

Configure Layer 3 TLOC Extension

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Introduction

This document describes how to configure TLOC-Extension Layer 3(L3) on a Software-Defined Wide Area Network (SD-WAN).

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- SD-WAN general overview
- Templates
- TLOC-extension
- Routing Protocols

Components Used

The information in this document is based on these software and hardware versions:

- Cisco vManage Release 20.7.x or later
- vManage Version 20.7.2
- vBond Version 20.7.2
- vSmart Version 20.7.2
- Integrated Service Routers (ISR)4451/K9 Version 17.7.2

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Background Information

The TLOC extension allows a WAN Edge router to:

- Communicate over the WAN transport (connected to the adjacent WAN Edge router) through a TLOC-extension interface.

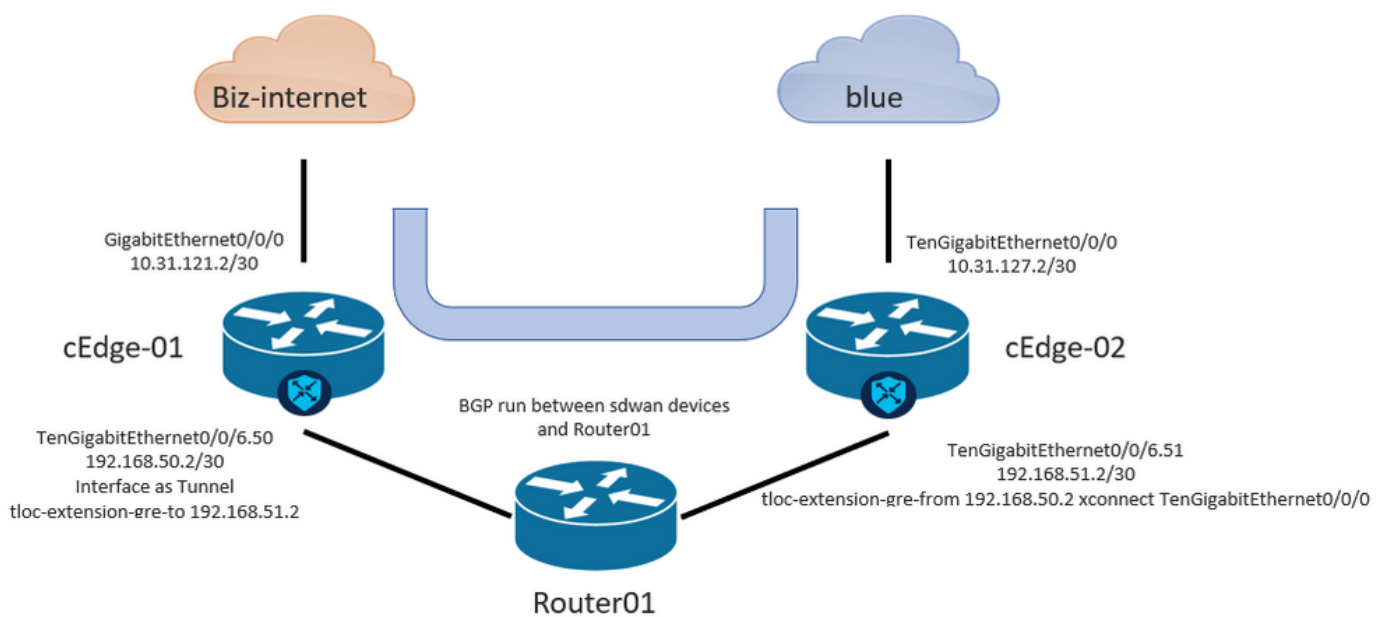
- Extend the TLOC to have redundancy on transport side.

There are two ways to configure TLOC Extension:

1. Via L2
 - Connect another SD-WAN router at the same physical site.
2. Via L3
 - Needs a router with L3 capabilities used to configure any routing protocol.
 - Connects between SD-WAN devices and non-SD-WAN device.
 - Must be via GRE tunnel to extend the TLOC.

Configure

Network Diagram



Configure TLOC Extension L3 from vManage GUI



Note: Must configure a routing protocol to communicate between SD-WAN devices with a non-SW-WAN device. In this example, BGP is configured.

Step 1. Configuration on cEdge-01

1.1 Configure the Interface for TLOC-L3 connection and assign it to tunnel interface.

- In vManage GUI, Navigate to **Configuration > Templates > Feature Template > Select Device > VPN Interface Ethernet** .
- Configure basic configuration of the Interface, assign an IP address, in this case, interface GigabitEthernet0/0/6.50.
- Navigate to **Tunnel** section and turn it **on**. Use the same color that the other SD-WAN device is used as local color, in this scenario, blue.

1.2 Enable TLOC extension statement from the device which gets the TLOC.

- Navigate to **Tunnel > Advance Option > GRE Tunnel destination IP**.



Note: The IP address must be the interface address assigned to the other SD-WAN device used for L3 connection.



Note: An example is the IP address on cEdge-02 of interface TengigabitEthernet0/0/6.51.

✓ BASIC CONFIGURATION

Shutdown



Yes

No

Interface Name



GigabitEthernet0/0/6.50

Description



Dynamic Static

IPv4 Address/ prefix-length



192.168.50.2/30

Secondary IP Address (Maximum: 4)

[+ Add](#)

DHCP Helper



Block Non Source IP



Yes

No

Bandwidth Upstream



Bandwidth Downstream



Auto Detect Bandwidth



On

Off

✓ TUNNEL

Tunnel Interface



On

Off

Per-tunnel Qos



On

Off

Color



blue



2. Enable TLOC extension statement from where the device gets the TLOC.

Navigate to **Tunnel > Advance Option > GRE Tunnel destination IP**.

The IP must be the IP address of interface assigned to the other SD-WAN device, which is used for L3 connection, in this case the IP address on cEdge-02 of interface TenGigabitEthernet0/0/6.51.

[Advanced Options](#) ▾

Encapsulation

GRE	<input checked="" type="checkbox"/> ▾	<input type="radio"/> On	<input checked="" type="radio"/> Off
IPsec	<input checked="" type="checkbox"/> ▾	<input checked="" type="radio"/> On	<input type="radio"/> Off
IPsec Preference	<input checked="" type="checkbox"/> ▾		
IPsec Weight	<input checked="" type="checkbox"/> ▾	1	
Carrier	<input checked="" type="checkbox"/> ▾	default	
Bind Loopback Tunnel	<input checked="" type="checkbox"/> ▾		
Last-Resort Circuit	<input checked="" type="checkbox"/> ▾	<input type="radio"/> On	<input checked="" type="radio"/> Off
NAT Refresh Interval	<input checked="" type="checkbox"/> ▾	5	
Hello Interval	<input checked="" type="checkbox"/> ▾	1000	
Hello Tolerance	<input checked="" type="checkbox"/> ▾	12	
GRE tunnel destination IP	<input checked="" type="checkbox"/> ▾	192.168.51.2	

Step 2. Configuration on cEdge-02

2.1 In vManage GUI, Navigate to **Configuration > Templates > Feature Template > Select Device > VPN Interface Ethernet**.



Note: In this interface, Tunnel must be OFF.

-
- Configure basic configuration of the Interface.
 - Assign an IP address (TenGigabitEthernet0/0/6.51 in this case).

✓ BASIC CONFIGURATION

Shutdown

Yes No

Interface Name

TenGigabitEthernet0/0/6.51

Description

Dynamic Static

IPv4 Address/ prefix-length

192.168.51.2/30

Secondary IP Address (Maximum: 4)

[+ Add](#)

DHCP Helper

Block Non Source IP

Yes No

Bandwidth Upstream

Bandwidth Downstream

Auto Detect Bandwidth

On Off

✓ TUNNEL

Tunnel Interface

On Off

2.2 Navigate to **Advance** section and complete the information for **GRE tunnel source IP**.



Note:

- The IP address must be the interface address assigned to the other SD-WAN device used for L3 connection.
 - xconnect must be the WAN interface used to send traffic over the extended TLOC.
-



Note: An example is the IP address on cEdge-02 of interface TengigabitEthernet0/0/6.51.

ADVANCED

Duplex



MAC Address



IP MTU



1500

TCP MSS



Speed



ARP Timeout



1200

Autonegotiation



On

Off

Media type



TLOC Extension



Load Interval



30



Tracker



ICMP/ICMPv6 Redirect Disable



On

Off

GRE tunnel source IP



192.168.50.2

Xconnect



TenGigabitEthernet0/0/0

IP Directed-Broadcast



On

Off

Configure TLOC Extension L3 from CLI

In this section, you can check how the configuration looks on CLI after template push.

Configuration on cEdge-01:

```
cEdge-01#show sdwan running-config
system
  system-ip          <system_ip>
  site-id            <site_id>
  organization-name  <organization_name>
  vbond <vbond>
!
hostname cEdge-01
!
ip route 0.0.0.0 0.0.0.0 10.31.121.1
interface GigabitEthernet0/0/0
  no shutdown
  ip address 10.31.121.2 255.255.255.252
exit
interface GigabitEthernet0/0/6
  no shutdown
  ip mtu 1504
  mtu 1504
  negotiation auto
exit
interface GigabitEthernet0/0/6.50
  no shutdown
  encapsulation dot1Q 50
  ip address 192.168.50.2 255.255.255.252
exit
interface Loopback100
  no shutdown
  ip address 10.10.10.10 255.255.255.255
exit
interface Tunnel0
  no shutdown
  ip unnumbered GigabitEthernet0/0/0
  tunnel source GigabitEthernet0/0/0
  tunnel mode sdwan
exit
interface Tunnel10101012
  no shutdown
  ip unnumbered GigabitEthernet0/0/6.50
  no ip redirects
  ipv6 unnumbered GigabitEthernet0/0/6.50
  no ipv6 redirects
  tunnel source GigabitEthernet0/0/6.50
  tunnel mode sdwan
exit
router bgp 65001
  bgp log-neighbor-changes
  bgp router-id 10.10.10.10
  neighbor 192.168.50.1 remote-as 65003
  address-family ipv4 unicast
    neighbor 192.168.50.1 activate
    network 192.168.50.0 mask 255.255.255.252
  exit-address-family
!
sdwan
  interface GigabitEthernet0/0/0
    tunnel-interface
```

```
    encapsulation ipsec
    color biz-internet
    allow-service all
  exit
exit
interface GigabitEthernet0/0/6.50
  tunnel-interface
  encapsulation ipsec
  color blue
  tloc-extension-gre-to 192.168.51.2
  exit
exit
cEdge-01#
```

Configuration on cEdge-02:

```
cEdge-02#show sdwan running-config
system
  system-ip          <system_ip>
  site-id            <site_id>
  organization-name  <organization_name>
  vbond <vbond>
!
hostname cEdge-02
!
ip route 0.0.0.0 0.0.0.0 10.31.127.1
ip nat inside source list nat-dia-vpn-hop-access-list interface TenGigabitEthernet0/0/0 overload
interface TenGigabitEthernet0/0/0
  no shutdown
  ip address 10.31.127.2 255.255.255.252
  ip nat outside
exit
interface TenGigabitEthernet0/0/6
  no shutdown
  mtu 1504
exit
interface TenGigabitEthernet0/0/6.51
  no shutdown
  encapsulation dot1Q 51
  ip address 192.168.51.2 255.255.255.252
exit
interface Loopback200
  no shutdown
  ip address 10.200.200.200 255.255.255.255
exit
interface Tunnel0
  no shutdown
  ip unnumbered TenGigabitEthernet0/0/0
  ipv6 unnumbered TenGigabitEthernet0/0/0
  tunnel source TenGigabitEthernet0/0/0
  tunnel mode sdwan
exit
router bgp 65002
  bgp log-neighbor-changes
  bgp router-id 10.200.200.200
  neighbor 192.168.51.1 remote-as 65003
  address-family ipv4 unicast
    neighbor 192.168.51.1 activate
```

```

network 192.168.51.0 mask 255.255.255.252
exit-address-family
!
sdwan
interface TenGigabitEthernet0/0/0
tunnel-interface
encapsulation ipsec
color blue
allow-service all
allow-service bgp
allow-service dhcp
allow-service dns
allow-service icmp
no allow-service sshd
no allow-service netconf
no allow-service ntp
no allow-service ospf
no allow-service stun
allow-service https
no allow-service snmp
no allow-service bfd
exit
exit
interface TenGigabitEthernet0/0/6.51
tloc-extension-gre-from 192.168.50.2 xconnect TenGigabitEthernet0/0/0
exit
cEdge-02#

```

Verify

Validation on cEdge-01:

cEdge-01 must create control connections with local TLOC (biz-internet) and TLOC Extension (blue).

```
cEdge-01L#show sdwan control connections
```

PEER TYPE	PEER PROT	PEER SYSTEM	IP	SITE ID	DOMAIN ID	PEER PRIVATE IP	PEER PORT	PEER PUBLIC IP
vsmart	dtls			10	1	192.168.21.34	32953	172.18.121
vsmart	dtls			10	1	192.168.21.34	32953	172.18.121
vbond	dtls			0	0	172.18.121.105	32853	172.18.121
vbond	dtls			0	0	172.18.121.105	32853	172.18.121
vmanage	dtls			10	0	192.168.28.25	32953	172.18.121

```
cEdge-01#show sdwan control local-properties
```

INTERFACE	PUBLIC IPv4	PUBLIC PORT	PRIVATE IPv4	PRIVATE IPv6
GigabitEthernet0/0/0	10.31.121.87	32853	10.31.121.87	::
GigabitEthernet0/0/6.50	10.31.127.62	5063	192.168.50.2	::

Troubleshoot

In case you have an issue, refer to:

[Troubleshoot SD-WAN Control Connections](#)