



## VLAN over ODU

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

- [Understand VLAN over ODU, on page 1](#)
- [Enable VLAN over ODU : Configuring Head End Node, on page 1](#)
- [SRLG Announce on Ethernet Terminated ODU, on page 2](#)
- [Enabling SRLG Announce on Ethernet Terminated ODU, on page 2](#)
- [SRLG Inheritance of Packet Terminated Optical Controller , on page 5](#)

## 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

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- |               |  |
|---------------|--|
| <b>Step 1</b> | To configure an OTN controller,                |
| <b>Step 2</b> | Configure GCC.                                 |
| <b>Step 3</b> | 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](#).
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## 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

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#### Step 1 **configure**

##### Example:

```
RP/0/RP0:hostname# configure
```

Enters Global Configuration mode.

#### Step 2 **mpls traffic-eng**

##### Example:

```
RP/0/RP0:hostname(config)# mpls traffic-eng
```

Enters MPLS-TE configuration mode.

#### Step 3 **gmpls optical-nni**

##### Example:

```
RP/0/RP0:hostname(config-mpls-te)# gmpls optical-nni
```

Enters the GMPLS NNI configuration mode.

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

##### Example:

```
RP/0/RP0:hostname(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/RP0:hostname(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/RP0:hostname(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/RP0:hostname(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/RP0:hostname(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/RP0:hostname(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/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 10
RP/0/RP0:hostname(config-te-gmpls-tun-0xa)# signalled-bandwidth ODU2
RP/0/RP0:hostname(config-te-gmpls-tun-0xa)# static-uni local-termination interface-name
TenGigE0/1/0/0/100 remote-termination unnumbered 32
RP/0/RP0:hostname(config-te-gmpls-tun-0xa)# destination ipv4 unnumbered 10.77.132.185
interface-if index 19
RP/0/RP0:hostname(config-te-gmpls-tun-0xa)# announce-srlg
RP/0/RP0:hostname(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/RP0:hostname# show mpls tr tunnels detail

Name: Odu-Group-Tel1 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
Tspec: 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

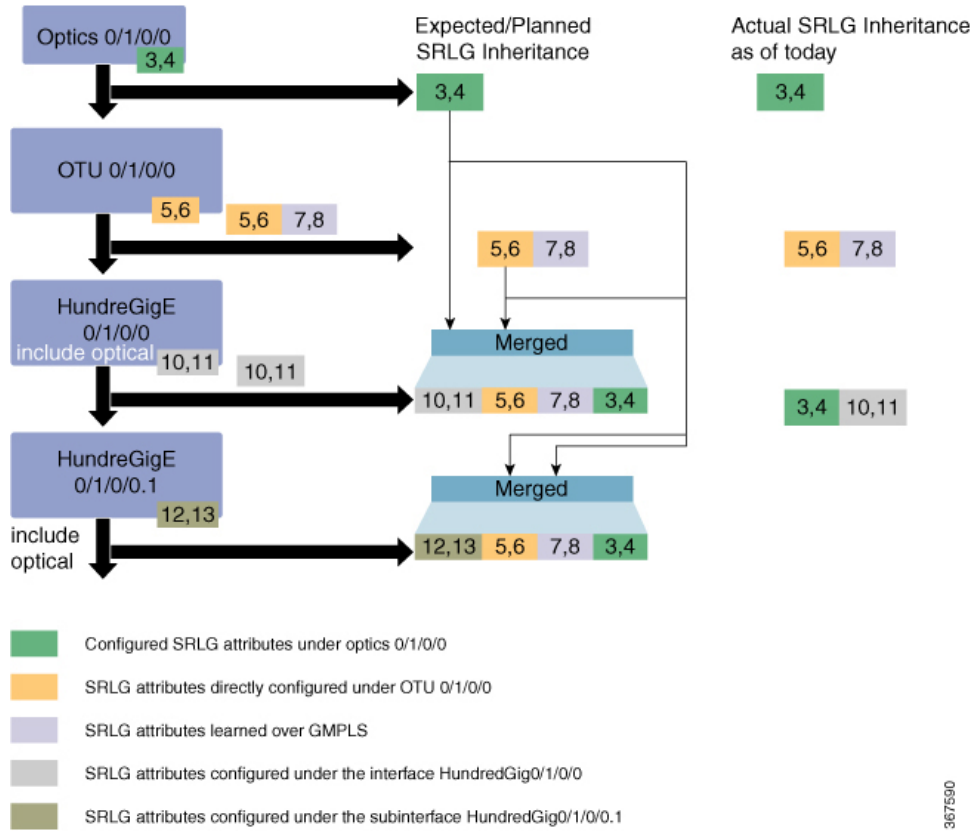
SRLG values configured under Controller Optics, Controller OTU and Controller ODU are inherited to its physical interfaces and subinterfaces.

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



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