr0/0/0/10                  -                      100
```

```
Location:          0/0
```

```

Slice ID:                1
Client Bitrate:         100GE
Trunk Bitrate:         400G
Status:                 Provisioned
LLDP Drop Enabled:     FALSE
ARP Snoop Enabled:     FALSE
Client Port              Mapper/Trunk Port      CoherentDSP0/0/0/9
                        Traffic Split Percentage

HundredGigEctrlr0/0/0/0      -              100
HundredGigEctrlr0/0/0/4      -              100
HundredGigEctrlr0/0/0/5      -              100
HundredGigEctrlr0/0/0/8      -              100

```

## Configuring Inverse Muxponder on OTN-XP Card for 400GE Client

Table 14: Feature History

Feature Name	Release Information	Feature Description
Inverse Muxponder Configuration on OTN-XP Card	Cisco IOS XR Release 7.3.2	<p>The OTN-XP card supports inverse multiplexing for 400GE client over 2x200G CFP2 trunk ports. This feature allows you to split the 400GE client signal and carry it over 2x200G trunks thereby increasing the ease of signal reachability.</p> <p>Commands modified:</p> <ul style="list-style-type: none"> <li>hw-module (OTN-XP Card)</li> <li>controller coherentDSP</li> </ul>

You can configure the OTN-XP card to support inverse multiplexing for 400GE client over 2x200G CFP2 trunk ports. To configure the inverse muxponder datapath, use the following commands:

**configure**

**hw-module location** *location*

**mxponder**

**trunk-rate** 200G

**client-port-rate** *client-port-number* **client-type** 400GE

**commit**

**end**

The following sample configures inverse muxponder for 400G:

```

RP/0/RP0/CPU0:ios #Configure
RP/0/RP0/CPU0:ios(config)#hw-module location 0/0 mxponder
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#trunk-rate 200G
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#client-port-rate 10 client-type 400GE
RP/0/RP0/CPU0:ios(config-hwmod-mxp)#commit

```



The following sample verifies the inverse muxponder configuration:

```
RP/0/RP0/CPU0:ios#show hw-module location 0/0 mxponder
Wed Jun 9 23:16:59.478 UTC

Location:                0/0
Client Bitrate:          400GE
Trunk Bitrate:           200G
Status:                  Provisioned
LLDP Drop Enabled:       FALSE
ARP Snoop Enabled:       FALSE
Client Port              Mapper/Trunk Port      CoherentDSP0/0/0/12
CoherentDSP0/0/0/13

Traffic Split Percentage

FourHundredGigEctrlr0/0/0/10 ODU-FLEX0/0/0/12/10      50      50
```

### Alarm Correlation in Inverse Muxponder

When any service-affecting alarm is raised on the trunk port 12 or 13, the alarms are reported on the ports as follows:

- Port 12—Flexo alarms (FLEXO\_LOS, FLEXO\_LOL, FLEXO\_GIDM, FLEXO\_FMM, FLEXO\_LOF, and FLEXO\_LOM) and OTU alarms (LOD, AIS, LOS, LOM, LOD, and TIM)
- Port 13—Flexo alarms except Flexo MM and GIDM.

Both ports 12 and 13 go down when any service-affecting alarm is raised.

#### Example:

Shut down the trunk port 12:

```
RP/0/RP0/CPU0:ios(config)#controller coherentDSP 0/3/0/12
RP/0/RP0/CPU0:ios(config-CoDSP)#shutdown
RP/0/RP0/CPU0:ios(config-CoDSP)#commit
Thu Sep 30 14:12:48.416 UTC
```

The following sample verifies that when trunk port 12 is shut down, LOS alarm is raised and the trunk port 13 also goes down.

```
RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/2/0/12
Thu Sep 30 14:12:54.604 UTC

Port                : CoherentDSP 0/2/0/12
Controller State    : Down
Inherited Secondary State : Normal
Configured Secondary State : Normal
Derived State       : In Service
Loopback mode       : None
BER Thresholds      : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring : Enable
Bandwidth           : 200.0Gb/s

Alarm Information:
LOS = 2 LOF = 0 LOM = 0
OOF = 1 OOM = 0 AIS = 1
IAE = 0 BIAE = 0      SF_BER = 0
SD_BER = 0      BDI = 0 TIM = 0
FECMISMATCH = 0 FEC-UNC = 0  FLEXO_GIDM = 0
FLEXO-MM = 0  FLEXO-LOM = 0  FLEXO-RDI = 1
FLEXO-LOF = 0
Detected Alarms    : LOS
```

```

Bit Error Rate Information
  PREFEC BER           : 0.00E+00
  POSTFEC BER          : 0.00E+00
  Q-Factor             : 0.00 dB

Q-Margin               : 0.00dB

TTI :
  Remote IP addr       : 0.0.0.0

FEC mode               : O_FEC

Flexo-Mode             : Enable
Flexo Details:
  Tx  GID              : 1
  TX  IID              : 1, 2,
  Rx  GID              : 0
  RX  IID              : 0, 0,

Flexo Peers Information:
  Controller           : CoherentDSP0_2_0_13
  OTUCn rate          : OTUC2

AINS Soak              : None
AINS Timer             : 0h, 0m
AINS remaining time    : 0 seconds

RP/0/RP0/CPU0:ios#show controllers coherentDSP 0/2/0/13
Thu Sep 30 14:12:59.330 UTC

Port                   : CoherentDSP 0/2/0/13
Controller State       : Down
Inherited Secondary State : Normal
Configured Secondary State : Normal
Derived State          : In Service
Loopback mode          : None
BER Thresholds         : SF = 1.0E-5  SD = 1.0E-7
Performance Monitoring : Enable
Bandwidth              : 200.0Gb/s

Alarm Information:
LOS = 1  LOF = 0  LOM = 0
OOF = 0  OOM = 0  AIS = 0
IAE = 0  BIAE = 0      SF_BER = 0
SD_BER = 0      BDI = 0  TIM = 0
FECMISMATCH = 0  FEC-UNC = 0      FLEXO_GIDM = 0
FLEXO-MM = 0      FLEXO-LOM = 0    FLEXO-RDI = 1
FLEXO-LOF = 0
Detected Alarms        : None

Bit Error Rate Information
  PREFEC BER           : 0.00E+00
  POSTFEC BER          : 0.00E+00
  Q-Factor             : 15.80 dB

Q-Margin               : 9.50dB

TTI :
  Remote IP addr       : 0.0.0.0

FEC mode               : O_FEC

```

```

Flexo-Mode                               : Enable
Flexo Details:
  Tx GID                                  : 1
  TX IID                                  : 3, 4,
  Rx GID                                  : 1
  RX IID                                  : 3, 4,

Flexo Peers Information:
  Controller                               : CoherentDSP0_2_0_12
  OTUCn rate                              : OTUC2

AINS Soak                                 : None
AINS Timer                                : 0h, 0m
AINS remaining time                       : 0 seconds

```

You can perform the following configurations on the DSPcontroller ports:

- [Flexo Parameter Update on Inverse Muxponder Configuration on the OTN-XP Card](#)
- [Configure TTI on Inverse Muxponder Configuration on the OTN-XP Card](#)
- [Configure Loopback on Inverse Muxponder Configured on the OTN-XP Card](#)

## 2-QDD-C Line Card

**Table 15: Feature History**

Feature Name	Release Information	Description
NCS1K4-2-QDD-C-K9 C-Band Line Card	Cisco IOS XR Release 7.3.1	<p>NCS 1004 supports the NCS1K4-2-QDD-C-K9 C-Band line card. The card has eight client ports (QSFP28 and QSFP-DD) and two DWDM dual sub-channel module trunk ports. Each trunk port is capable of 200, 300, and 400 Gbps line rate with fine control of modulation format, baud-rate, and forward error correction. The trunk ports are software configurable. The line card supports module and slice configurations.</p> <p>Command added:</p> <ul style="list-style-type: none"> <li>• <b>controller fourHundredGigECtrlr</b></li> </ul>

The following section describes the supported configurations and procedures to configure the card modes on the 2-QDD-C line card.

## Limitations for 2-QDD-C

- Flex Ethernet is not supported.
- A single 400GE cannot be split and use as 4x 100GE due to hardware limitations.

## Unsupported Features for 2-QDD-C in R731

The following features are not supported in R7.3.1 for 2-QDD-C card:

- OTU4 client
- Layer 1 encryption
- GCC remote node management
- Line rates of 50G, 100G, 150G, 250G, and 350G

## 2-QDD-C Card Modes

The 2-QDD-C line cards support module and slice configurations.

The line cards have two trunk ports (0 and 1) and 8 client ports (2 through 9) each. You can configure the line card in two modes:

- Muxponder—In this mode, both trunk ports are configured with the same trunk rate. The client-to-trunk mapping is in a sequence in vertical order.
- Muxponder slice—In this mode, each trunk port is configured independent of the other with different trunk rates. The client-to-trunk mapping is fixed in vertical order. For Trunk 0, the client ports are 2 through 5. For Trunk 1, the client ports are 6 through 9.

## Supported Data Rates for 2-QDD-C Card

The following table displays the client and trunk ports that are enabled for the muxponder configuration.

Trunk Data Rate	Card Support	Client Data Rate	Client Optics	Trunk Ports	Client Ports
200	2-QDD-C	100GE, OTU4	QSFP-28	0, 1	2, 3, 4, 5
300	2-QDD-C	100GE, OTU4	QSFP-28	0, 1	2, 3, 4, 5, 6, 7
400	2-QDD-C	100GE, OTU4	QSFP-28	0, 1	2, 3, 4, 5, 6, 7, 8, 9
200	2-QDD-C	400GE	QSFP-DD	0, 1	4
400	2-QDD-C	400GE	QSFP-DD	0, 1	4,8

The following table displays the client and trunk ports that are enabled for the muxponder slice 0 configuration.

Trunk Data Rate	Card Support	Client Data Rate	Trunk Ports	Client Ports
200	2-QDD-C	100GE, OTU4	0	2, 3

Trunk Data Rate	Card Support	Client Data Rate	Trunk Ports	Client Ports
300	2-QDD-C	100GE, OTU4	0	2, 3, 4
400	2-QDD-C	100GE, OTU4	0	2, 3, 4, 5
400	2-QDD-C	400GE	0	4

The following table displays the client and trunk ports that are enabled for the muxponder slice 1 configuration.

Trunk Data Rate	Card Support	Client Data Rate	Trunk Ports	Client Ports
200	2-QDD-C	100GE, OTU4	1	6, 7
300	2-QDD-C	100GE, OTU4	1	6, 7, 8
400	2-QDD-C	100GE, OTU4	1	6, 7, 8, 9
400	2-QDD-C	400GE	1	8

The following table displays the trunk parameter ranges for the 2-QDD-C card.

Trunk Payload	FEC	Min BPS	Max BPS	Min GBd	Max GBd
150G	27%	1.453125	4.335938	24.02079	71.67494
200G	27%	2	4.40625	31.51	69.43
250G	27%	2.414063	6	28.93129	71.9069
300G	27%	2.8984375	6	34.7175497	71.8681352
350G	27%	3.382813	6	40.5038	71.84047
400G	27%	3.8671875	6	46.2900663	71.8197392
150G	15%	1.320313	3.9375	24.02079	71.67494
200G	15%	1.7578125	5.25	24.02079115	71.74209625
250G	15%	2.195313	6	26.27274	71.80592
300G	15%	3.8203125	6	31.52728839	49.51525048
350G	15%	3.070313	6	36.78184	71.87901
400G	15%	3.8671875	6	42.03638452	71.9018782



**Note** The recommended value for 6 BPS for corresponding line rates are listed below:

Trunk Payload	FEC	BPS	GBd
300G	27%	6	34.7175
350G	27%	6	40.5038
400G	15%	6	42.0364

For more information on the QDD-C card, see the [data sheet](#).

## Configuring the Card Mode for 2-QDD-C Card

From R7.3.1, you can configure the 2-QDD-C line card in the module (muxponder) or slice configuration (muxponder slice).

To configure the card in the muxponder mode, use the following commands:

- **configure**

```
hw-module location location mxponder client-rate {100GE | OTU4 }
```

```
hw-module location location mxponder trunk-rate {100G | 150G | 200G | 250G | 300G | 350G | 400G }
```

```
commit
```

- **configure**

```
hw-module location location mxponder client-rate { 400GE }
```

```
hw-module location location mxponder trunk-rate { 200G | 400G }
```

```
commit
```

To configure the card in the muxponder slice mode, use the following commands.

**configure**

```
hw-module location location mxponder-slice mxponder-slice-number client-rate { 100GE | 400GE }
```

```
hw-module location location mxponder-slice mxponder-slice-number trunk-rate { 100G | 200G | 300G | 400G }
```

```
commit
```

### Examples

The following is a sample in which the card is configured in the muxponder mode with a 400G trunk rate.

```
RP/0/RP0/CPU0:ios#config
Tue Oct 15 01:24:56.355 UTC
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder client-rate 100GE
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder trunk-rate 400G
RP/0/RP0/CPU0:ios(config)#commit
```

The following is a sample in which the card is configured in the muxponder slice 0 mode with a 400G trunk rate.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0 client-rate 100GE
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 0 trunk-rate 400G
RP/0/RP0/CPU0:ios(config)#commit
```

The following is a sample in which the card is configured in the muxponder slice 1 mode with a 400G trunk rate.

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 1 client-rate 100GE
RP/0/RP0/CPU0:ios(config)#hw-module location 0/1 mxponder-slice 1 trunk-rate 400G
RP/0/RP0/CPU0:ios(config)#commit
```

The following is a sample in which the card is configured in the muxponder mode with a 400GE trunk rate.

```
RP/0/RP0/CPU0:west#configure
Thu Oct 7 11:43:01.914 IST
RP/0/RP0/CPU0:west(config)#hw-module location 0/2 mxponder trunk-rate 4
400G 450G
RP/0/RP0/CPU0:west(config)#hw-module location 0/2 mxponder trunk-rate 400G
RP/0/RP0/CPU0:west(config)#hw-module location 0/2 mxponder client-rate 400GE
RP/0/RP0/CPU0:west(config)#commit
```

