

Configure TLOC Extension Using vManage Feature Template

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Introduction

This document describes how to configure TLOC Extension using vManage feature template.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Use of vManage Feature Template
- Two (2) vEdge devices must be successfully onboarded on vManage

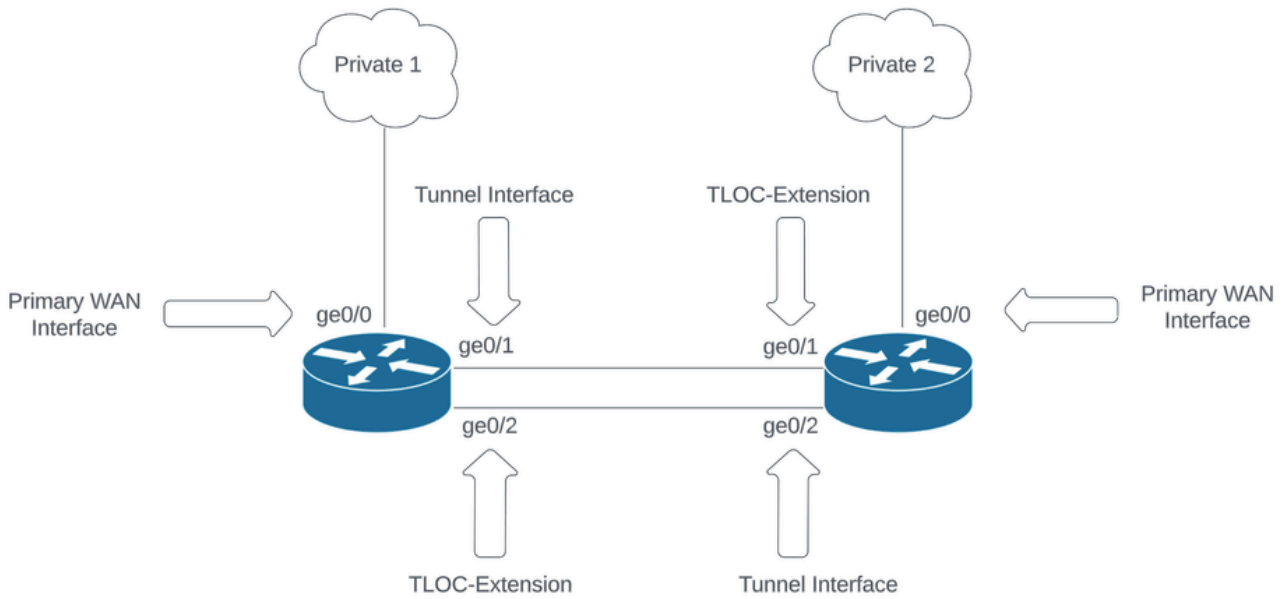
Components Used

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

- Cisco vManage version 20.6.3
- vEdge 20.6.3

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.

Network Diagram



Network Topology

Configurations

This document assumes you already have the rest of the feature templates configured. The same feature template workflow applies for Cisco IOS® XE SD-WAN devices.

Create a total of 4 feature templates to apply to vEdge device template.

VPN Feature Template

This feature template includes VPN 0, VPN Interface Ethernet (Primary WAN connection), VPN Interface Ethernet (Tunnel/NoTlocExt), and VPN Interface Ethernet (TlocExt/NoTunnel):

The screenshot shows the Cisco SD-WAN configuration interface. The 'Feature Template' tab is selected, and the 'Add Template' button is highlighted. A search for 'viptela' shows several device models. The 'VPN' feature template is selected, and the 'VPN Interface Ethernet' sub-template is highlighted.

VPN Feature Templates

Steps to create Feature Templates:

1. VPN 0: Select the specific device value for Transport VPN in basic configuration section and add DNS server address in DNS section:

The screenshot shows the Cisco vManage Configuration - Templates interface. The breadcrumb trail is "Feature Template > Add Template > VPN". The "Device Type" is set to "Site35_VPN0". The "Template Name" and "Description" are both "Site35_VPN0". The "BASIC CONFIGURATION" section is expanded, showing "VPN" set to "0", "Name" set to "[vpn0_name]", "Enhance ECMP Keying" set to "Off", "Enable TCP Optimization" set to "Off", and "OMP Admin Distance IPv4" set to "0". The "DNS" section is also expanded, showing "Primary DNS Address (IPv4)" set to "172.18.108.43" and "Secondary DNS Address (IPv4)" set to "0.0.0.0". A "New Host Mapping" button is visible. The "List of IP Addresses (Maximum: 8)" table is empty, showing "No data available". The "Cancel" and "Save" buttons are at the bottom.

VPN 0 Feature Template Basic Configuration

Add a prefix with specific device values for 2 next hop address (Primary WAN & TLOC-EXT) in IPv4 route section:

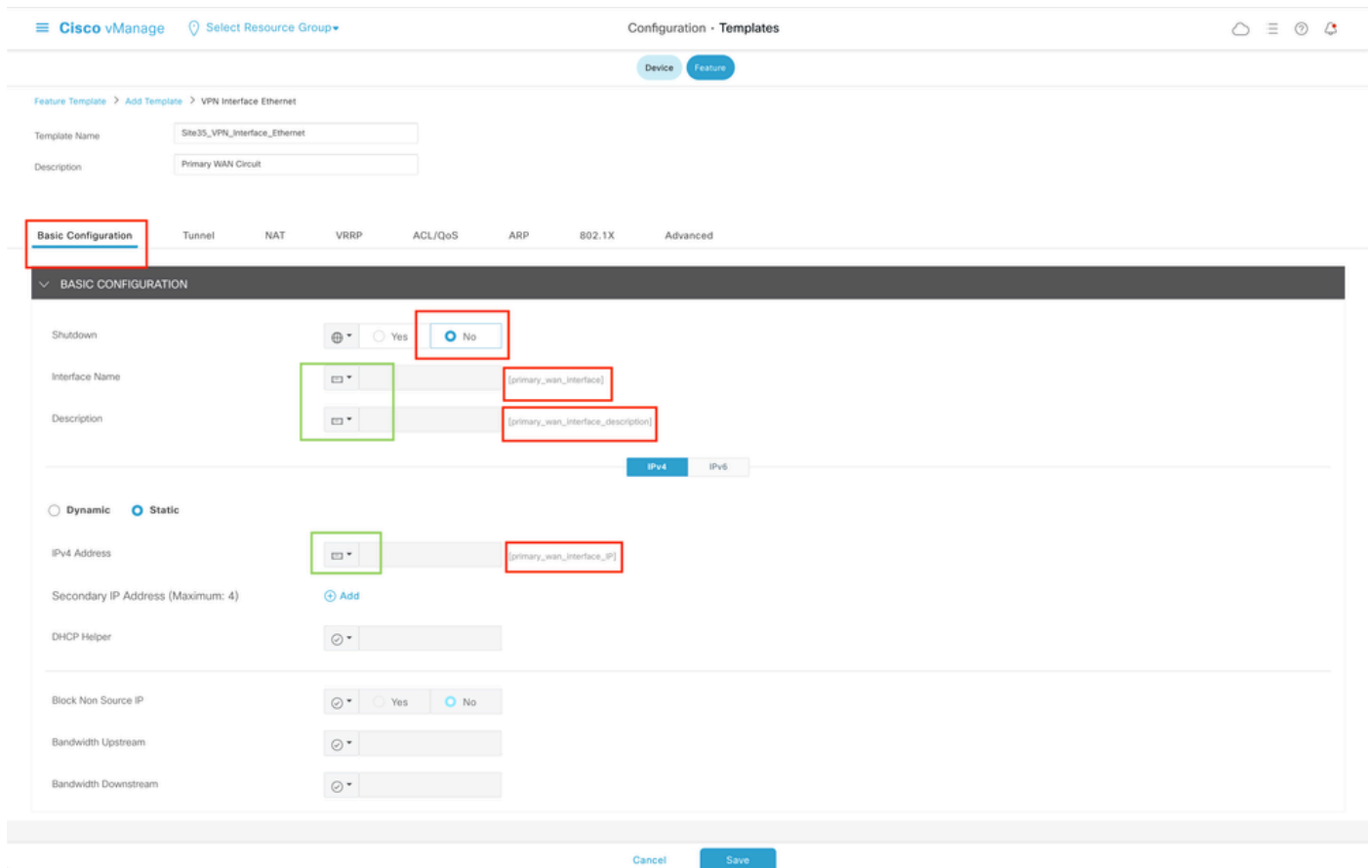
The screenshot shows the Cisco vManage Configuration - Templates interface. The breadcrumb trail is "Feature Template > VPN > Site35_VPN0". The "IPv4 Route" section is selected. The "Next Hop" dialog box is open, showing two entries: "[primary_WAN_next hop]" with a distance of "1" and "[tlocst_nexthop]" with a distance of "1". The "Add Next Hop" button is visible. The "Save Changes" and "Cancel" buttons are at the bottom of the dialog box.

VPN 0 Feature Template IPv4 Route



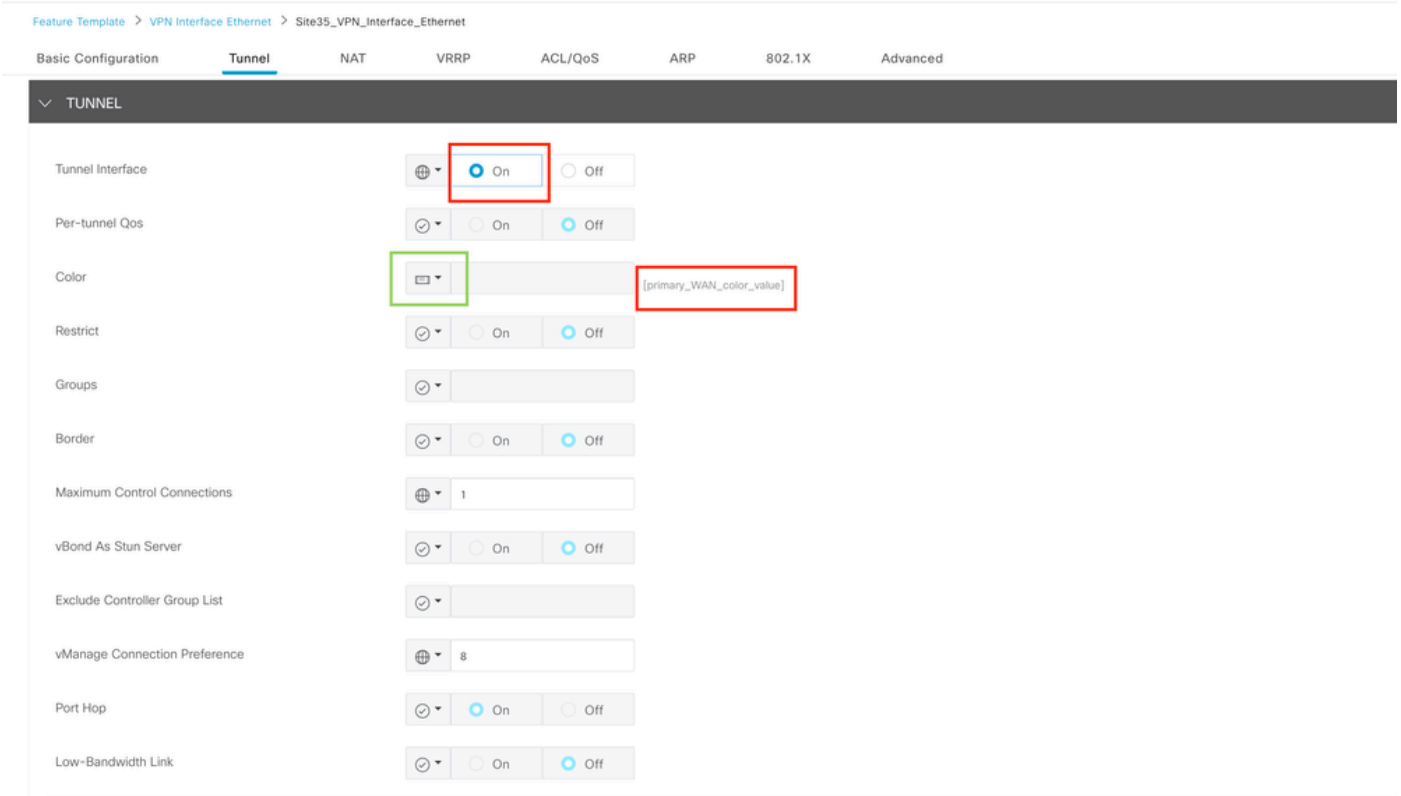
VPN 0 Feature Template IPv4 Route Next Hop

2. VPN Interface Ethernet (Primary WAN Connection): Ensure interface is in **no shutdown** state. Select specific device values for interface name, description, and IP address:



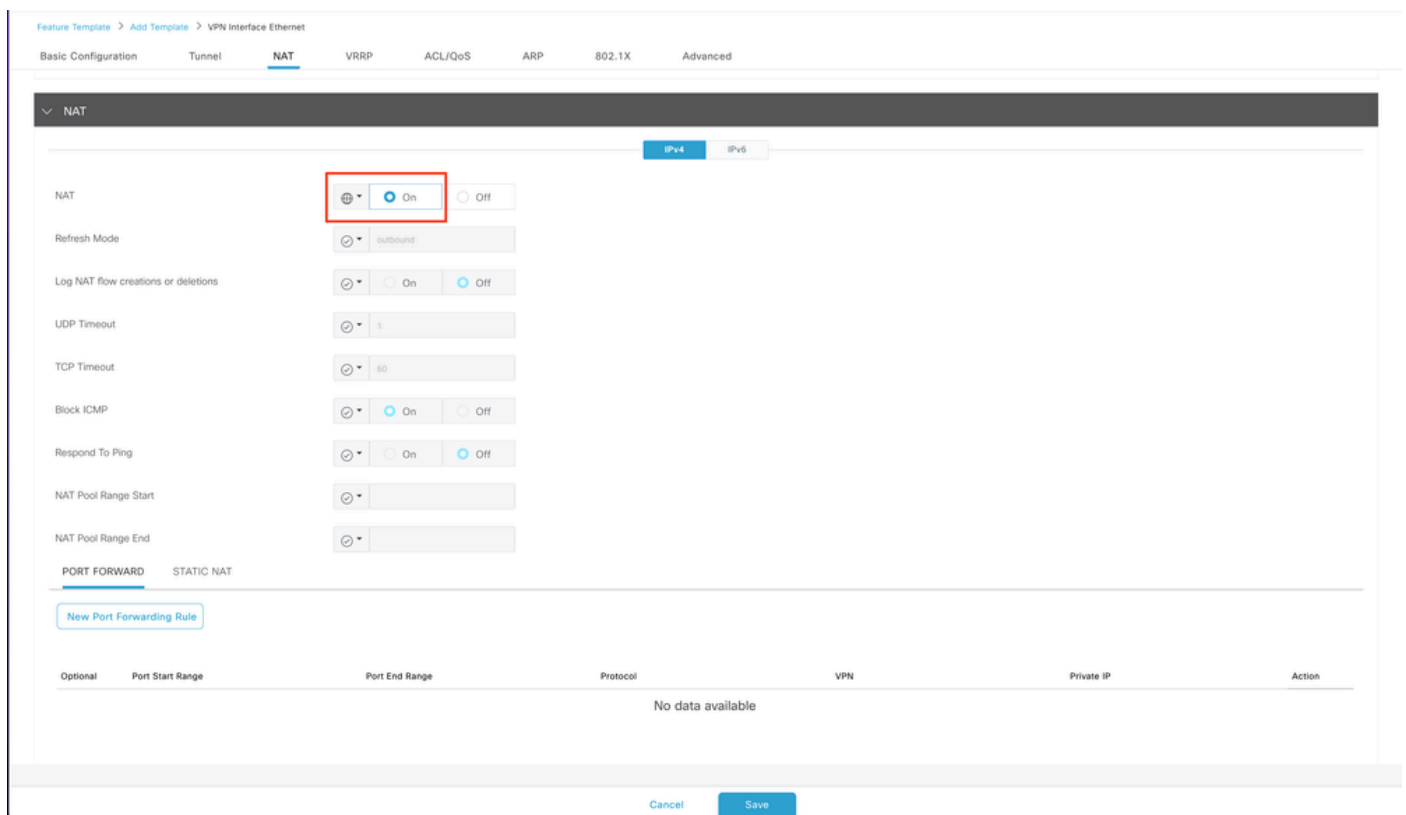
Primary WAN Interface Feature Template Basic Configuration

Ensure Tunnel interface is set to **ON**. Select the specific device value for Primary WAN Color:



VPN 0 Feature Template Tunnel Interface

Ensure NAT is set to **ON** for public WAN interface:



VPN 0 Interface Template NAT

3. VPN Interface Ethernet (TLOC-EXT/NO Tunnel Interface): Make sure TLOC-Ext interface is in **no shutdown** state. Select the specific device values for interface, description, and IP address. Ensure Tunnel interface is set to **Off**:

Feature Template > VPN Interface Ethernet > Site35_TLOC_Ext_NoTunnel

Device Type: ISR 1100 6G (Viptela OS),ISR 1100X 6G (Viptela OS),ISR 1100 4GLTE* (Viptela OS),ISR 1100 4G (Viptela OS),ISR 1100X 4G (Viptela OS)

Template Name: Site35_TLOC_Ext_NoTunnel

Description: Site 35 TLOC Extension Template without Tunnel Config

Basic Configuration | Tunnel | NAT | VRRP | ACL/QoS | ARP | 802.1X | Advanced

BASIC CONFIGURATION

Shutdown: Yes No

Interface Name: [TLOC_NoTunnel_Interface]

Description: [TLOC_NoTunnel_Interface_Description]

IPv4 IPv6

Dynamic Static

IPv4 Address: [TLOC_NoTunnel_Interface_IP]

Secondary IP Address (Maximum: 4): [Add](#)

DHCP Helper:

Block Non Source IP: Yes No

Bandwidth Upstream:

Bandwidth Downstream:

TUNNEL

Tunnel Interface: On Off

Cancel Update

TLOC-EXT/NO Tunnel Interface Basic configuration

Add TLOC-Ext interface in Advanced Section:

Feature Template > VPN Interface Ethernet > Site35_TLOC_Ext_NoTunnel

Basic Configuration Tunnel NAT VRRP ACL/QoS ARP 802.1X **Advanced**

ADVANCED

Duplex	<input type="text"/>
MAC Address	<input type="text"/>
IP MTU	<input type="text" value="1500"/>
PMTU Discovery	<input type="radio"/> On <input checked="" type="radio"/> Off
Flow Control	<input type="text" value="autoneg"/>
TCP MSS	<input type="text"/>
Speed	<input type="text"/>
Clear-Dont-Fragment	<input type="radio"/> On <input checked="" type="radio"/> Off
Static Ingress QoS	<input type="text"/>
ARP Timeout	<input type="text" value="1200"/>
Autonegotiation	<input checked="" type="radio"/> On <input type="radio"/> Off
TLOC Extension	<input type="text" value="ge0/0"/>
Tracker	<input type="text"/>
ICMP/ICMPv6 Redirect Disable	<input type="radio"/> On <input checked="" type="radio"/> Off
GRE tunnel source IP	<input type="text"/>
Xconnect	<input type="text"/>
IP Directed-Broadcast	<input type="radio"/> On <input checked="" type="radio"/> Off

TLOC-Ext interface

4. VPN Interface Ethernet (Tunnel Interface/No Tloc-ext): Ensure interface is in **no shutdown** state. Select the specific device values for interface, description, and IP address:

Device Type: ISR 1100 4G (Viptela OS),ISR 1100 4GLTE* (Viptela OS),ISR 1100 6G (Viptela OS),ISR 1100X 4G (Viptela OS),ISR 1100X 6G (Viptela OS)

Template Name: Site35_Tunnel_NoTlocExt

Description: Site 35 TLOC Tunnel Configuration No TLOC-Ext

Basic Configuration | Tunnel | NAT | VRRP | ACL/QoS | ARP | 802.1X | Advanced

BASIC CONFIGURATION

Shutdown: Yes No

Interface Name: [dropdown] [interface_tunn_notlocext]

Description: [dropdown] [interface_description_tunn_notlocext]

Dynamic Static

IPv4 Address: [dropdown] [interface_ip_tunn_notlocext]

Secondary IP Address (Maximum: 4): [+ Add](#)

DHCP Helper: [dropdown]

IPv4 | IPv6

Tunnel Interface/No Tloc-ext Basic configuration

Ensure tunnel interface is set to **ON**. Select the specific device value for Tloc-Ext color:

Device Feature

Basic Configuration | **Tunnel** | NAT | VRRP | ACL/QoS | ARP | 802.1X | Advanced

TUNNEL

Tunnel Interface: On Off

Per-tunnel Qos: On Off

Color: [dropdown] [tlocext_color_value]

Restrict: On Off

Groups: [dropdown]

Border: On Off

Maximum Control Connections: [dropdown]

vBond As Stun Server: On Off

Exclude Controller Group List: [dropdown]

vManage Connection Preference: [dropdown] 5

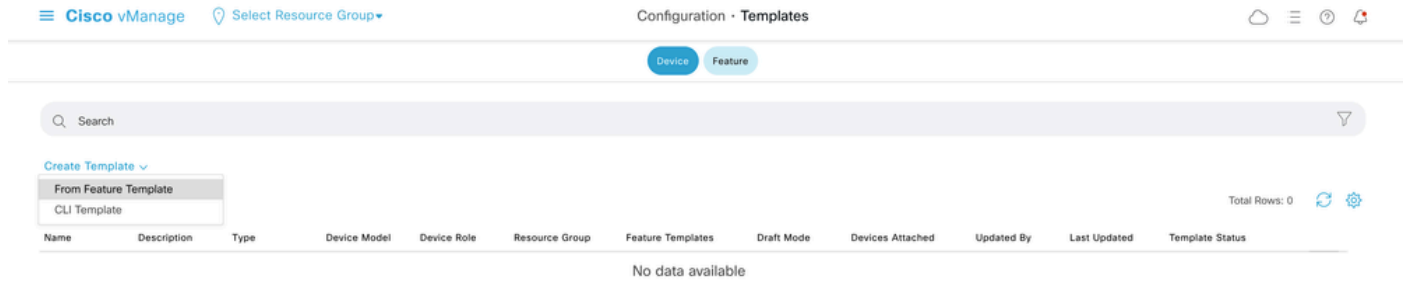
Port Hop: On Off

Low-Bandwidth Link: On Off

Device Template

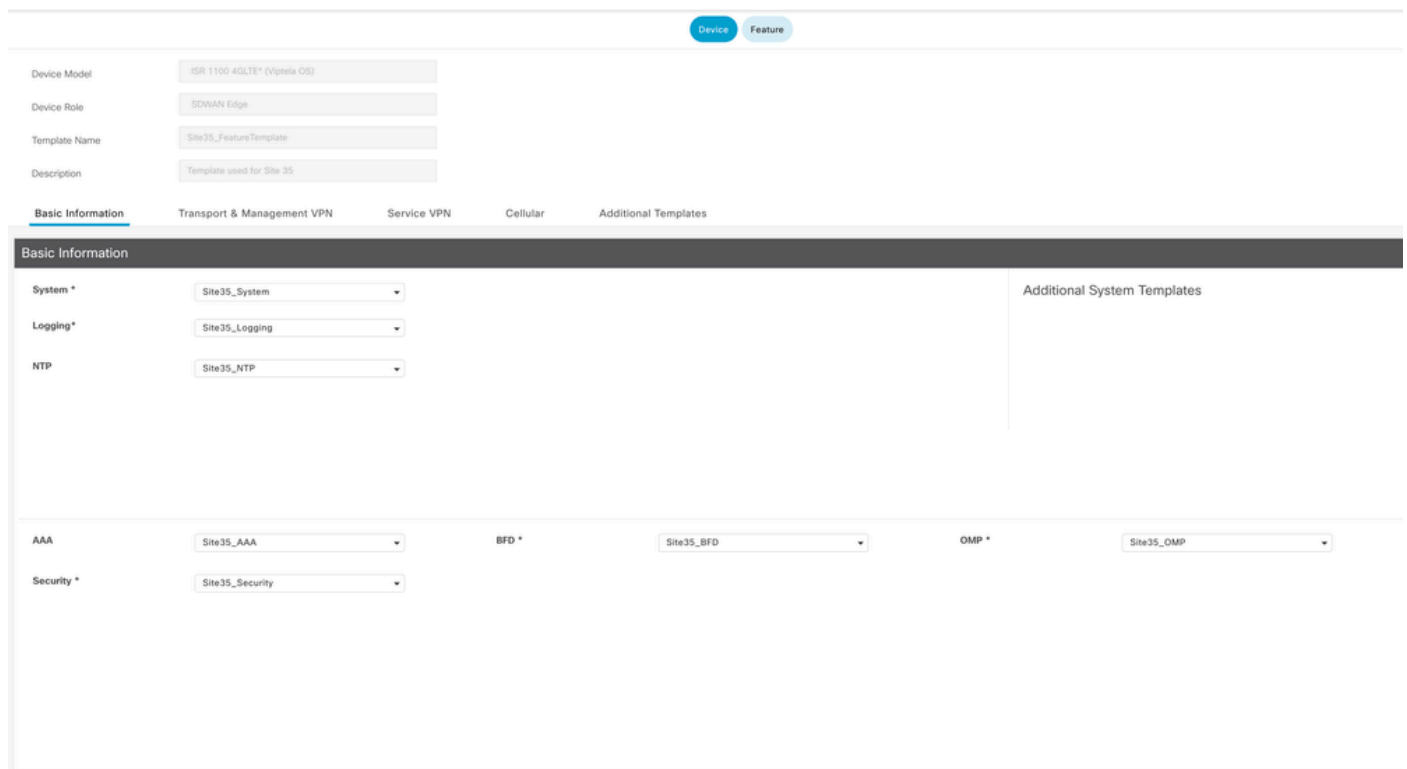
Steps to create the device template:

1. Create the device template **from feature template**:



Device template from Feature Template

2. Populate all the required feature templates:



Device Template details with feature templates basic configuration

Cisco vManage Select Resource Group Configuration - Templates

Device Feature

Basic Information **Transport & Management VPN** Service VPN Cellular Additional Templates

Transport & Management VPN

VPN 0 * Site35_VPN0 Additional VPN 0 Templates

VPN Interface Site35_VPN_Interface_Ethernet

VPN Interface Site35_TLOC_Ext_NoTunnel

VPN Interface Site35_Tunnel_NoTlocExt

VPN 512 * Site35_VPN512 Additional VPN 512 Templates

Device Template details with feature templates Transport and Management

3. Attach both devices to the device template:

Cisco vManage Select Resource Group Configuration - Templates

Device Feature

Q Search

Create Template

Template Type: Non-Default

Total Rows: 1

Name	Description	Type	Device Model	Device Role	Resource Group	Feature Templates	Draft Mode	Devices Attached	Updated By	Last Updated	Template Status
Site35_FeatureTemplate	Template used ...	Feature	ISR 1100 4GLTE* (Viptela OS)	SDWAN Edge	global	12	Disabled	0	admin	25 Jul 2022 12:2...	In Sync

- Edit
- View
- Delete
- Copy
- Attach Devices
- Change Resource Group
- Export CSV

Attach devices to templates

4. Move both devices from available devices to selected devices tab:

Attach Devices

Attach device from the list below

2 Items Selected

Available Devices

All Search

Name	Device IP

Selected Devices

All Search

Name	Device IP
vEdge	10.10.10.17
vEdge	10.10.10.19

Attach Cancel

Move devices from available to selected

5. Enter all the required details for both devices:

Site35_vEdge1

Update Device Template ✕

Variable List (Hover over each field for more information)

Status	complete
Chassis Number	ISR1100-4GLTEGB-FGL2347LHT6
System IP	10.10.10.17
Hostname	vEdge
Name(vpn0_name)	<input type="text" value="Transport"/>
Address(primary_WAN_next_hop)	<input type="text" value="10.201.237.1"/>
Address(tlocext_nexthop)	<input type="text" value="192.168.30.5"/>
Interface Name(interface_tunn_notlocext)	<input type="text" value="ge0/1"/>
Description(interface_description_tunn_notlocext)	<input type="text" value="TunnelInterface_NoTLOCExt"/>
IPv4 Address(interface_ip_tunn_notlocext)	<input type="text" value="192.168.30.4/24"/>
Color(tlocext_color_value)	<input type="text" value="private2"/>
Interface Name(TLOC_NoTunnel_Interface)	<input type="text" value="ge0/2"/>
Description(TLOC_NoTunnel_Interface_Description)	<input type="text" value="TLOC_NoTunnelInterface"/>
IPv4 Address(TLOC_NoTunnel_Interface_IP)	<input type="text" value="192.168.40.4/24"/>
Interface Name(primary_wan_interface)	<input type="text" value="ge0/0"/>
Description(primary_wan_interface_description)	<input type="text" value="Primary WAN connection"/>
IPv4 Address(primary_wan_interface_IP)	<input type="text" value="10.201.237.120/24"/>
Color(primary_WAN_color_value)	<input type="text" value="private1"/>
Hostname(system_host_name)	<input type="text" value="Site35_vEdge1"/>
System IP(system_system_ip)	<input type="text" value="10.10.10.17"/>
Site ID(system_site_id)	<input type="text" value="35"/>

Update values 1

Site35_vEdge2

Update Device Template

Variable List (Hover over each field for more information)

Status	complete
Chassis Number	ISR1100-4GLTENA-FGL2347LJ1G
System IP	10.10.10.19
Hostname	vEdge
Name(vpn0_name)	Transport
Address(primary_WAN_next_hop)	10.201.237.1
Address(tlocext_nexthop)	192.168.40.4
Interface Name(interface_tunn_notlocext)	ge0/2
Description(interface_description_tunn_notlocext)	TunnelInterface_NoTLOCExt
IPv4 Address(interface_ip_tunn_notlocext)	192.168.40.5/24
Color(tlocext_color_value)	private1
Interface Name(TLOC_NoTunnel_Interface)	ge0/1
Description(TLOC_NoTunnel_Interface_Description)	TLOC_NoTunnelInterface
IPv4 Address(TLOC_NoTunnel_Interface_IP)	192.168.30.5/24
Interface Name(primary_wan_interface)	ge0/0
Description(primary_wan_interface_description)	Primary WAN connection
IPv4 Address(primary_wan_interface_IP)	10.201.237.66/24
Color(primary_WAN_color_value)	private2
Hostname(system_host_name)	Site35_vEdge2
System IP(system_system_ip)	10.10.10.19
Site ID(system_site_id)	35

Generate Password

Update

Cancel

Update values 2

6. Verify the values selected are intended for these devices:

Site35_vEdge1

Cisco vManage Configuration · Templates

Device Template: Site35_FeatureTemplate (Total: 1)

Device list (Total: 2 devices)

Filter/Search

ISR1100-4GLTEGB-FGL2347LHT6 vEdge10.10.10.17

ISR1100-4GLTENA-FGL2347LJ1G vEdge10.10.10.19

Configure Device Rollback Timer

76	allow-service sshd	78	allow-service sshd
77	no allow-service netconf	79	no allow-service netconf
78	no allow-service ntp	80	no allow-service ntp
79	no allow-service ospf	81	no allow-service ospf
80	no allow-service stun	82	no allow-service stun
81	allow-service https	83	allow-service https
82	!	84	!
83	no shutdown	85	no shutdown
84	!	86	!
		87	interface ge0/1
		88	description TunnelInterface_NoTLOCExt
		89	ip address 192.168.30.4/24
		90	tunnel-interface
		91	encapsulation ipsec
		92	color private2
		93	max-control-connections 1
		94	no allow-service bgp
		95	allow-service dhcp
		96	allow-service dns
		97	allow-service icmp
		98	no allow-service sshd
		99	no allow-service netconf
		100	no allow-service ntp
		101	no allow-service ospf
		102	no allow-service stun
		103	allow-service https
		104	!
		105	no shutdown
		106	!
		107	interface ge0/2
		108	description TLOC_NoTunnelInterface
		109	ip address 192.168.40.4/24
		110	no shutdown
		111	!
85	ip route 0.0.0.0/0 10.201.237.1 1	112	ip route 0.0.0.0/0 10.201.237.1 1
		113	ip route 0.0.0.0/0 192.168.30.5 1
86	!	114	!
87	vpn 512	115	vpn 512
88	!	116	!
89	!	117	!
90	!	118	!
91	!	119	!

Back Configure Devices Cancel

Configuration preview 1

Site35_vEdge2

Cisco vManage Configuration · Templates

Device Template: Site35_FeatureTemplate (Total: 1)

Device list (Total: 2 devices)

Filter/Search

ISR1100-4GLTEGB-FGL2347LHT6 vEdge10.10.10.17

ISR1100-4GLTENA-FGL2347LJ1G vEdge10.10.10.19

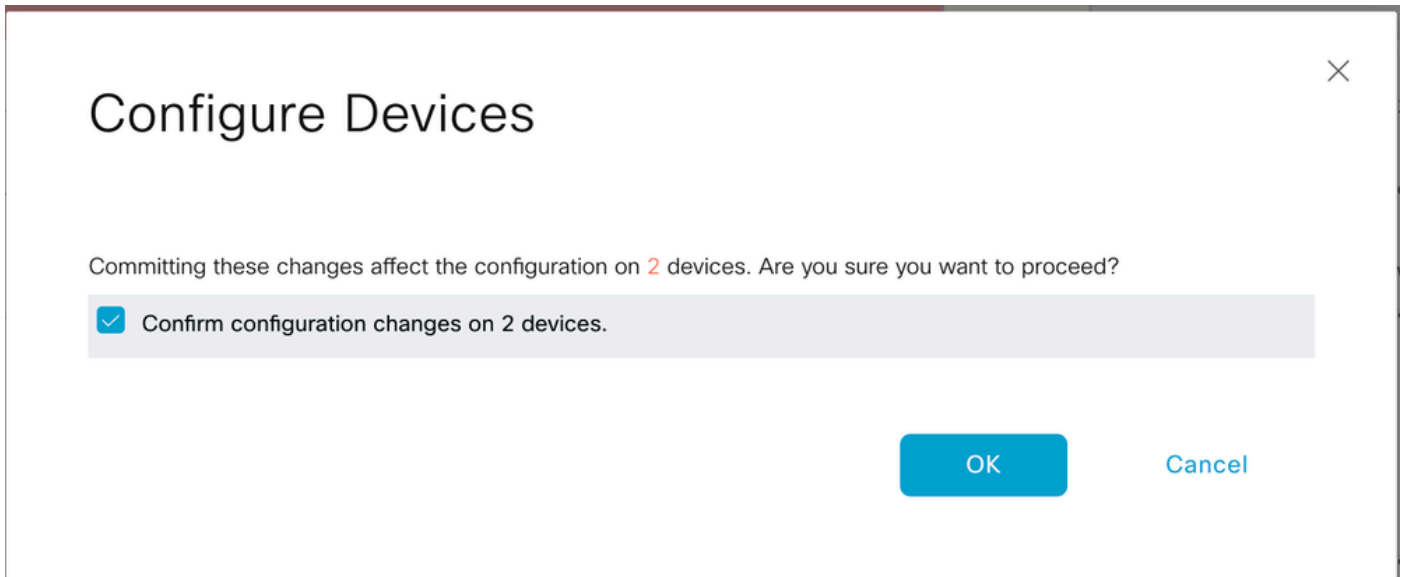
Configure Device Rollback Timer

75	allow-service sshd	78	allow-service sshd
76	no allow-service netconf	79	no allow-service netconf
77	no allow-service ntp	80	no allow-service ntp
78	no allow-service ospf	81	no allow-service ospf
79	no allow-service stun	82	no allow-service stun
80	allow-service https	83	allow-service https
81	!	84	!
82	no shutdown	85	no shutdown
83	!	86	!
		87	interface ge0/1
		88	description TLOC_NoTunnelInterface
		89	ip address 192.168.30.5/24
		90	no shutdown
		91	!
		92	interface ge0/2
		93	description TunnelInterface_NoTLOCExt
		94	ip address 192.168.40.5/24
		95	tunnel-interface
		96	encapsulation ipsec
		97	color private1
		98	max-control-connections 1
		99	no allow-service bgp
		100	allow-service dhcp
		101	allow-service dns
		102	allow-service icmp
		103	no allow-service sshd
		104	no allow-service netconf
		105	no allow-service ntp
		106	no allow-service ospf
		107	no allow-service stun
		108	allow-service https
		109	!
		110	no shutdown
		111	!
84	ip route 0.0.0.0/0 10.201.237.1 1	112	ip route 0.0.0.0/0 10.201.237.1 1
		113	ip route 0.0.0.0/0 192.168.40.4 1
85	!	114	!
86	vpn 512	115	vpn 512
87	!	116	!
88	!	117	!
89	!	118	!
90	!	119	!

Back Configure Devices Cancel

Configuration preview 2

6. Finally, push these configuration to the device:



Confirm configuration

The next output captures the running configuration for vpn 0 once template is pushed successfully:

Site35_vEdge1

```
Site35_vEdge1# show run vpn 0
vpn 0
interface ge0/0
ip address 10.201.237.120/24
ipv6 dhcp-client
nat
!
tunnel-interface
encapsulation ipsec
color private1
max-control-connections 1
no allow-service bgp
allow-service dhcp
allow-service dns
allow-service icmp
allow-service sshd
no allow-service netconf
no allow-service ntp
no allow-service ospf
no allow-service stun
allow-service https
!
no shutdown
!
interface ge0/1
description TunnelInterface_NoTLOExt
ip address 192.168.30.4/24
tunnel-interface
encapsulation ipsec
color private2
max-control-connections 1
no 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 shutdown
!
interface ge0/2
description TL0C_NoTunnelInterface
ip address 192.168.40.4/24
tloc-extension ge0/0
no shutdown
!

ip route 0.0.0.0/0 10.201.237.1
ip route 0.0.0.0/0 192.168.30.5
!
Site35_vEdge1#
```

Site35_vEdge2

```
Site35_vEdge2#
Site35_vEdge2#
Site35_vEdge2#
Site35_vEdge2# sh run vpn 0
vpn 0
interface ge0/0
ip address 10.201.237.66/24
ipv6 dhcp-client
nat
!
tunnel-interface
encapsulation ipsec
color private2
max-control-connections 1
no allow-service bgp
allow-service dhcp
allow-service dns
allow-service icmp
allow-service sshd
no allow-service netconf
no allow-service ntp
no allow-service ospf
no allow-service stun
allow-service https
!
no shutdown
!
interface ge0/1
description TL0C_NoTunnelInterface
ip address 192.168.30.5/24
tloc-extension ge0/0
no shutdown
!
interface ge0/2
description TunnelInterface_NoTLOCExt
```

```

ip address 192.168.40.5/24
tunnel-interface
encapsulation ipsec
color private1
max-control-connections 1
no 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 shutdown
!
ip route 0.0.0.0/0 10.201.237.1
ip route 0.0.0.0/0 192.168.40.4
!
Site35_vEdge2#

```

Verification

1. The template is successfully attached to both devices:

Push Feature Template Configuration ● Validation Success Initiated By: admin From: 10.24.227.28

Total Task: 2 | Success: 2

Total Rows: 2

Status	Message	Chassis Number	Device Model	Hostname	System IP	Site ID	vManage IP
● Success	Done - Push Feature Template Con...	ISR1100-4GLTEGB-FGL2347LHT6	ISR 1100 4GLTE* (Viptela OS)	vEdge	10.10.10.17	35	10.10.10.1
<div style="font-size: 0.8em; padding: 2px;"> <p>[25-Jul-2022 18:16:20 UTC] Checking and creating device in vManage</p> <p>[25-Jul-2022 18:16:21 UTC] Generating configuration from template</p> <p>[25-Jul-2022 18:16:27 UTC] Device is online</p> <p>[25-Jul-2022 18:16:27 UTC] Updating device configuration in vManage</p> <p>[25-Jul-2022 18:16:27 UTC] Sending configuration to device</p> <p>[25-Jul-2022 18:16:40 UTC] Completed template push to device.</p> <p>[25-Jul-2022 18:16:41 UTC] Template successfully attached to device</p> </div>							
● Success	Done - Push Feature Template Con...	ISR1100-4GLTENA-FGL2347LJ1G	ISR 1100 4GLTE* (Viptela OS)	vEdge	10.10.10.19	35	10.10.10.1
<div style="font-size: 0.8em; padding: 2px;"> <p>[25-Jul-2022 18:16:20 UTC] Checking and creating device in vManage</p> <p>[25-Jul-2022 18:16:20 UTC] Generating configuration from template</p> <p>[25-Jul-2022 18:16:26 UTC] Device is online</p> <p>[25-Jul-2022 18:16:26 UTC] Updating device configuration in vManage</p> <p>[25-Jul-2022 18:16:27 UTC] Sending configuration to device</p> <p>[25-Jul-2022 18:16:38 UTC] Completed template push to device.</p> <p>[25-Jul-2022 18:16:41 UTC] Template successfully attached to device</p> </div>							

Template push success

2. Control connection is up via Primary WAN and TLOC-Ext Interface:


```
Site35_vEdge1# show control connections
```

PEER TYPE	PEER PROT	PEER SYSTEM IP	SITE ID	DOMAIN ID	PEER PRIVATE IP	PEER PRIV PORT	PEER PUBLIC IP	PEER PUB PORT	ORGANIZATION	LOCAL COLOR	CONTROLLER GROUP PROXY	STATE	UPTIME	ID
vsmart	dtls	10.10.10.3	1	1	10.201.237.137	12446	10.201.237.137	12446	rcdn_sdwan_lab	private1	No	up	0:00:01:47	0
vsmart	dtls	10.10.10.3	1	1	10.201.237.137	12446	10.201.237.137	12446	rcdn_sdwan_lab	private2	No	up	0:00:01:42	0
vmanage	dtls	10.10.10.1	1	0	10.201.237.91	12446	10.201.237.91	12446	rcdn_sdwan_lab	private1	No	up	0:00:01:52	0

```
Site35_vEdge1#
```

Control connection verification 1

```
Site35_vEdge2# show control connections
```

PEER TYPE	PEER PROT	PEER SYSTEM IP	SITE ID	DOMAIN ID	PEER PRIVATE IP	PEER PRIV PORT	PEER PUBLIC IP	PEER PUB PORT	LOCAL COLOR	PROXY	STATE	UPTIME	CONTROLLER GROUP ID
vsmart	dtls	10.10.10.3	1	1	10.201.237.137	12446	10.201.237.137	12446	private2	No	up	0:00:00:25	0
vsmart	dtls	10.10.10.3	1	1	10.201.237.137	12446	10.201.237.137	12446	private1	No	up	0:00:00:15	0
vmanage	dtls	10.10.10.1	1	0	10.201.237.91	12446	10.201.237.91	12446	private2	No	up	0:00:00:20	0

Control connection verification 2

Use Cases

Depending on local site design, TLOC Extension can also be implemented using L2 or L3 TLOC Extension.

1. L2 TLOC Extension: These extensions are in same broadcast domain or in same subnet.
2. L3 TLOC Extension: These extensions are separated by a L3 device and can run any routing protocol (is only supported on Cisco IOSXE SD-WAN devices)



Note: See the TLOC Extension section in the WAN Edge Deployment chapter of [Cisco SD-WAN Design Guide](#).

Limitations

- TLOC and TLOC extension interfaces are supported only on L3 routed interfaces. L2 switchports/SVIs cannot be used as WAN/Tunnel interfaces and can only be used on the service side.
- LTE also is not used as a TLOC extension interface between WAN Edge routers.
- L3 TLOC extension is only supported on Cisco IOSXE SD-WAN routers and they are not supported on vEdge routers.
- TLOC extension does not work on transport interfaces which are bound to loopback tunnel interfaces.

Related Information

- [Cisco Technical Support & Downloads](#)