



Configure Affinity for OTN

This chapter describes the XR procedure for configuring Affinity Support for OTN GMPLS.

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Configuring Affinity for GMPLS using Cisco IOS XR commands

Procedure

Step 1 Define colours and assign bits to each colour using command : **affinity-map** *<colour>* **bit-position** *<bit position>*

Example:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# mpls traffic-eng
RP/0/RP0:hostname(config-mpls-te)# affinity-map red bit-position 1
RP/0/RP0:hostname(config-mpls-te)# affinity-map green bit-position 0
```

Note Only one colour can be mapped to a particular bit position.

Note Same bit map should be defined at all the connected nodes.

Step 2 Assign one or multiple colours to the OTN link using command **affinity-name***<colour>*

Example:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# mpls traffic-eng
RP/0/RP0:hostname(config-mpls-te)# gmpls optical-nni
RP/0/RP0:hostname(config-te-gmpls-nni)# topology instance ospf abc area 5
RP/0/RP0:hostname(config-te-gmpls-nni-ti)# controller otu4 0/0/0/1
RP/0/RP0:hostname(config-te-gmpls-nni-ti-cntl)# affinity-name red blue green yellow
```

Note Assign colour to all the ports of the connected nodes.

Step 3 Define an attribute set using command **attribute-set path-option**

This will define the affinity constraints.

Example:

```
RP/0/RP0:hostname# configure terminal
RP/0/RP0:hostname(config)# mpls traffic-eng
RP/0/RP0:hostname(config-mpls-te)# attribute-set path-option Affinity1
RP/0/RP0:hostname(config-te-attribute-set)# affinity include red
```

Step 4 Configure **attribute-set** for **path-option** for OTN tunnel.

This will assign affinity constraints to OTN tunnel. Following are the constraint type:

- **include** : The TE link will be eligible for path-calculation if it has all the colours listed in the constraint. The link may have additional colours.
- **include-strict** : The TE link will be eligible for path-calculation only if it has the same set of colours listed in the constraint. The link should not have any additional colour.
- **exclude**: The TE link will be eligible for path-calculation if it does not have all the colours listed in the constraint
- **exclude-all**: This constraint is not associated with any colour. If this constraint is configured for a tunnel, path-calculator will only accept the links that do not have any colour.

Note In case of exclude-all constraint, other configured constraints for the same tunnel will be ignored.

Example:

```
RP/0/RP0:hostname# configure
RP/0/RP0:hostname(config)# mpls traffic-eng
RP/0/RP0:hostname(config-mpls-te)# gmpls optical-nni
RP/0/RP0:hostname(config-te-gmpls-nni)# controller Odu-Group-Te 7
RP/0/RP0:hostname(config-te-gmpls-tun-0x7)# signalled-bandwidth ODU2
RP/0/RP0:hostname(config-te-gmpls-tun-0x7)# destination ipv4 unicast 192.168.0.3
RP/0/RP0:hostname(config-te-gmpls-tun-0x7)# path-option 1 dynamic attribute-set Affinity1
protected-by 2 restored-from 3 lockdown
RP/0/RP0:hostname (config-te-gmpls-tun-0x7)# path-option 2 dynamic attribute-set Affinity2
lockdown
```

Step 5 Verify the configurations using show commands.**Example:**

```
RP/0/RP0:hostname# show mpls traffic-eng affinity-map
```

```
Tue Jun 26 15:12:01.948 IST
          Affinity Name      Bit-position      Affinity Value
Affinity Table
-----
Mapping                red                2                0x::4
Mapping                yellow             3                0x::8
Mapping                blue              21               0x::20:0
Mapping                green             31               0x::8000:0
```

```
RP/0/RP0:hostname# show mpls traffic-eng link-management optical-nni controller otu2 0/0/0/22
```

```

Tue Nov 7 11:52:51.063 IST
System Information::
NNI OTN Links Count: 3 (Maximum NNI OTN Links Supported 300)
Link Name:: OTU20_0_0_22 (Handle:0x00000170, Addr: V4-Unnum 192.168.0.1 [17])
Link Status      : Up
Link Label Type  : G709_ODU
Physical BW      : OTU2 (10.709Gbps)
Max LSP Bandwidth Per Priority(kbps):
  Priority[0] : 7495557
  Priority[1] : 0
  Priority[2] : 0
  Priority[3] : 0
  Priority[4] : 0
  Priority[5] : 0
  Priority[6] : 0
  Priority[7] : 0
Fixed ODU Capabilities:
  Signal Type      Stages      Flags      Resources
                   1 2 3 4    T S 1.25G 2.5G V L Maximum Unreserved
  -----
  ODU2             - - - -    Y Y Y    N   N N 1      0
  ODU0             2             Y Y Y    N   N N 8      6
  ODU1             2             Y Y Y    N   N N 4      3
Flex ODU Capabilities:
  Signal Type      Stages      Flags      Bandwidth(kbps)
                   1 2 3 4    T S 1.25G 2.5G V L Maximum Unreserved Max Lsp
  -----
  ODUFlex CBR     2             Y Y Y    N   N N 9995277 7495557 7495557
  ODUFlex GFPFix 2             Y Y Y    N   N N 9995277 7494313 7494313

SRLG Values:1,
TTI Mode          : Section Monitoring
TCM ID            : 0
IGP Neighbor Count : 1
Flooding Status: (1 area)
IGP Area[1]:: OSPF, ring, 0: Flooded
Remote Link Id:V4-Unnum 192.168.0.2 [16], TE Metric: 1
Delay(Configured/Computed/ToFlood): 0/0/300000 micro-sec
Attributes      : 0x2
Attribute Names : red(1)

```

RP/0/RP0:hostname# show mpls traffic-eng topology

```

IGP Id: 192.168.0.4, MPLS TE Id: 192.168.0.4 Router Node (OSPF ring area 0)
Link[0]:Point-to-Point, Nbr IGP Id:192.168.0.2, Nbr Node Id:2, gen:28399
  Attribute Flags: 0x2
  Ext Admin Group:
    Length: 256 bits
    Value : 0x::2
  Attribute Names: red(1)
  Intf Id:13 Nbr Intf Id:15 TE Metric:1
  Uni Delay:300000
  SRLGs: 3
  Switching Capability:otn, Encoding:g709-otn
  Physical BW:10709224 (kbps), Max Reservable BW:10709224 (kbps)
  Max LSP Bandwidth Per Priority(kbps):
    Priority[0] : 7495556
    Priority[1] : 0
    Priority[2] : 0
    Priority[3] : 0

```

```

Priority[4] : 0
Priority[5] : 0
Priority[6] : 0
Priority[7] : 0
Fixed ODU Capabilities:
  Signal Type      Stages      Flags      Resources
                   1 2 3 4 T S 1.25G 2.5G V L Maximum Unreserved
  -----
  ODU2             - - - - - Y Y Y N N N 1 0
  ODU0             2 - - - - Y Y Y N N N 8 6
  ODU1             2 - - - - Y Y Y N N N 4 3
Flex ODU Capabilities:
  Signal Type      Stages      Flags      Bandwidth(kbps)
                   1 2 3 4 T S 1.25G 2.5G V L Maximum Unreserved Max Lsp
  -----
  ODUFlex CBR     2 - - - - Y Y Y N N N 9995277 7495556 7495556
  ODUFlex GFPFix 2 - - - - Y Y Y N N N 9995277 7494312 7494312

```

RP/0/RP0:hostname# show mpls traffic-eng attribute-set path-option test2

```

Thu Dec 21 14:12:43.364 IST
Attribute Set Name: test2 (Type: path option)
Bandwidth: 0 kbps (CT0) (Default)
Number of affinity constraints: 3
  Include bit map      : 0x2
  Include ext bit map  :
  Length: 256 bits
  Value : 0x::2
  Include affinity name : red(1)
  Include bit map      : 0x4
  Include ext bit map  :
  Length: 256 bits
  Value : 0x::4
  Include affinity name : blue(2)
  Include bit map      : 0x8
  Include ext bit map  :
  Length: 256 bits
  Value : 0x::8
  Include affinity name : yellow(3)
Exclude List Name: none (Default)
List of tunnel IDs (count 0)

```

RP/0/RP0:hostname# show mpls traffic-eng tunnels 7 detail

```

Tue Nov 7 11:19:28.610 IST
Name: Odu-Group-Te7 Destination: 192.168.0.4 Ifhandle:0xd0
Signalled-Name: rtrA_otn7
Status:
  Admin: up Oper: up Path: valid Signalling: connected
  path option 1, (LOCKDOWN) type dynamic (Basis for Current, path weight 2)
  Protected-by PO index: none
  Path-option attribute: test_red
  Number of affinity constraints: 1
  Include bit map      : 0x2
  Include ext bit map  :
  Length: 256 bits
  Value : 0x::2
  Include affinity name : red(1)

```

```

Reroute pending (DROP)
path option 2, (LOCKDOWN) type dynamic
Path-option attribute: test_red
Number of affinity constraints: 1
  Include bit map           : 0x2
  Include ext bit map       :
    Length: 256 bits
    Value : 0x::2
  Include affinity name     : red(1)

Last PCALC Error [Standby]: Mon Nov  6 16:52:34 2017
  Info: No diverse path found
Bandwidth Requested: 2498775 kbps  CT0
Creation Time: Mon Nov  6 15:36:06 2017 (19:43:22 ago)
Config Parameters:
Bandwidth: ODU1
Priority: 24  0 Affinity: 0x0/0xffff
Metric Type: TE (default)
Path Selection:
  Tiebreaker: Min-fill (default)
Hop-limit: disabled
Cost-limit: disabled
Delay-limit: disabled
Path-invalidation timeout: 10000 msec (default), Action: Tear (default)
AutoRoute: disabled LockDown: enabled Policy class: not set
Forward class: 0 (not enabled)
Forwarding-Adjacency: disabled
Autoroute Destinations: 0
Loadshare:          0 equal loadshares
Auto-bw: disabled
Fast Reroute: Disabled, Protection Desired: None
BFD Fast Detection: Disabled
Reoptimization after affinity failure: Enabled
Soft Preemption: Disabled
SNMP Index: 13
Binding SID: None
Path Protection Info:
  SNC Mode:SNC-N , TCM id: Not used , Type:Bi-directional APS, Non-revertive
  Restoration style: keep-failed-lsp
  Path Protection Profile Type: 1+0
  Timers WTR: 300000 milliseconds, HoldOff: 0 milliseconds
  Active Lsp: WORKING LSP, Standby Diversity Type: None
Restoration Info:
  Non-revertive
  Diverse Lsp for UNKNOWN, Diversity Type: None
Revert Schedule: Not Configured
Static-uni Info:
  Locally Client Port:  Client Ifhandle: 0x0
  Client ODU:  Client ODU Ifhandle: 0x0
  XC Id: 0
  State: Not Connected
  Uptime: Thu Jan  1 05:30:00 1970
Working Homepath ERO:
  Status: Down
  Explicit Route:
Diversity Info:
  Dependent Tunnel List:
    8

Current LSP Info:
  Instance: 2108, Signaling Area: OSPF ring area 0
  Uptime: 18:27:10 (since Mon Nov 06 16:52:18 IST 2017), Signaling State: Up, Oper State:
Up
  G-PID: None (0)

```

```

XC Id: 0
State: Connected
Uptime: Mon Nov  6 16:52:18 2017
Egress Interface: OTU20/0/0/22 (State:Up Ifhandle:0x170)
Egress Controller: ODU20_0_0_22 (State:Up Ifhandle:0x190)
Egress Sub Controller: ODU10_0_0_22_41 (State:Up, Ifhandle:0x3d0)
Path Ingress label: TPN: 4 BitMap Len: 8 BitMap: 7:8
Resv Egress label: TPN: 4 BitMap Len: 8 BitMap: 7:8
Router-IDs: local      192.168.0.1
             downstream 192.168.0.2
Soft Preemption: None
SRLGs: not collected
Path Info:
  Outgoing:
    Explicit Route:
      Strict, 192.168.0.2(16)
      Strict, 192.168.0.4(13)
      Strict, 192.168.0.4

Record Route: Empty
Tspec: signal_type ODU1 Bitrate 0kbps NVC 0 MT 1

Session Attributes: Local Prot: Not Set, Node Prot: Not Set, BW Prot: Not Set
                   Soft Preemption Desired: Not Set
Path Protection Info:
SNC Mode:SNC-N TCM id:Not used Type:Bi-directional APS
Path Protection Profile Type: 1+0
Bits S:0 P:0 N:0 O:0
Timeout WTR:0 milliseconds HoldOff:0 milliseconds
Resv Info:
Record Route:
IPv4 192.168.0.2, flags 0x20 (Node-ID)
Label          Label TPN: 4 BitMap Len: 8 BitMap: 7:8 , flags 0x1

Unnumbered 192.168.0.2 (16), flags 0x0
Label          Label TPN: 4 BitMap Len: 8 BitMap: 7:8 , flags 0x1
IPv4 192.168.0.4, flags 0x20 (Node-ID)
Label          Label TPN: 4 BitMap Len: 8 BitMap: 7:8 , flags 0x1

Unnumbered 192.168.0.4 (13), flags 0x0
Label          Label TPN: 4 BitMap Len: 8 BitMap: 7:8 , flags 0x1
Tspec: signal_type ODU1 Bitrate 0kbps NVC 0 MT 1

Persistent Forwarding Statistics:
  Out Bytes: 0
  Out Packets: 0
Displayed 1 (of 2) heads, 0 (of 0) midpoints, 0 (of 0) tails
Displayed 1 up, 0 down, 0 recovering, 0 recovered heads

```
