

VLAN over ODU

This chapter provides conceptual and configuration information to enable VLAN over ODU on Cisco NCS 4000 Series routers.

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Understand VLAN over ODU

This feature enables the user to carry the VLAN traffic over the ODU channel. The ODU channel is created as part of the GMPLS tunnel using local termination method.

Local termination method enables the user to create multiple GMPLS tunnels from the head-end only instead of manually configuring tunnels across multiple nodes of the topology.

Local termination method is supported for following channelized interfaces:

- ODU4 terminating to 100GE interface.
- ODU2, ODU2e, ODU1e terminating to 10GE interface.
- ODU3 terminating to 40GE interface.

Enable VLAN over ODU : Configuring Head End Node

Following procedure enables to carry the VLAN traffic over an ODU channel. The ODU channel is created as part of the GMPLS tunnel using local termination method.

Procedure

Step 1 To configure an OTN controller,

Step 2 Configure GCC.

Step 3 Configure OSPF on the OTN controller, complete

Step 4 To configure packet controller :

Step 5 Perform manipulation of VLAN tags using rewrite command.

Step 6 To configure the MPLS-TE on packet controller, complete

Step 7 To configure local switching , complete Configuring Local Switching.

SRLG Announce on Ethernet Terminated ODU

To provide better protection at L2 layer, the SRLG configured on OTN layer needs to be propagated to the Ethernet Terminated Interface. SRLG Announce feature enables to fetch SRLG values from all traversed TE-Links, summarize and announce them to the ethernet terminated interface at head and tail nodes.

Enabling SRLG Announce on Ethernet Terminated ODU

To provide better protection at L2 layer, the SRLG configured on OTN layer needs to be propagated to the Ethernet Terminated Interface. SRLG Announce feature enables to fetch SRLG values from all traversed TE-Links, summarize and announce them to the ethernet terminated interface at head and tail nodes.

Perform following procedure to enable SRLG announce on Ethernet Terminated ODU on headend node. SRLG announce can be enabled on both headend and tailend.

Procedure

Step 1 **configure**

Example:

```
RP/0/# configure
```

Enters Global Configuration mode.

Step 2 **mpls traffic-eng**

Example:

```
RP/0/(config)# mpls traffic-eng
```

Enters MPLS-TE configuration mode.

Step 3 **gmpls optical-nni**

Example:

```
RP/0/(config-mpls-te)# gmpls optical-nni
```

Enters the GMPLS NNI configuration mode.

Step 4 **controller odu-group-te** *tunnel-id*

Example:

```
RP/0/(config-te-gmpls-nni)# controller odu-group-te 10
```

Enters the Odu-Group-Te configuration mode. The tunnel ID value ranges from 0 to 64535.

Step 5 **signalled-bandwidth** *oduk*

Example:

```
RP/0/(config-te-gmpls-tun-0xa)# signalled-bandwidth ODU2
```

Configures the bandwidth required for a GMPLS OTN tunnel.

Step 6 **static-uni local-termination interface-name** *interface-path-id* **remote-termination unnumbered** *tail-end-if-index*

Example:

```
RP/0/(config-te-gmpls-tun-0xa)# static-uni local-termination interface-name TenGigE0/1/0/0/100
 remote-termination unnumbered 32
```

Sets the static UNI endpoints of the NNI tunnel.

Step 7 **destination ipv4 unnumbered** *destination-router-id* **interface-ifindex** *destination-if-index*

Example:

```
RP/0/(config-te-gmpls-tun-0xa)# destination ipv4 unnumbered 10.77.132.185 interface-if index
 19
```

Specifies the GMPLS-NNI tunnel destination.

Step 8 **announce-srlg**

Example:

```
RP/0/(config-te-gmpls-tun-0xa)# announce-srlg
```

Enable Announce of SRLGs.

Step 9 **path-option** *path-option* **dynamic protected-by** *path-preference-level* **lockdown**

Example:

```
RP/0/(config-te-gmpls-tun-0xa)# path-option 1 dynamic protected-by none lockdown
```

Sets path option for GMPLS NNI tunnel.

Enabling SRLG Announce on Ethernet Terminated ODU

The following example shows how to enable SRLG Announce on ethernet terminated ODU using Cisco IOS XR commands:

```
RP/0/# configure
RP/0/(config)# mpls traffic-eng
RP/0/(config-mpls-te)# gmpls optical-nni
RP/0/(config-te-gmpls-nni)# controller odu-group-te 10
RP/0/(config-te-gmpls-tun-0xa)# signalled-bandwidth ODU2
RP/0/(config-te-gmpls-tun-0xa)# static-uni local-termination interface-name TenGigE0/1/0/0/100
 remote-termination unnumbered 32
RP/0/(config-te-gmpls-tun-0xa)# destination ipv4 unnumbered 10.77.132.185 interface-if index
 19
RP/0/(config-te-gmpls-tun-0xa)# announce-srlg
RP/0/(config-te-gmpls-tun-0xa)# path-option 1 dynamic protected-by none lockdown
```

To verify the above configuration use the following show command:

```
 RP/0/# show mpls tr tunnels detail

Name: Odu-Group-Te11  Destination: 10.77.132.185  Ifhandle:0x82001e4
  Signalled-Name: 3M_otn11
  Status:
    Admin:    up Oper:   up   Path:  valid   Signalling: connected

    path option 1, (LOCKDOWN) type dynamic  (Basis for Current, path weight 1)
      Protected-by PO index: none
        Reroute pending (DROP)
    Bandwidth Requested: 10037273 kbps  CT0
    Creation Time: Thu Oct  5 08:59:53 2017 (00:45:09 ago)
  Config Parameters:
    Bandwidth: ODU2
    Priority: 24  0 Affinity: 0x0/0xffff
    Metric Type: TE (default)
    Path Selection:
      Tiebreaker: Min-fill (default)
    Hop-limit: disabled
    Cost-limit: disabled
    Path-invalidation timeout: 10000 msec (default), Action: Tear (default)
    AutoRoute: disabled  LockDown:  enabled  Policy class: not set
    Forward class: 0 (default)
    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: 72
  Binding SID: None
  Static-uni Info:
    Locally Terminated Interface Name: TenGigE0_1_0_0_200  Ifhandle: 0x82001fc
      Local Termination Type: Ether
      State: Terminated up since Thu Oct  5 08:59:54 2017
      SRLG Values: 2,  7,  8,  20,  21,  33,
  Remote termination Interface: 0.0.0.0 [42]
    Egress Client Port: 0.0.0.0 [42]
  Working Homepath ERO:
    Status: Down
    Explicit Route:
  Diversity Info: None

  History:
    Tunnel has been up for: 00:45:04 (since Thu Oct 05 08:59:58 UTC 2017)
    Current LSP:
      Uptime: 00:45:08 (since Thu Oct 05 08:59:54 UTC 2017)
  Current LSP Info:
    Instance: 302, Signaling Area: OSPF OTN area 0
    Uptime: 00:45:08 (since Thu Oct 05 08:59:54 UTC 2017), Signaling State: Up, Oper State:
 Up
    G-PID: Gfp_F Generic Framing Procedure-Framed (54)
      XC Id: 0
      State: Connected
      Uptime: Thu Oct  5 08:59:54 2017
      Egress Interface: OTU40/1/0/0 (State:Up  Ifhandle:0x8a0020c)
      Egress Controller: ODU40_1_0_0 (State:Up Ifhandle:0x8a00214)
      Egress Sub Controller: ODU20_1_0_0_42 (State:Up, Ifhandle:0x82001ec)
      Path Ingress  label: TPN: 4 BitMap Len: 80 BitMap: 25:32
```

```
      Resv Egress  label: TPN: 4 BitMap Len: 80 BitMap: 25:32
    Router-IDs: local      10.77.132.187
                downstream 10.77.132.185
    Soft Preemption: None
    SRLGs: mandatory collection
    Path Info:
      Outgoing:
        Explicit Route:
          Strict, 10.77.132.185(19)
          Strict, 10.77.132.185
          Strict, 10.77.132.185(42)

      Record Route: Empty
      Tspec: signal_type ODU2 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 10.77.132.185, flags 0x20 (Node-ID)
        Label         Label TPN: 4 BitMap Len: 80 BitMap: 25:32 , flags 0x1

        Unnumbered 10.77.132.185 (19), flags 0x0
        Label         Label TPN: 4 BitMap Len: 80 BitMap: 25:32 , flags 0x1
      Fspec: signal_type ODU2 Bitrate 0kbps NVC 0 MT 1

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

SRLG Inheritance of Packet Terminated Optical Controller

SRLG values configured under Controller Optics, Controller OTU and Controller ODU are inherited to its physical interfaces and subinterfaces.

RSI (RSI agent and RSI primary) maintain the optical database (DB) and the interface DB. The optical DB contains the SRLG values exported by producers while the interface DB contains the SRLG values configured by SRLG in itself. RSI primary acts as SRLG manager, which will handle SRLG values exported by existing as well as by new optical controllers and RSI agent uses these values to calculate the final set of SRLG values and send them to interested clients.

To inherit the SRLG values from controller OTU & ODU to the underlying physical interface, the SRLG values from Optical DB and Interface DB are merged. These values are merged by matching the R/S/I/P and giving SRLG values from immediate parent higher priority.

The following diagram summarizes the approach adopted to inherit the SRLG values:

Figure 1: Inheritance SRLG

