Configure Dual Active Route-Based Site-to-Site VPN with PBR on FTD Managed by FDM

Contents

Introduction

This document describes how to configure dual active route-based site-to-site VPN with PBR on FTD

managed by FDM.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Basic understanding of VPN
- Basic understanding of Policy Based Routing (PBR)
- Basic understanding of Internet Protocol Service Level Agreement (IP SLA)
- Experience with FDM

Components Used

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

- Cisco FTDv version 7.4.2
- Cisco FDM version 7.4.2

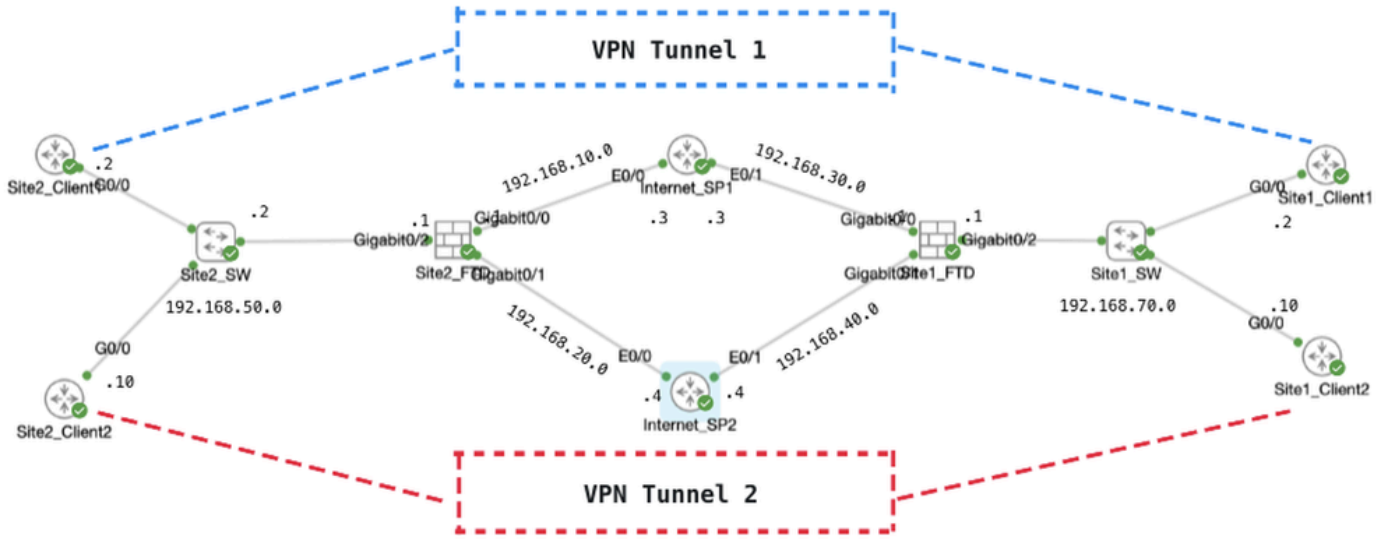
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Background Information

This document explains how to configure a dual active route-based site-to-site VPN on FTD. In this example, FTDs at both Site1 and Site2 have dual active ISP connections establishing the site-to-site VPN with both ISPs simultaneously. By default, VPN traffic traverses Tunnel 1 over ISP1 (blue line). For specific hosts, traffic goes through Tunnel 2 over ISP2 (red line). If ISP1 experiences an interruption, traffic switches to ISP2 as a backup. Conversely, if ISP2 experiences an interruption, traffic switches to ISP1 as a backup. Policy-Based Routing (PBR) and Internet Protocol Service Level Agreement (IP SLA) are utilized in this example to meet these requirements.

Configure

Network Diagram



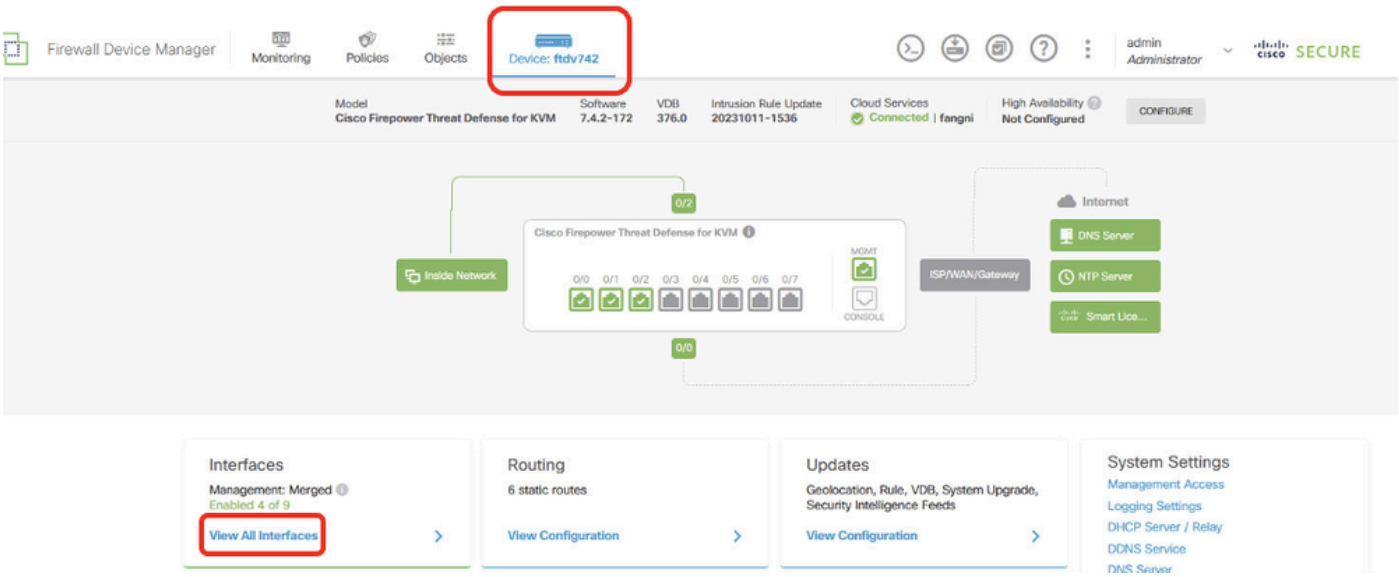
Topology

Configurations on VPN

It is essential to ensure that the preliminary configuration of IP interconnectivity between nodes has been duly completed. The clients in both Site1 and Site2 are with FTD inside IP address as gateway.

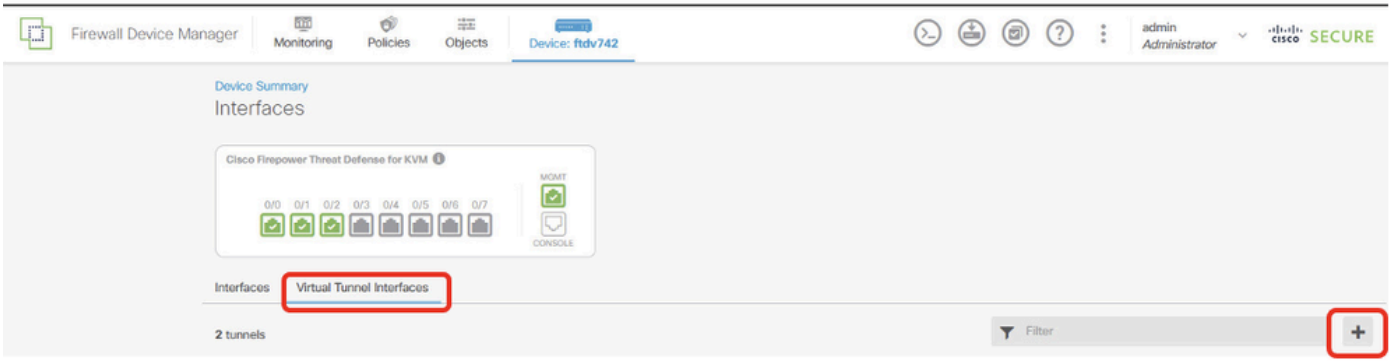
Site1 FTD VPN Configuration

Step 1. Create virtual tunnel interfaces for ISP1 and ISP2. Login the FDM GUI of Site1 FTD. Navigate to **Device > Interfaces**. Click **View All Interfaces**.



Site1FTD_View_All_Interfaces

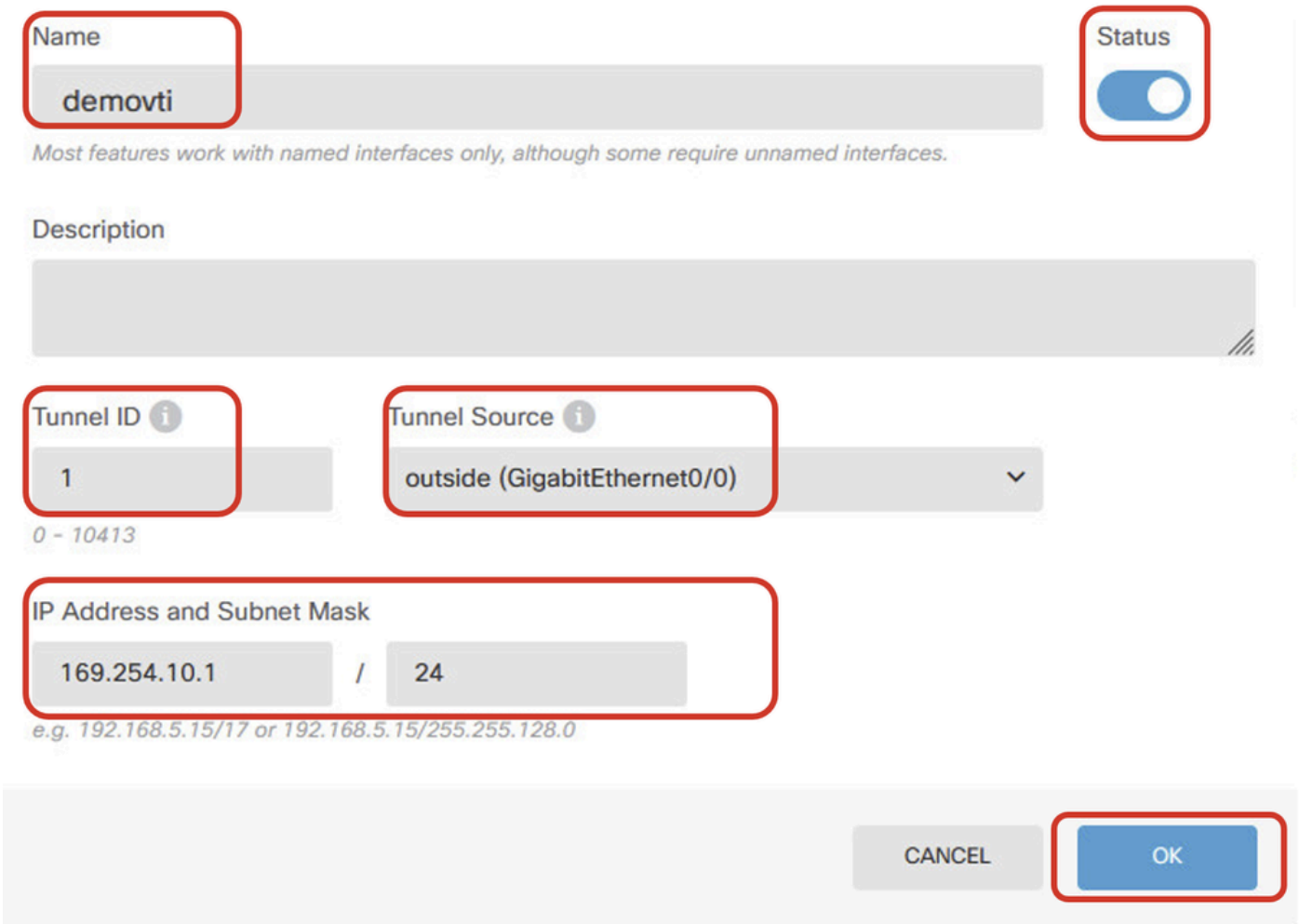
Step 2. Click **Virtual Tunnel Interfaces** tab and then the **+** button.



Site1FTD_Create_VTI

Step 3. Provide necessary information of VTI details. Click **OK** button.

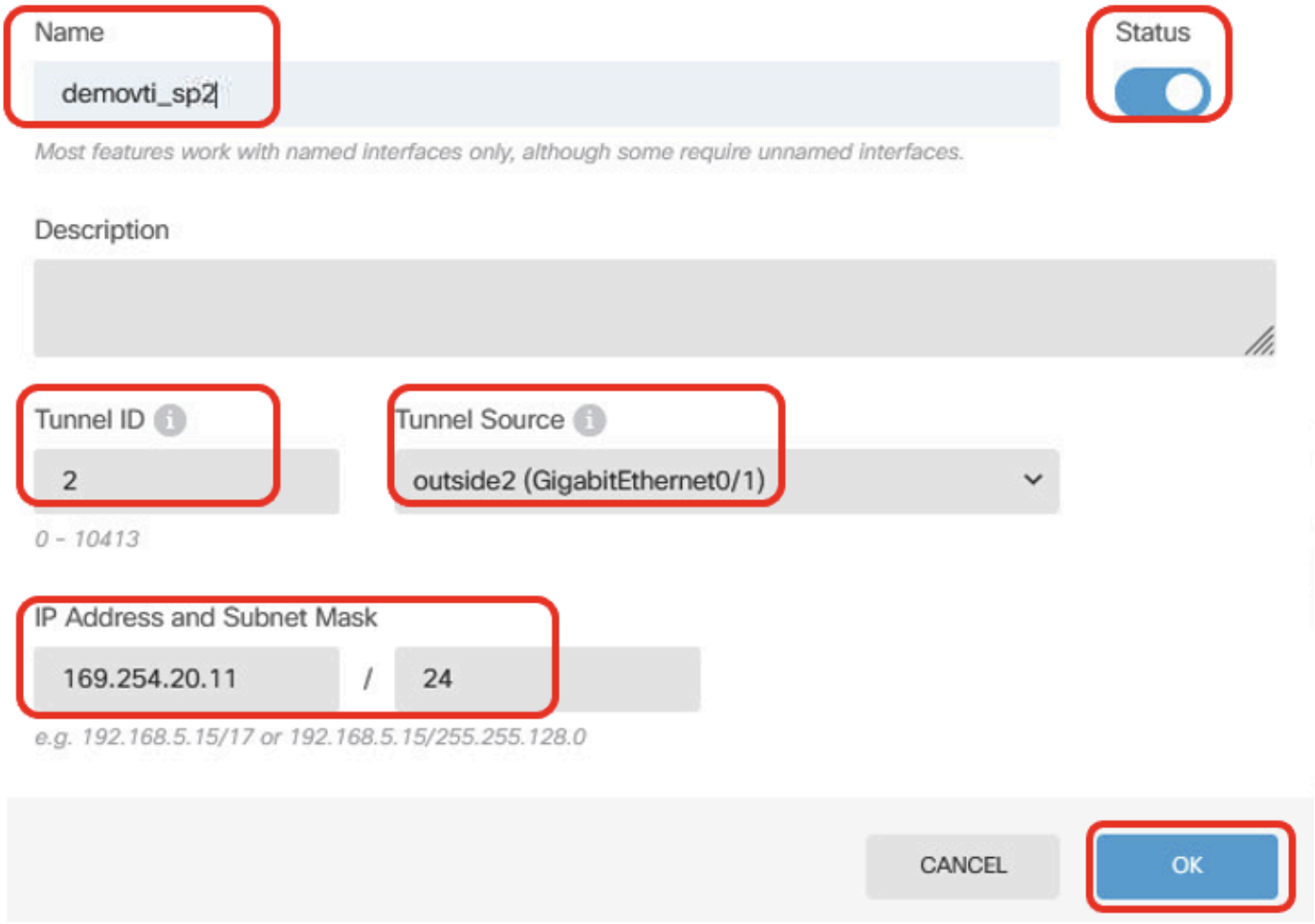
- Name: demovti
- Tunnel ID: 1
- Tunnel Source: outside (GigabitEthernet0/0)
- IP Address And Subnet Mask: 169.254.10.1/24
- Status: click the slider to the Enabled position



Site1FTD_VTI_Details_Tunnel1_ISP1

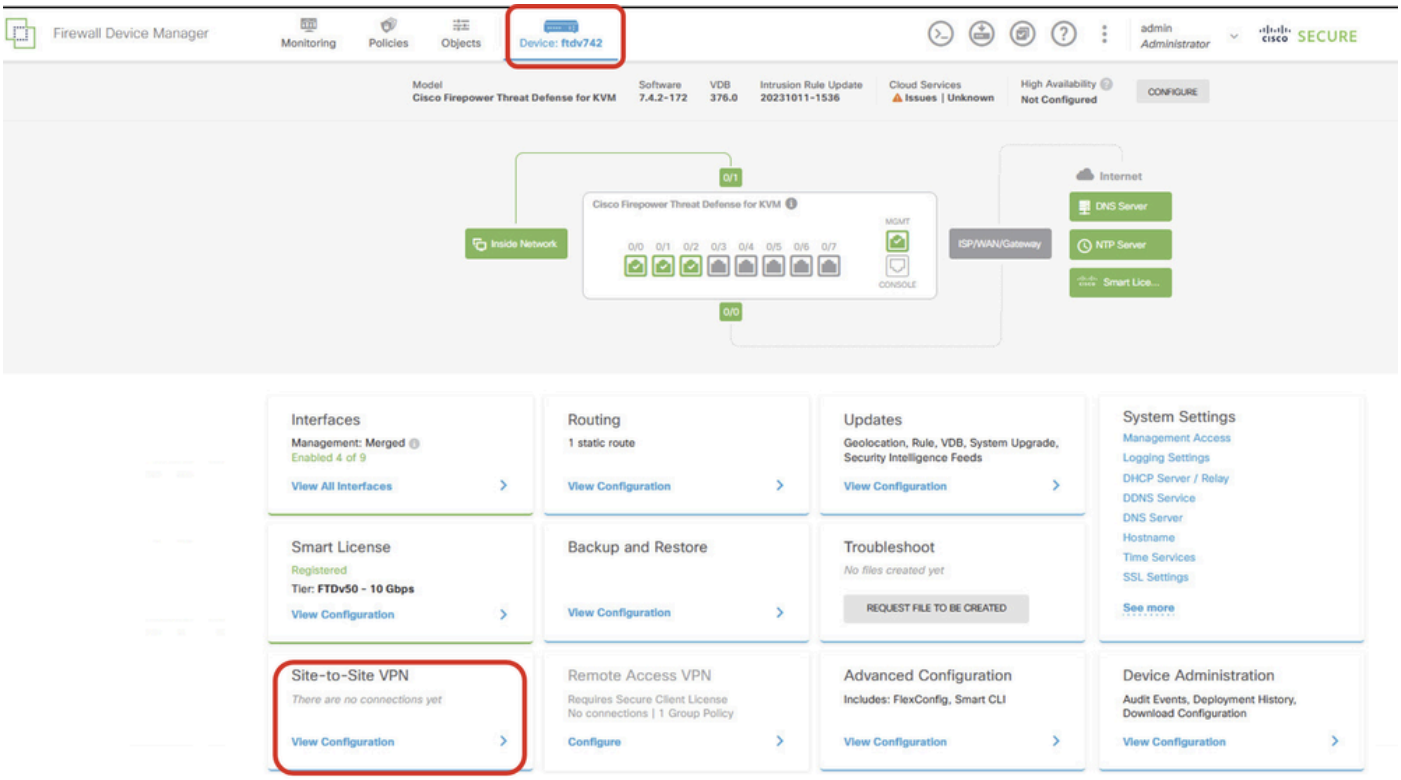
- Name: demovti_sp2
- Tunnel ID: 2
- Tunnel Source: outside2 (GigabitEthernet0/1)

- IP Address And Subnet Mask: 169.254.20.11/24
- Status: click the slider to the Enabled position



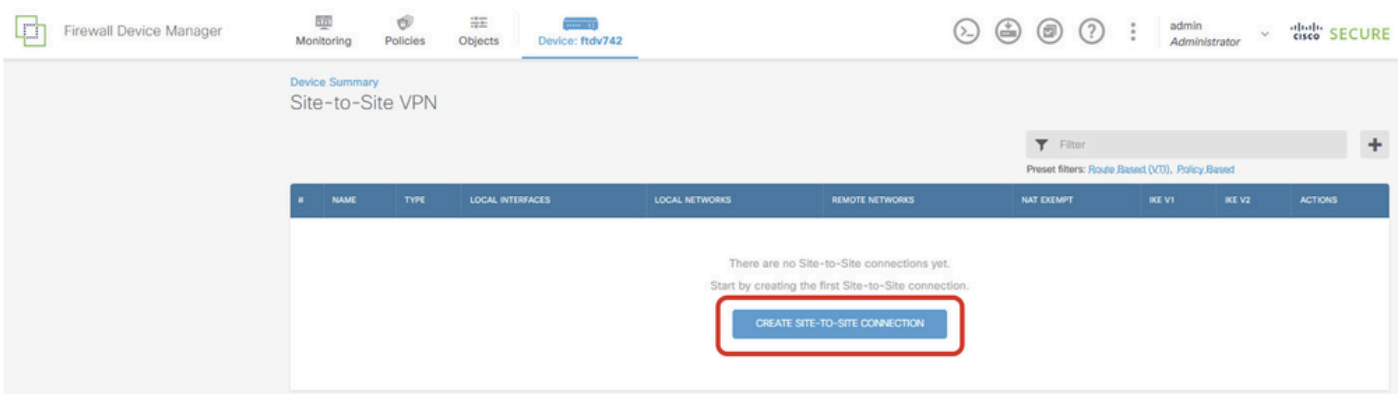
Site1FTD_VTI_Details_Tunnel2_ISP2

Step 4. Navigate to **Device > Site-to-Site VPN**. Click **View Configuration** button.



Site1FTD_View_Site2Site_VPN

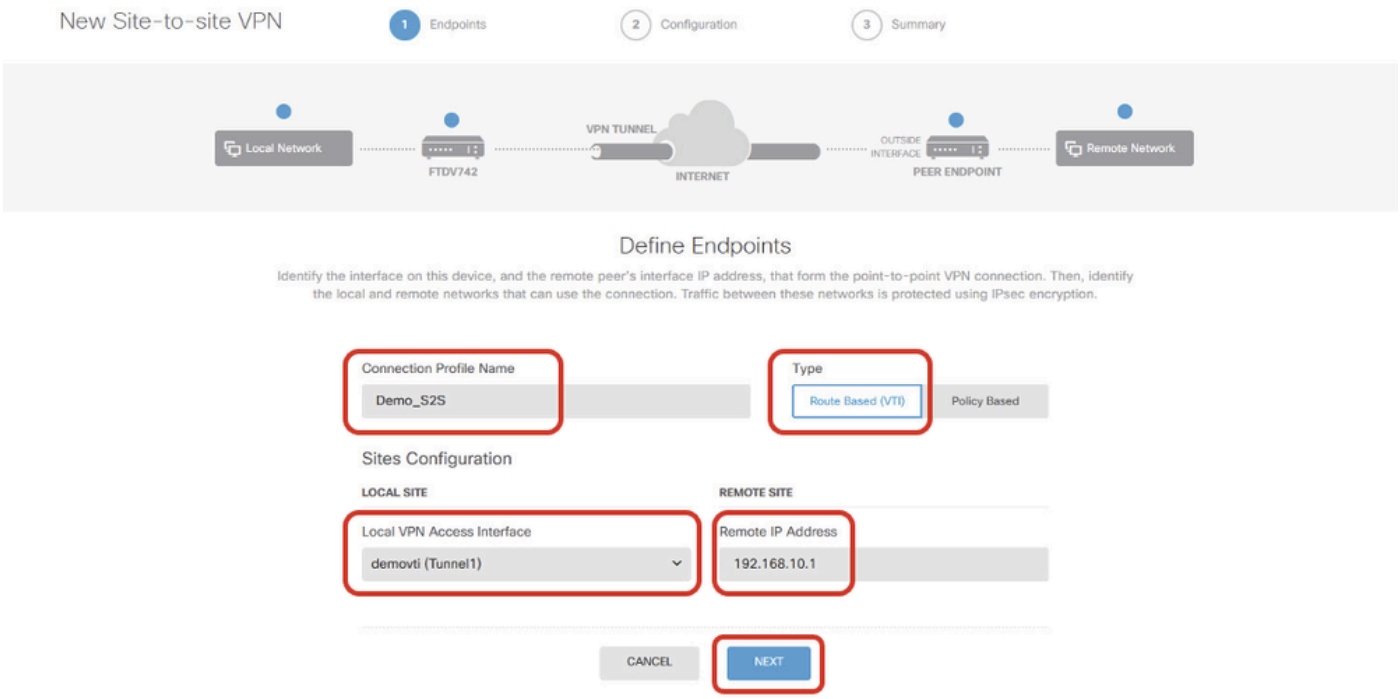
Step 5. Start to create new site-to-site VPN through ISP1. Click **CREATE SITE-TO-SITE CONNECTION** button, or click the + button.



Site1FTD_Create_Site-to-Site_Connection

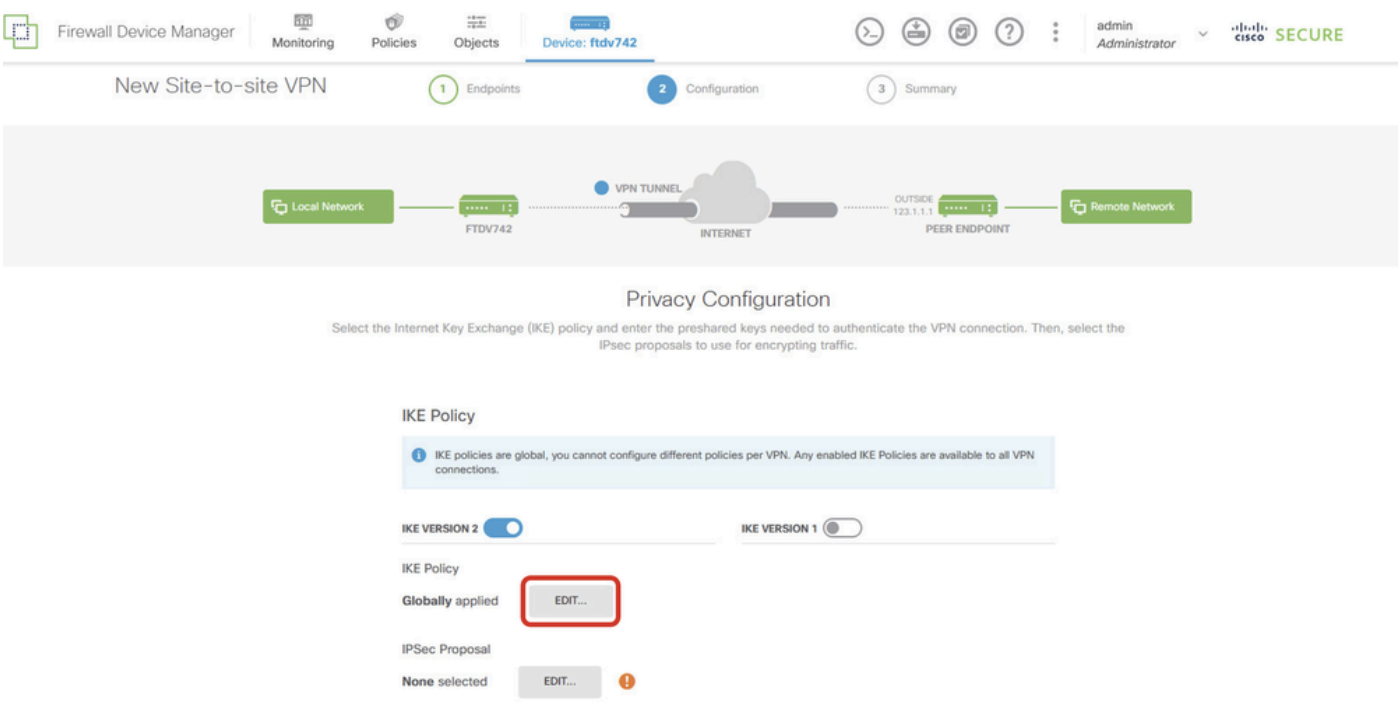
Step 5.1. Provide necessary information of Endpoints. Click **NEXT** button.

- Connection Profile Name: Demo_S2S
- Type: Route Based (VTI)
- Local VPN Access Interface: demovti (created in Step 3.)
- Remote IP Address: 192.168.10.1 (this is Site2 FTD ISP1 IP address)



Site1FTD_ISP1_Site-to-Site_VPN_Define_Endpoints

Step 5.2. Navigate to IKE Policy. Click **EDIT** button.



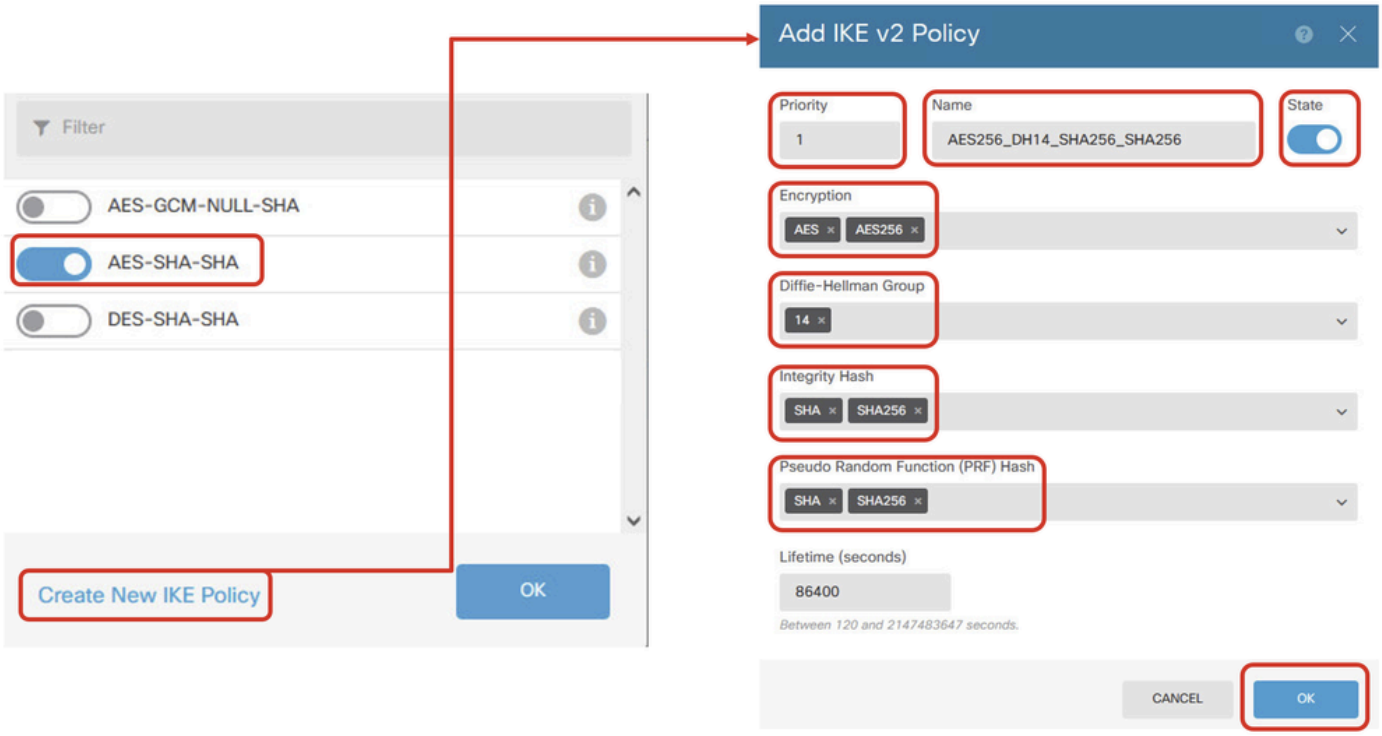
Site1FTD_Edit_IKE_Policy

Step 5.3. For IKE policy, you can use pre-defined or you can create a new one by clicking **Create New IKE Policy**.

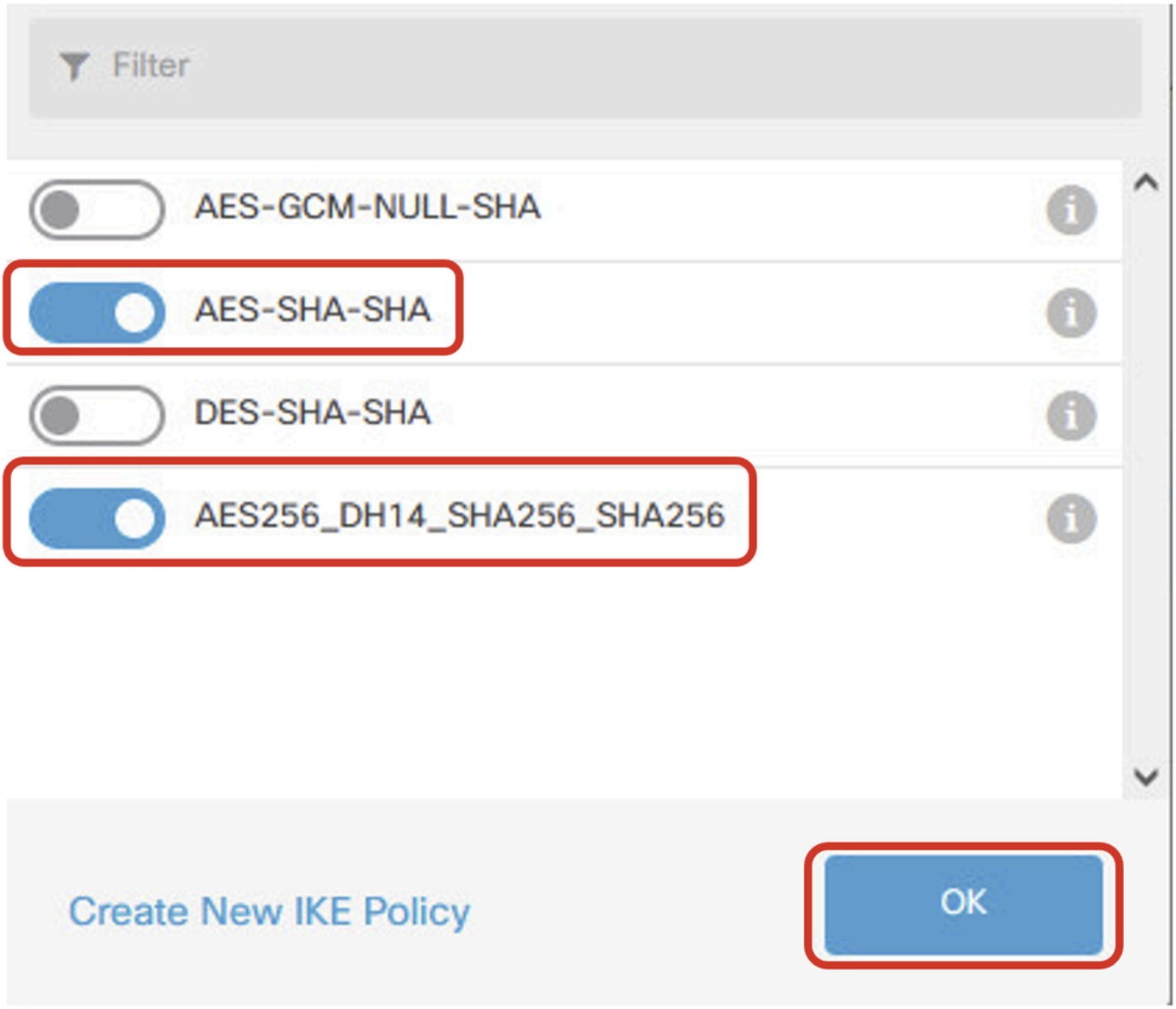
In this example, toggle an existing IKE policy **AES-SHA-SHA** and also create a new one for demo purpose. Click **OK** button in order to save.

- Name: AES256_DH14_SHA256_SHA256

- Encryption: AES, AES256
- DH Group: 14
- Integrity Hash: SHA, SHA256
- PRF Hash: SHA, SHA256
- Lifetime: 86400 (default)

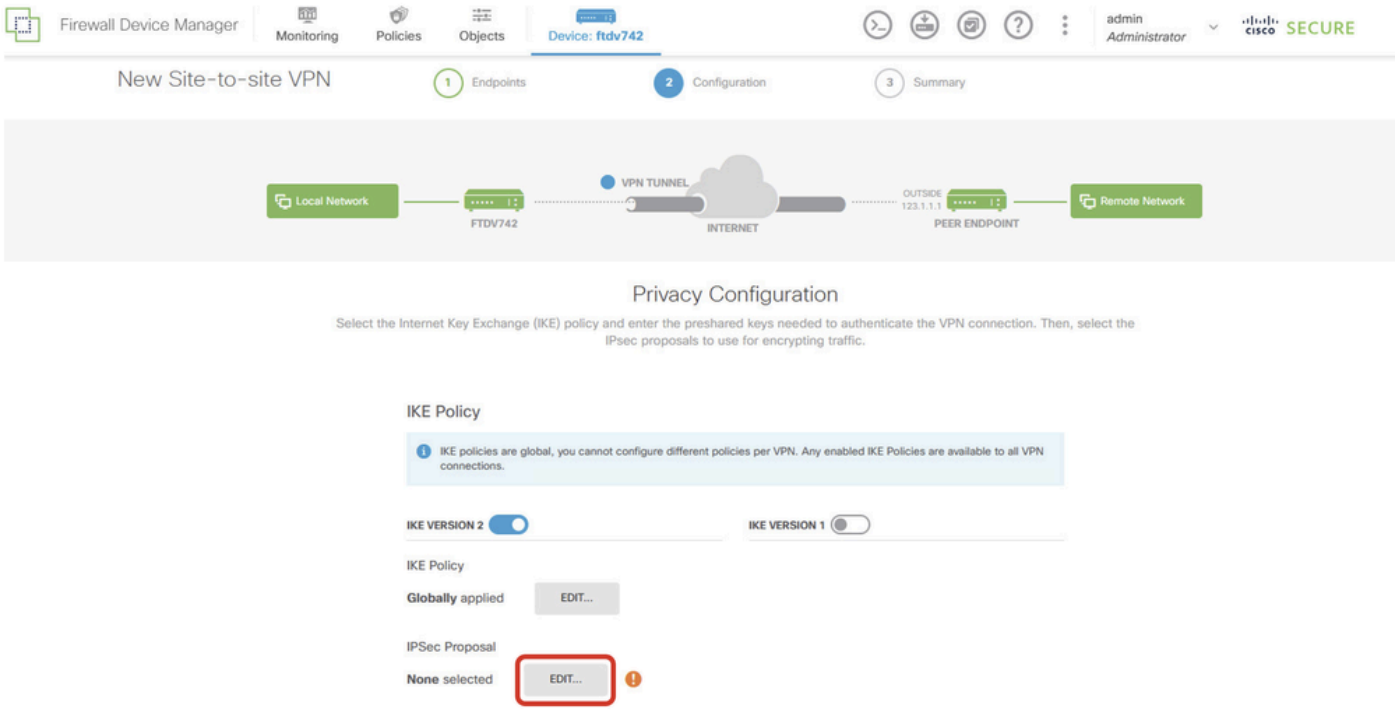


Site1FTD_Add_New_IKE_Policy



Site1FTD_Enable_New_IKE_Policy

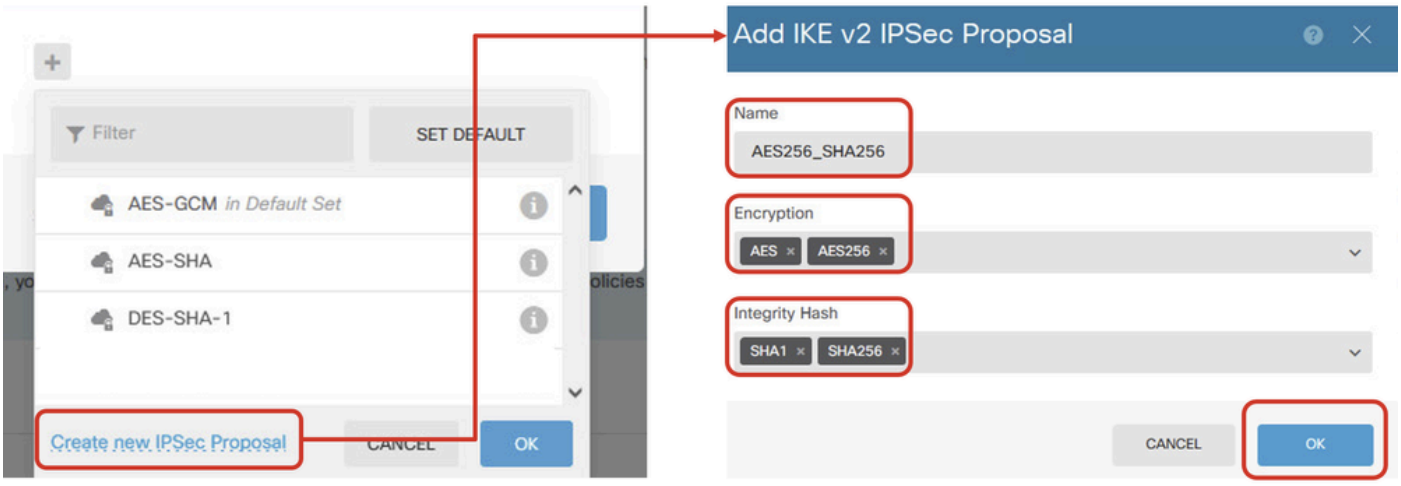
Step 5.4. Navigate to IPSec Proposal. Click **EDIT** button.



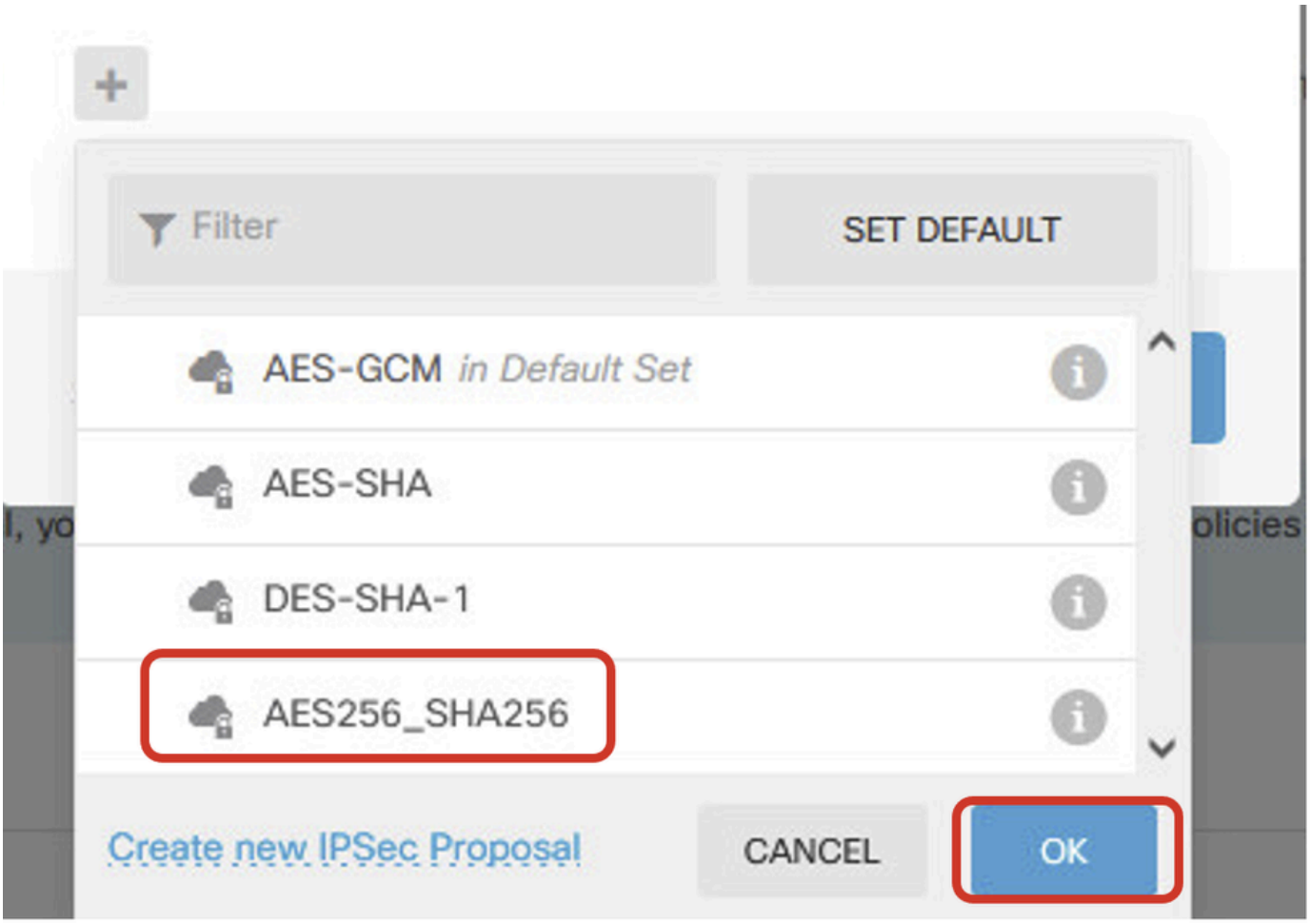
Site1FTD_Edit_IKE_Proposal

Step 5.5. For IPSec proposal, you can use pre-defined or you can create a new one by clicking **Create new IPSec Proposal**. In this example, create a new one for demo purpose. Click **OK** button in order to save.

- Name: AES256_SHA256
- Encryption: AES, AES256
- Integrity Hash: SHA1, SHA256



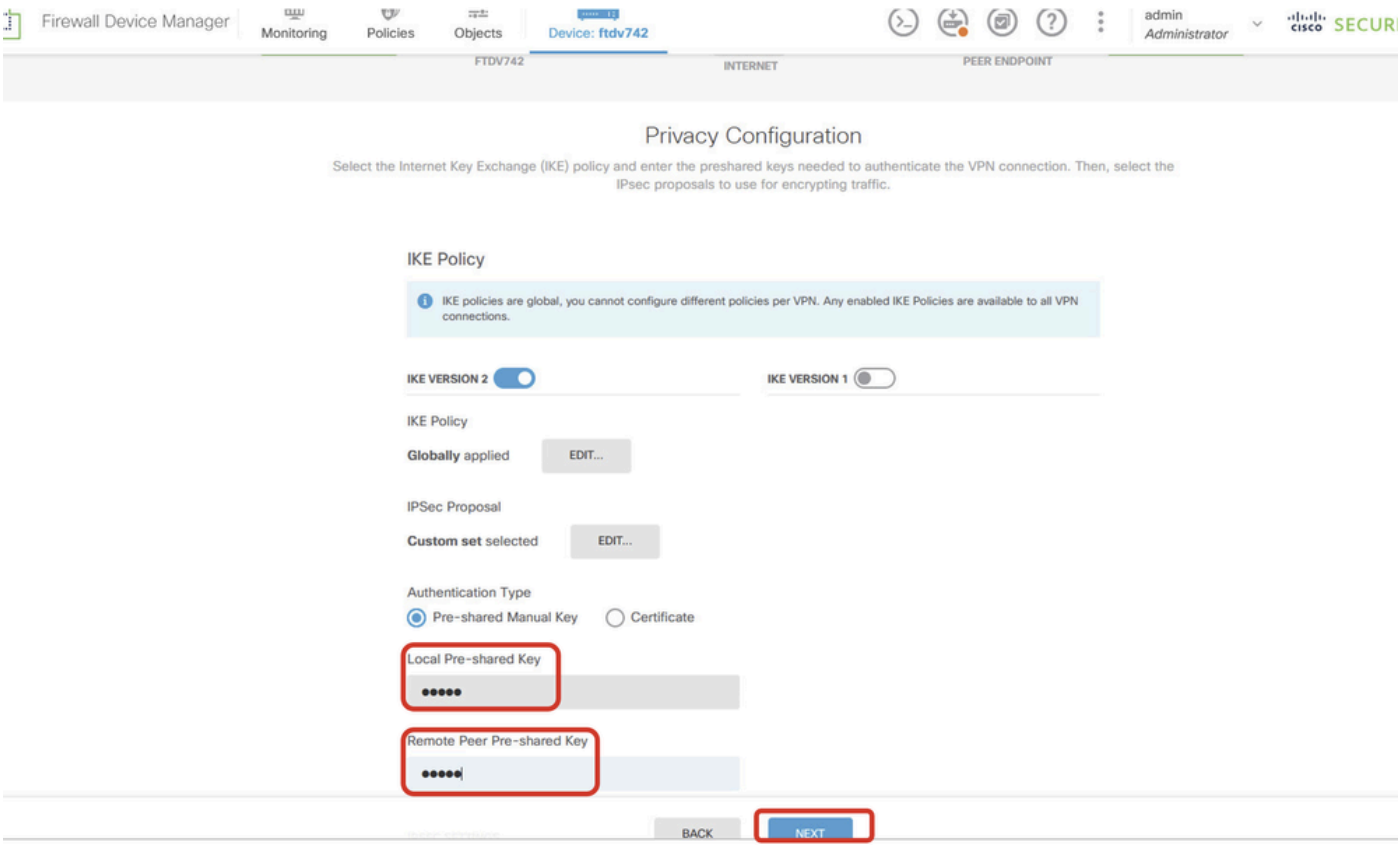
Site1FTD_Add_New_IKE_Proposal



Site1FTD_Enable_New_IKE_Proposal

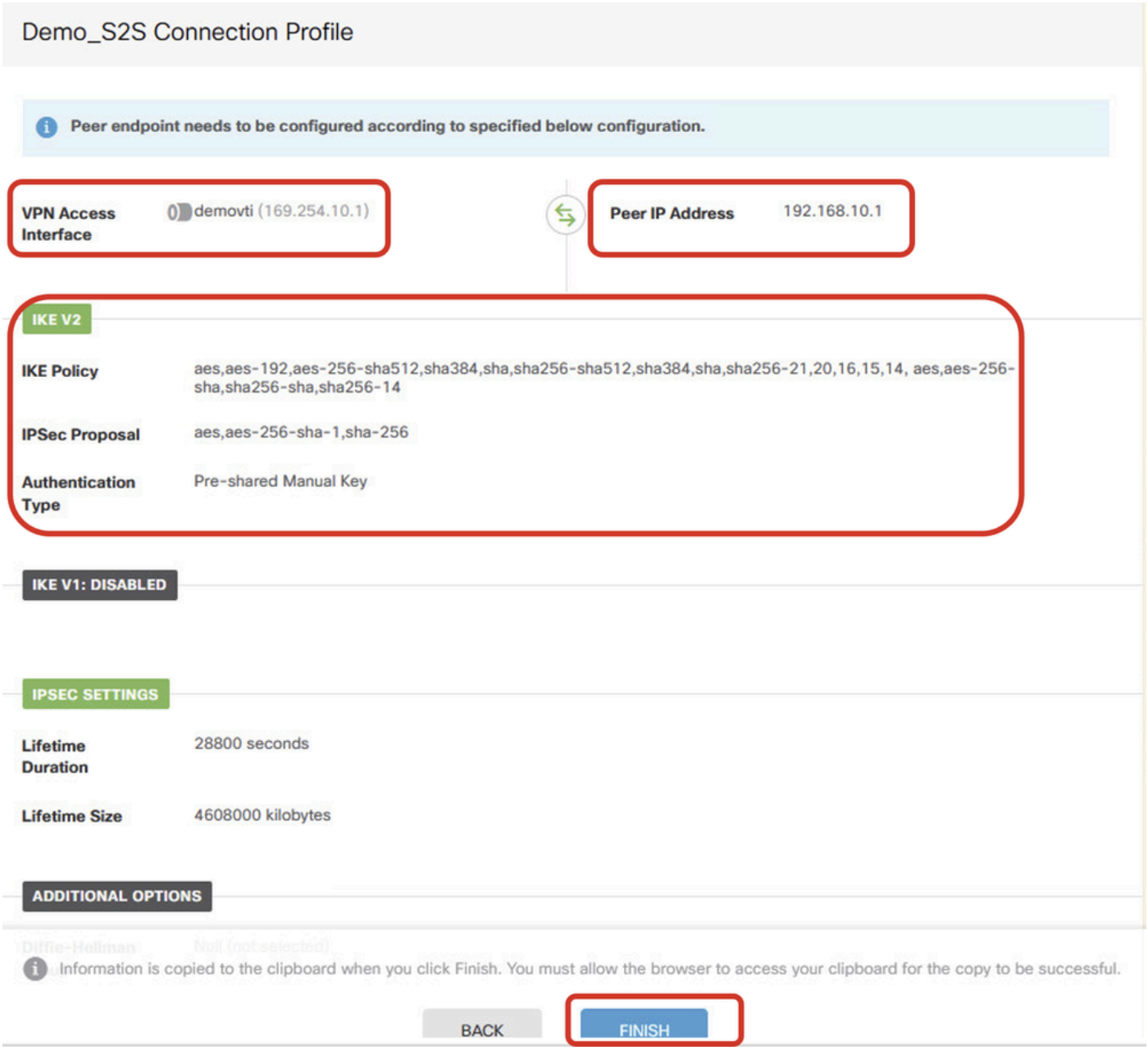
Step 5.6. Scroll down the page and configure the pre-shared key. Click**NEXT**button.

Note down this pre-shared key and configure it on Site2 FTD later.



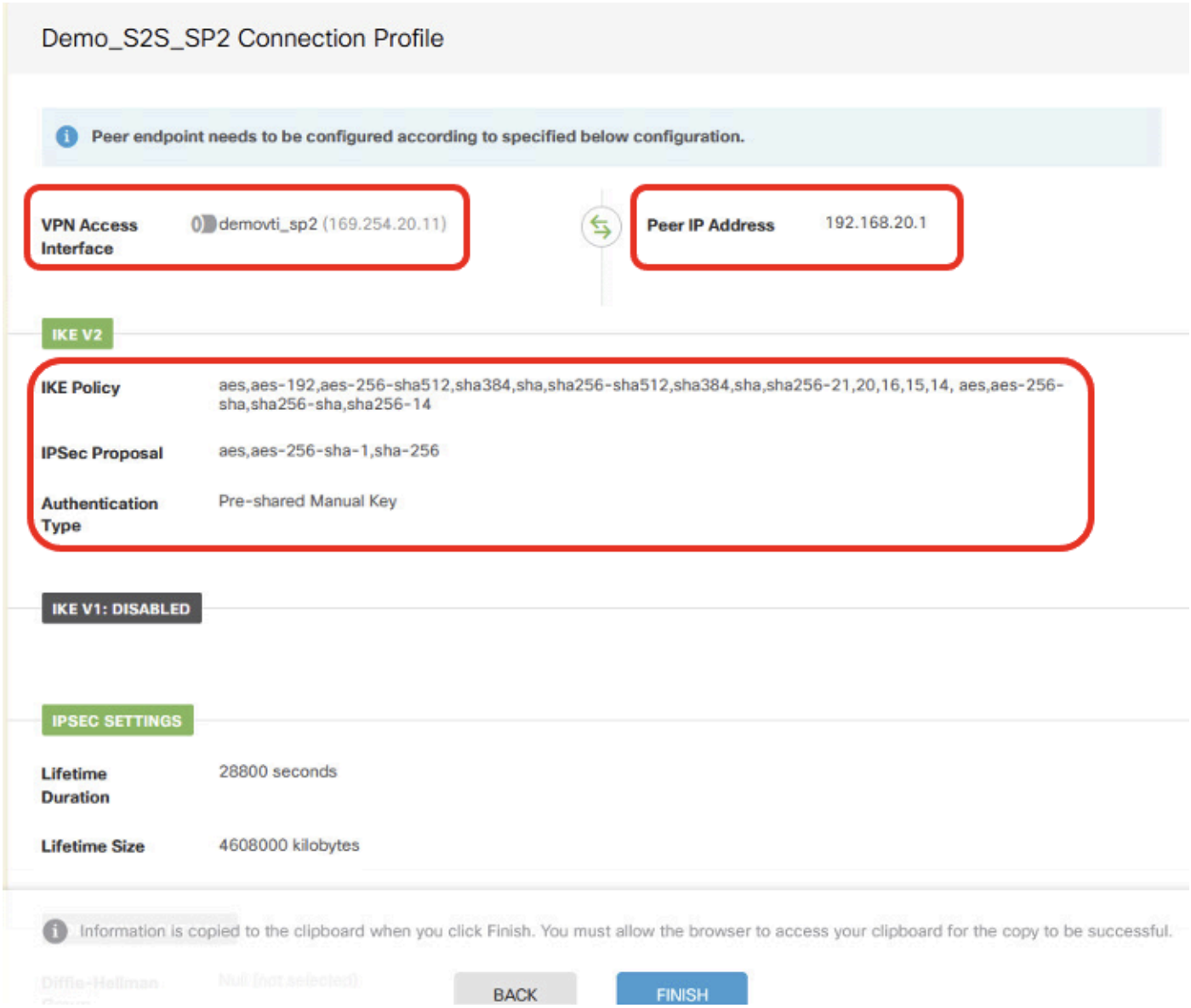
Site1FTD_Configure_Pre_Shared_Key

Step 5.7. Review the VPN configuration. If anything needs to be modified, click the **BACK** button. If everything is good, click the **FINISH** button.



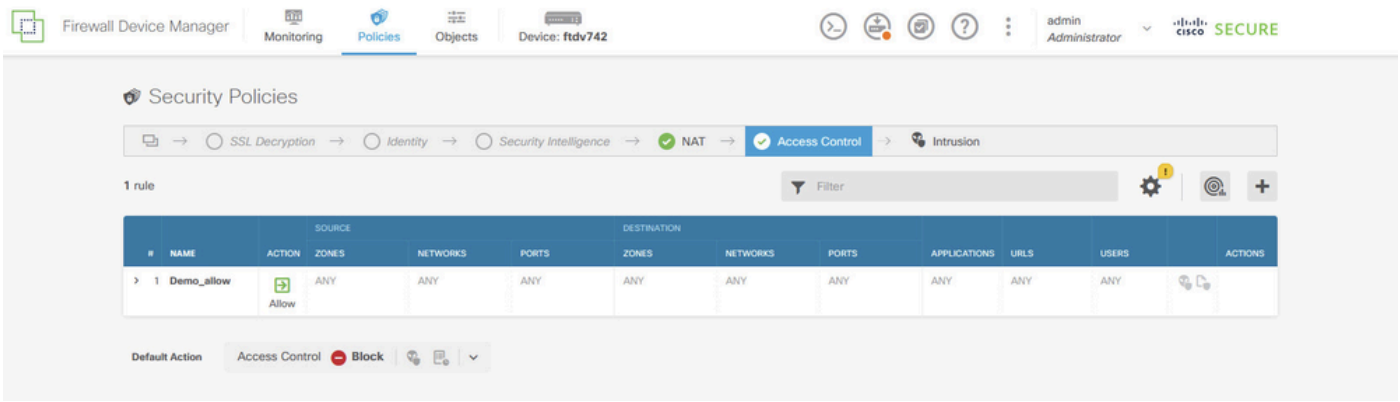
Site1FTD_ISP1_Review_VPN_Config_Summary

Step 6. Repeat the Step 5. in order to create new site-to-site VPN through ISP2.



Site1FTD_ISP2_Review_VPN_Config_Summary

Step 7. Create Access Control rule in order to allow traffic pass through the FTD. In this example, allow all for demo purpose. Modify your policy based on your actual needs.



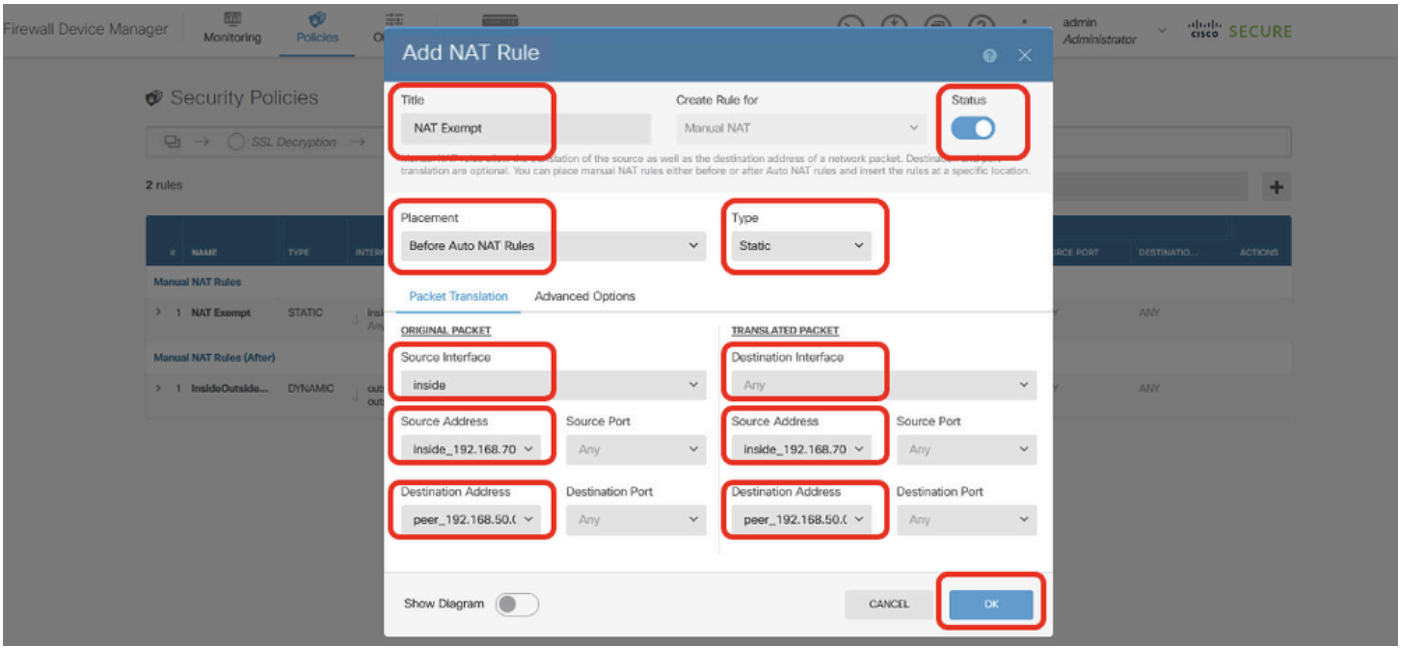
Site1FTD_Allow_Access_Control_Rule_Example

Step 8. (Optional) Configure NAT exempt rule for the client traffic on FTD if there is dynamic NAT configured for client in order to access internet.

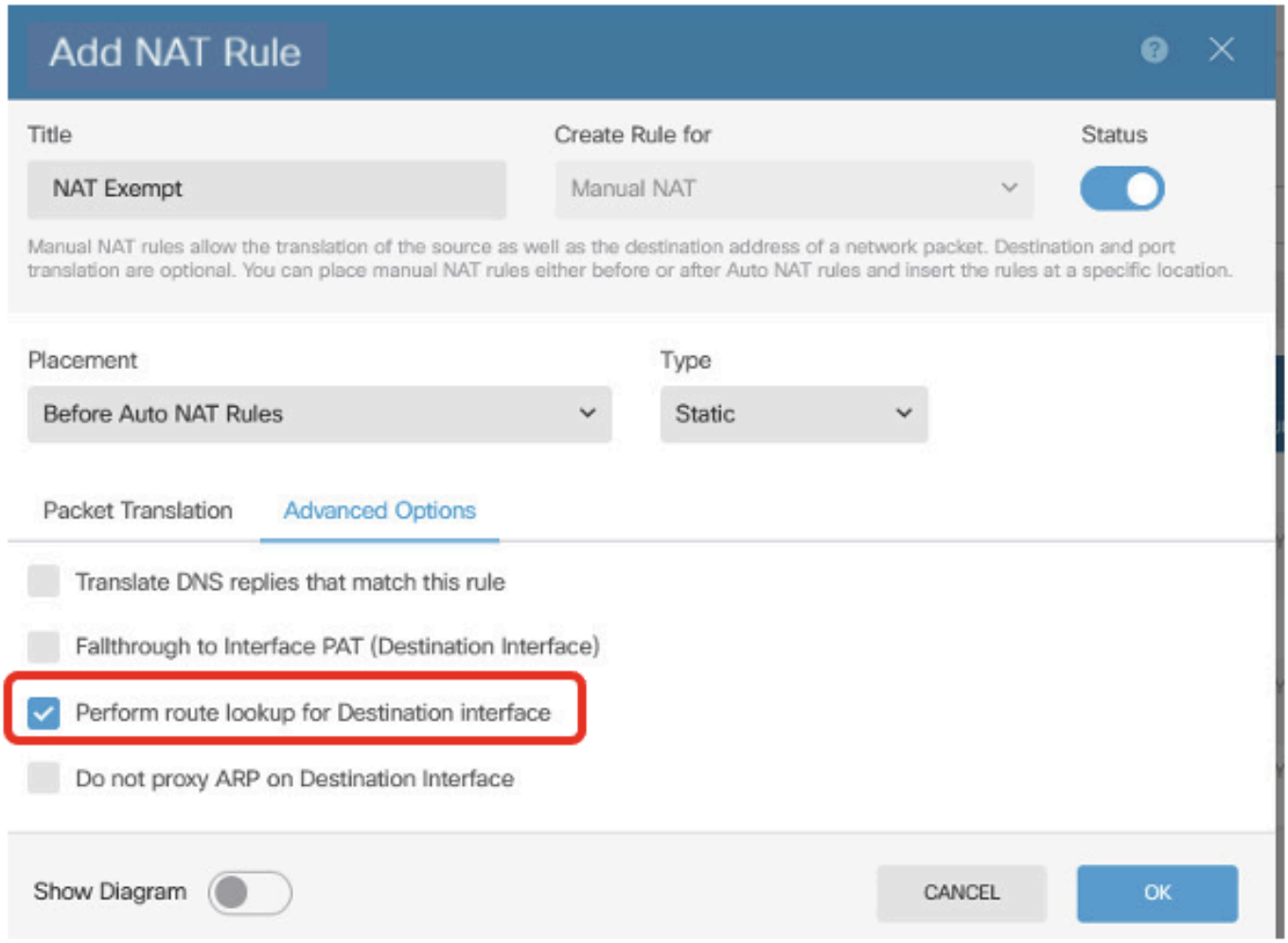
For demo purpose, dynamic NAT is configured for clients in order to access internet in this example. Therefore NAT exempt rule is needed.

Navigate to **Policies > NAT**. Click + button. Provide the details and click **OK**.

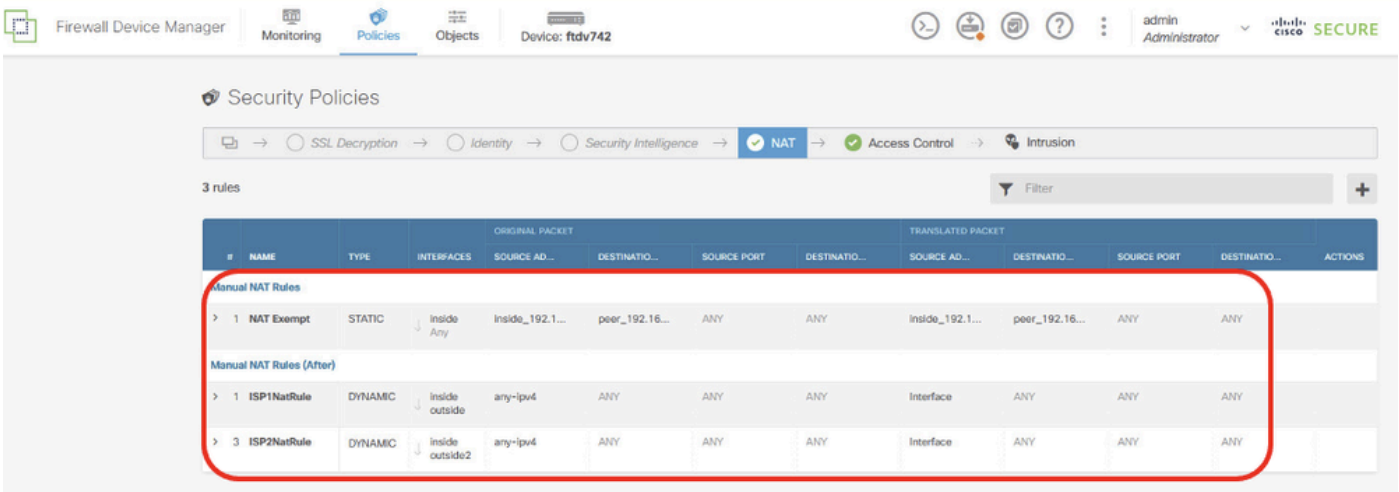
- Title: NAT Exempt
- Placement: Before Auto NAT Rules
- Type: Static
- Source Interface: Inside
- Destination: Any
- Original Source Address: 192.168.70.0/24
- Translated Source Address: 192.168.70.0/24
- Original Destination Address: 192.168.50.0/24
- Translated Destination Address: 192.168.50.0/24
- With Route-Lookup enabled



Site1FTD_Nat_Exempt_Rule



Site1FTD_Nat_Exempt_Rule_2



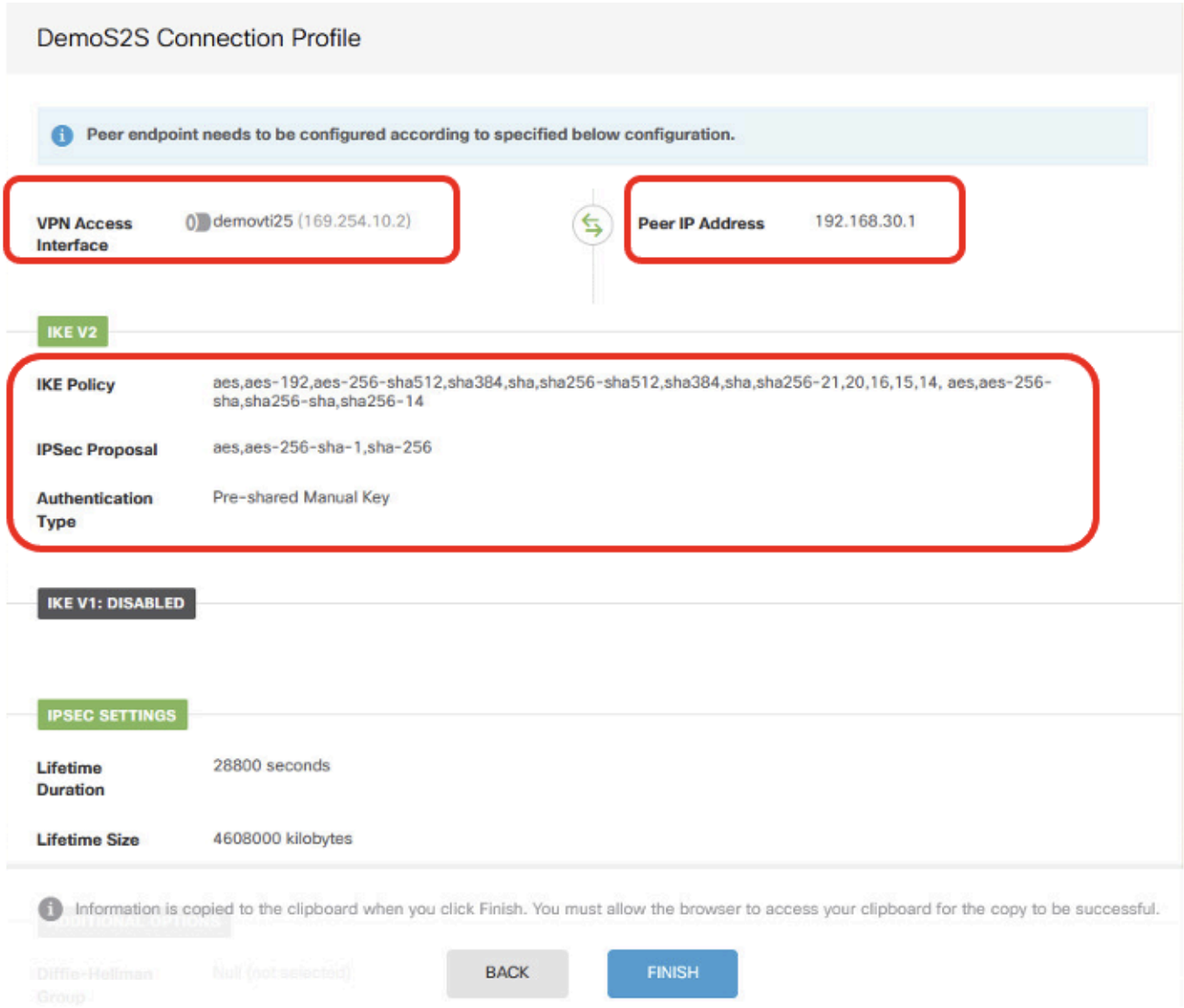
Site1FTD_Nat_Rule_Overview

Step 9. Deploy the configuration changes.

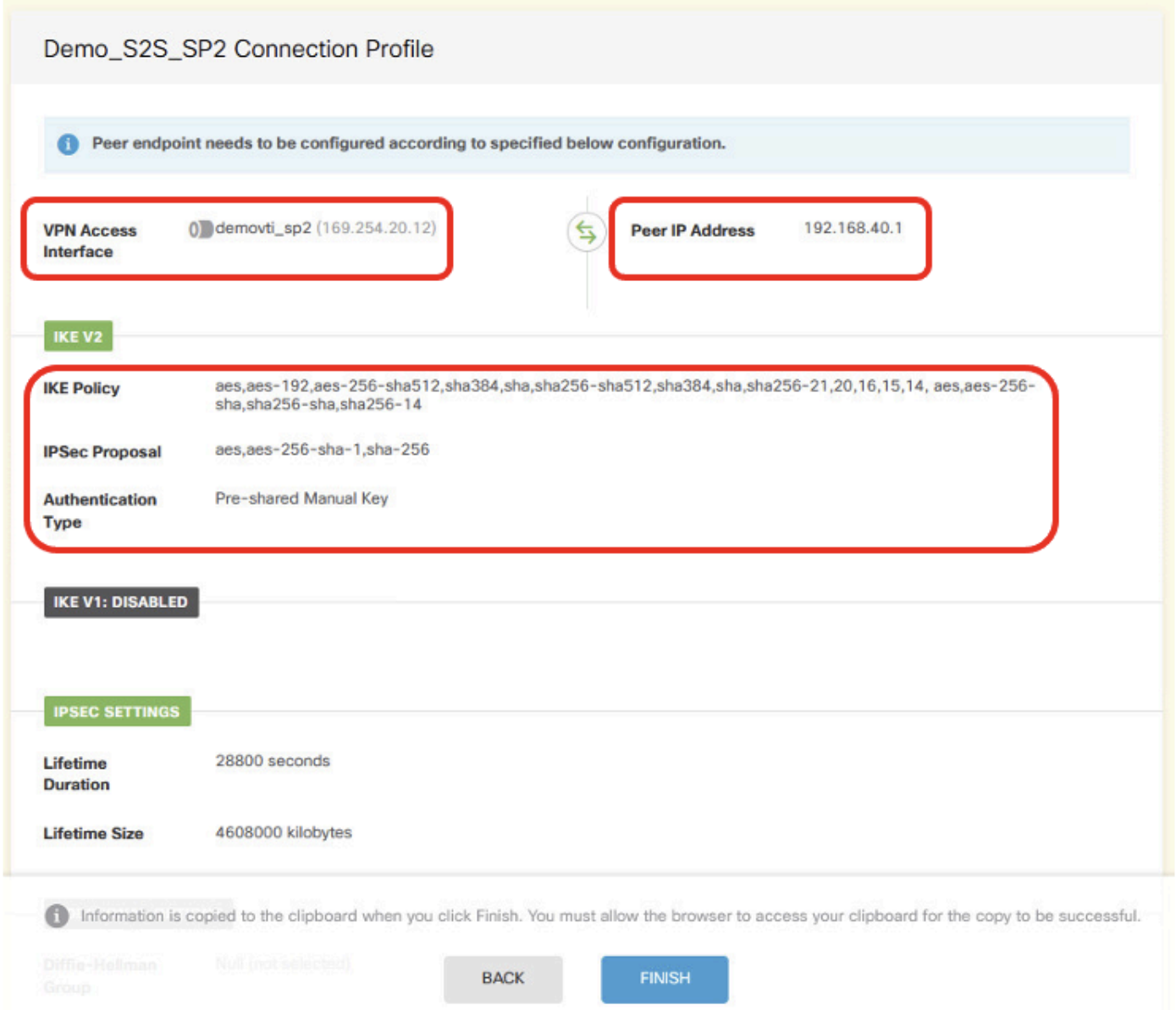
Site1FTD_Deployment_Changes

Site2 FTD VPN Configuration

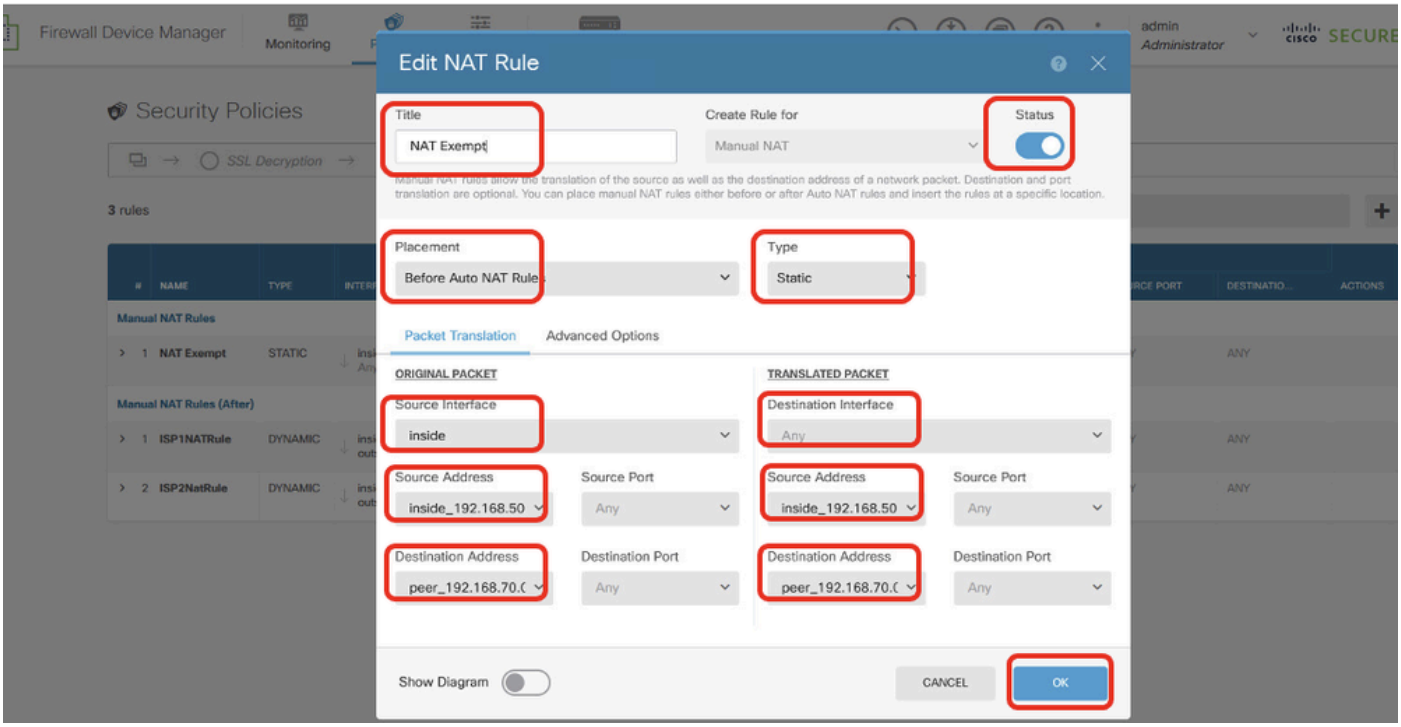
Step 10. Repeat Step 1 to Step 9 with the corresponding parameters for Site2 FTD.



Site2FTD_ISP1_Review_VPN_Config_Summary



Site2FTD_ISP2_Review_VPN_Config_Summary



Site2FTD_Nat_Exempt_Rule

Configurations on PBR

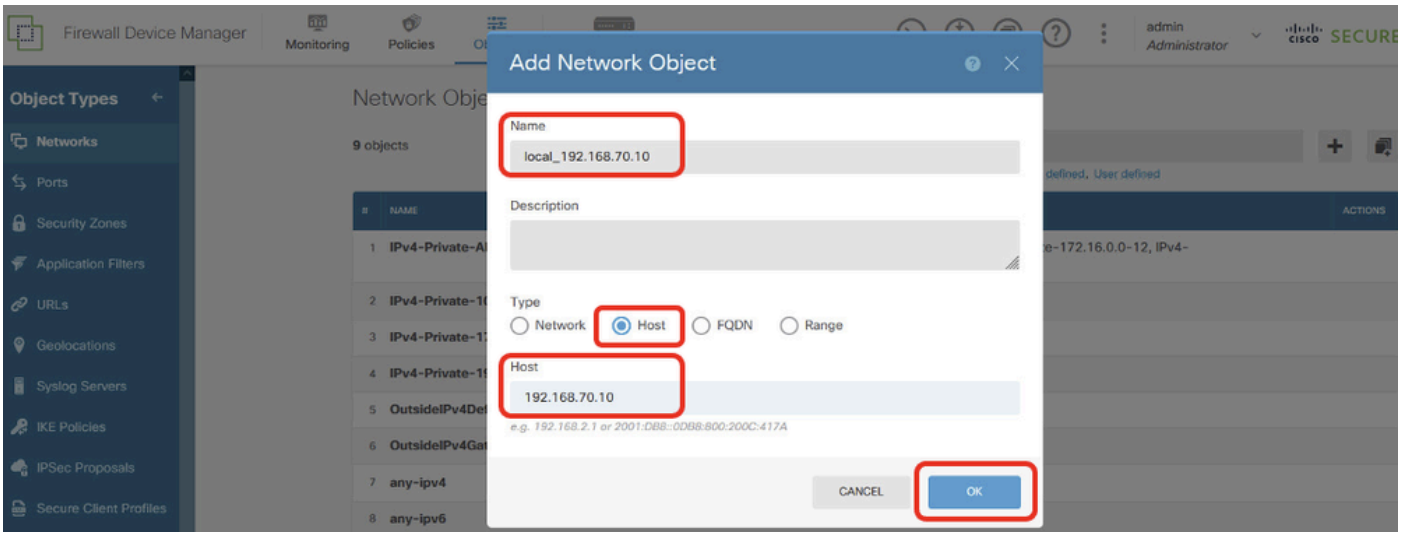
Site1 FTD PBR Configuration

Step 11. Create new network objects to be used by PBR access-list for Site1 FTD. Navigate to **Objects** > **Networks** and click + button.

Site1FTD_Create_Network_Object

Step 11.1. Create object of Site1 Client2 IP address. Provide necessary information. Click the **OK** button.

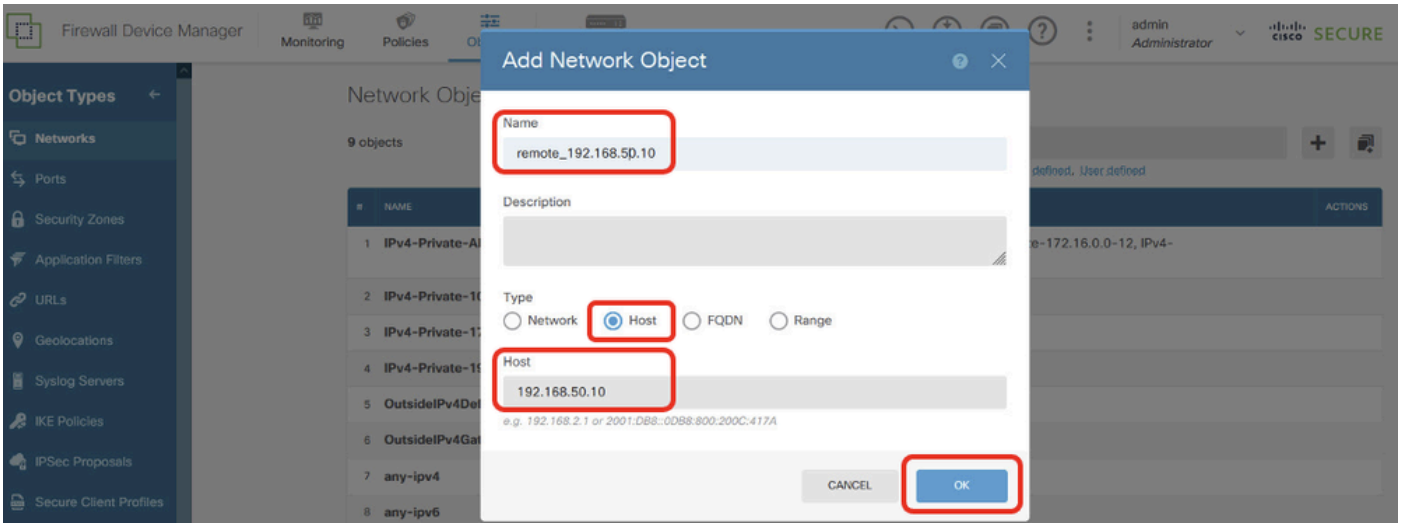
- Name: local_192.168.70.10
- Type: Host
- Host: 192.168.70.10



Site1FTD_Site1FTD_PBR_LocalObject

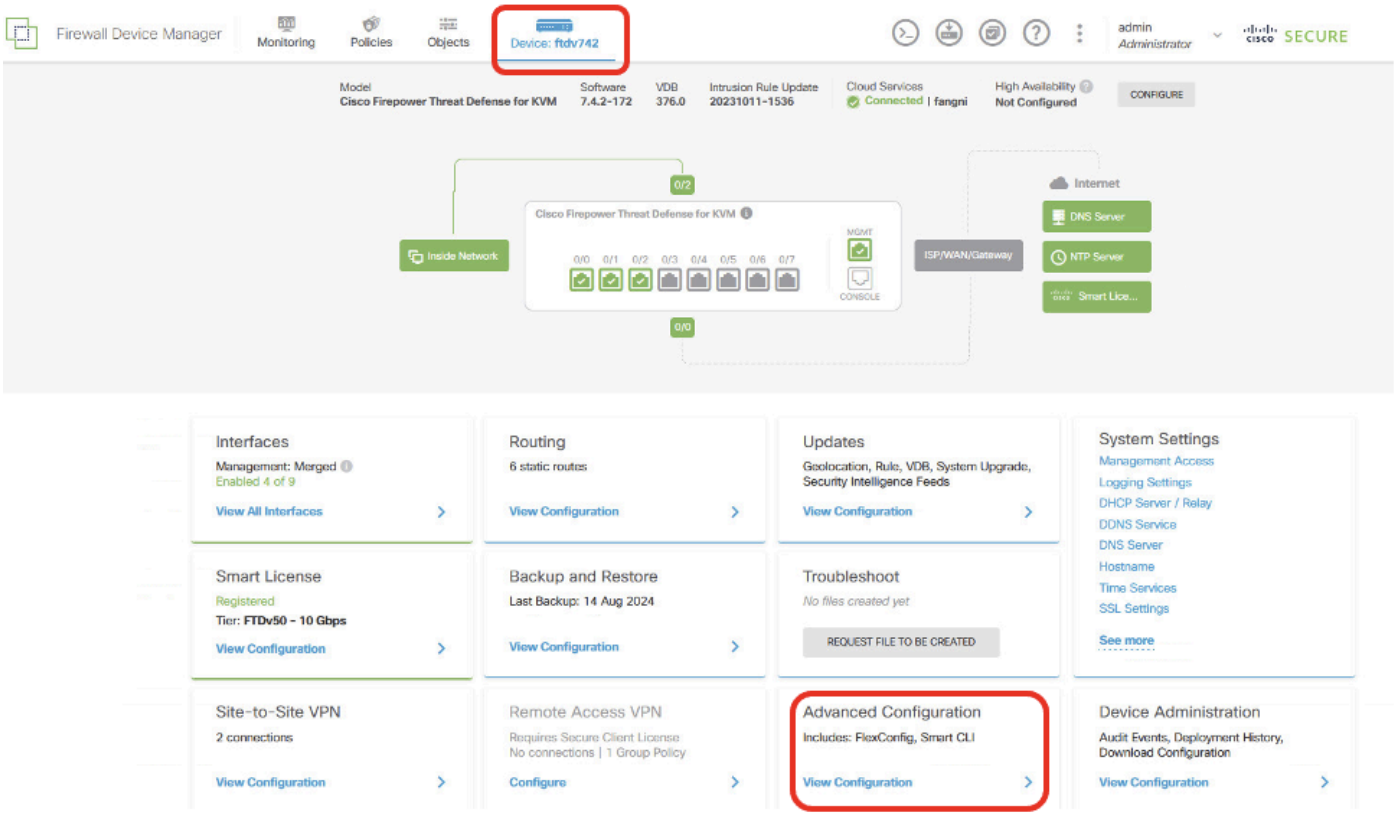
Step 11.2. Create object of Site2 Client2 IP address. Provide necessary information. Click **OK** button.

- Name: remote_192.168.50.10
- Type: Host
- Host: 192.168.50.10



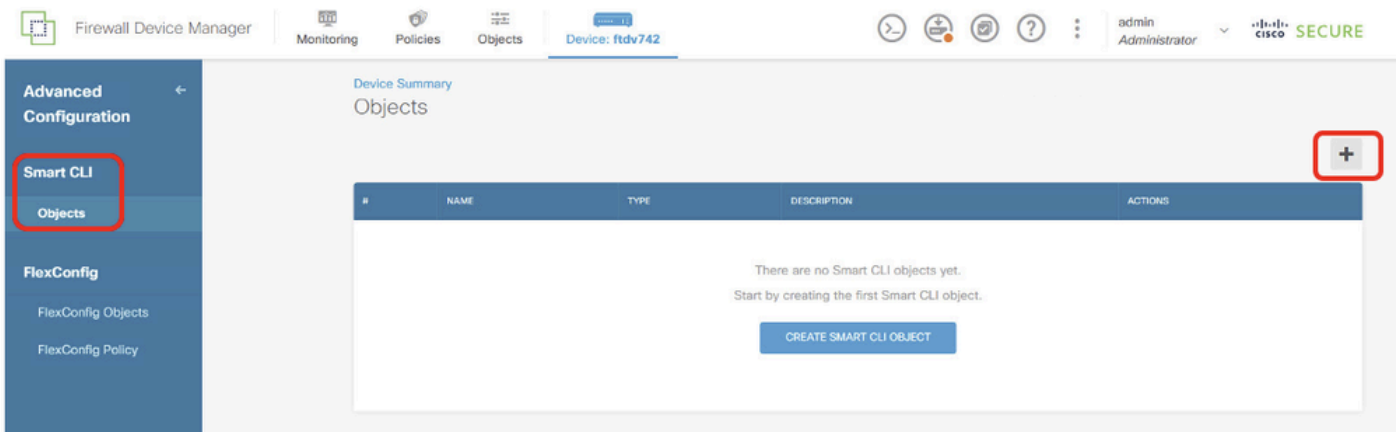
Site1FTD_PBR_RemoteObject

Step 12. Create extend access-list for PBR. Navigate to **Device > Advanced Configuration**. Click **View Configuration**.



Site1FTD_View_Advanced_Configuration

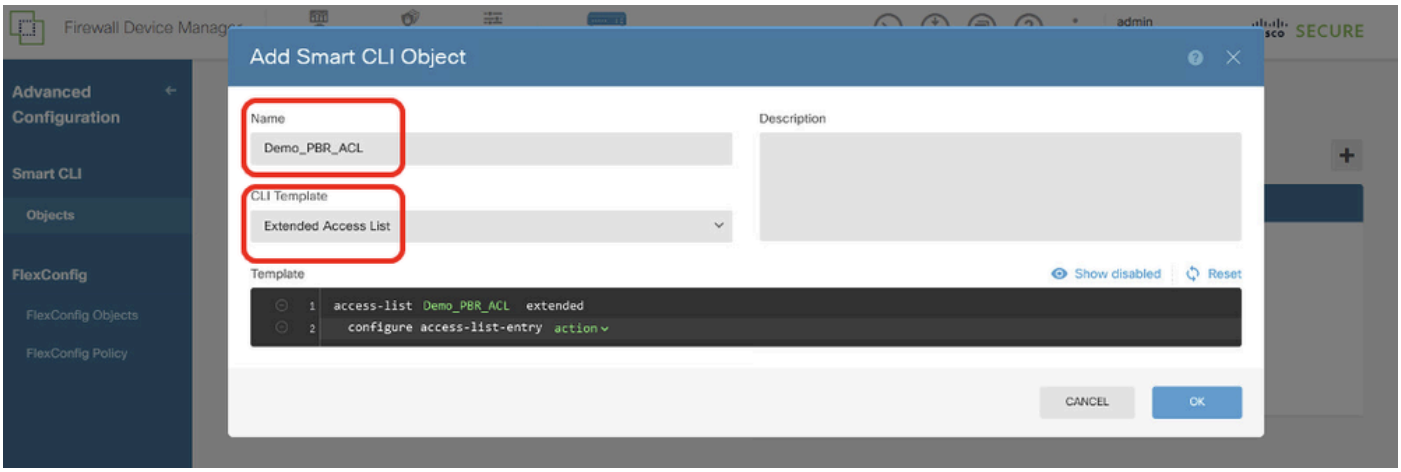
Step 12.1. Navigate to **Smart CLI > Objects**. Click + button.



Site1FTD_Add_SmartCLI_Object

Step 12.2. Enter a name for the object and choose the CLI Template.

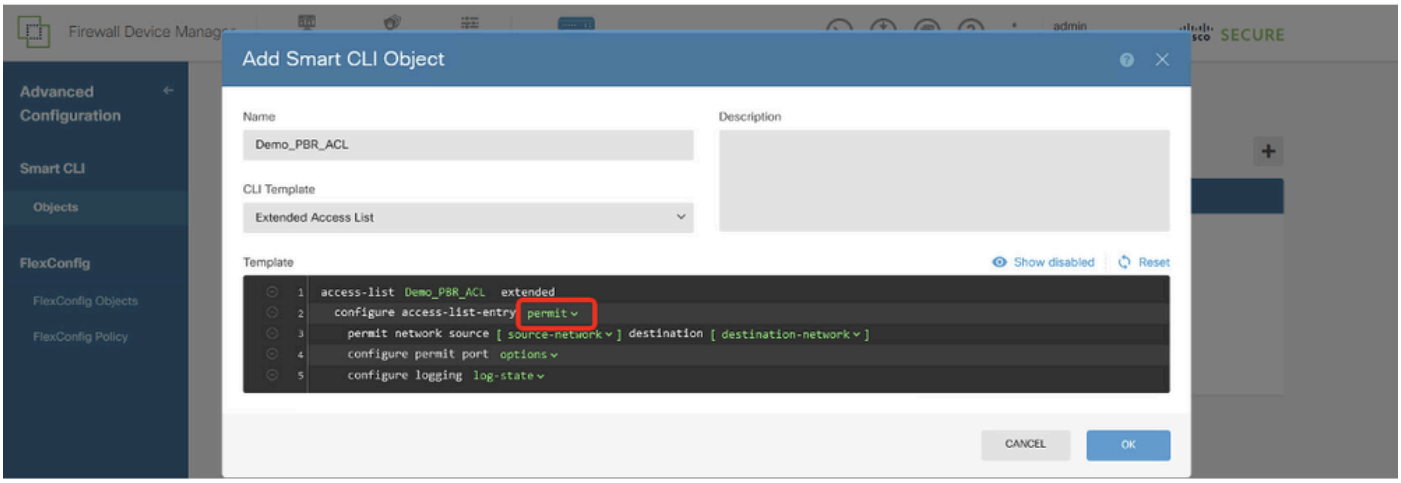
- Name: Demo_PBR_ACL
- CLI Template: Extended Access List



Site1FTD_Create_PBR_ACL_1

Step 12.3. Navigate to **Template** and configure. Click the **OK** button in order to save.

Line 2, click **action**. Choose **permit**.

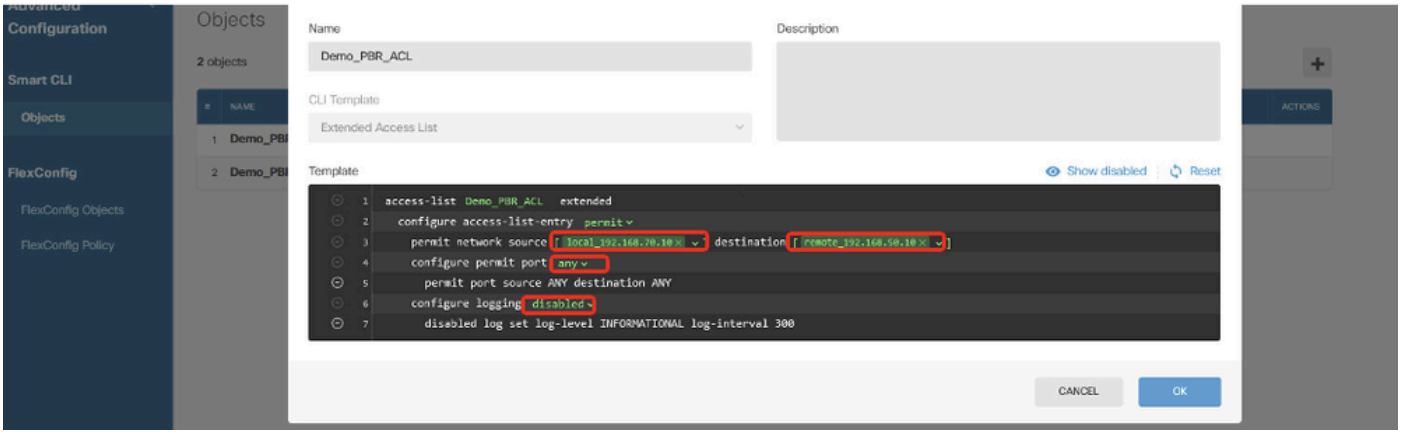


Site1FTD_Create_PBR_ACL_2

Line 3, click **source-network**. Choose **local_192.168.70.10**. Click **destination-network**. Choose **remote_192.168.50.10**.

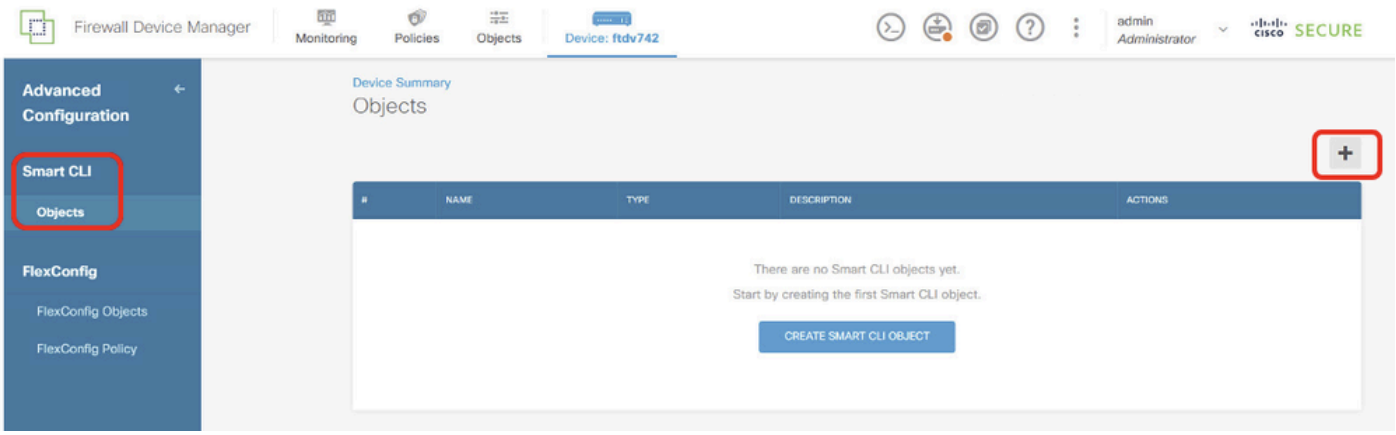
Line 4, click **options** and choose **any**.

Line 6, click **log-state** and choose **disabled**.



Site1FTD_Create_PBR_ACL_3

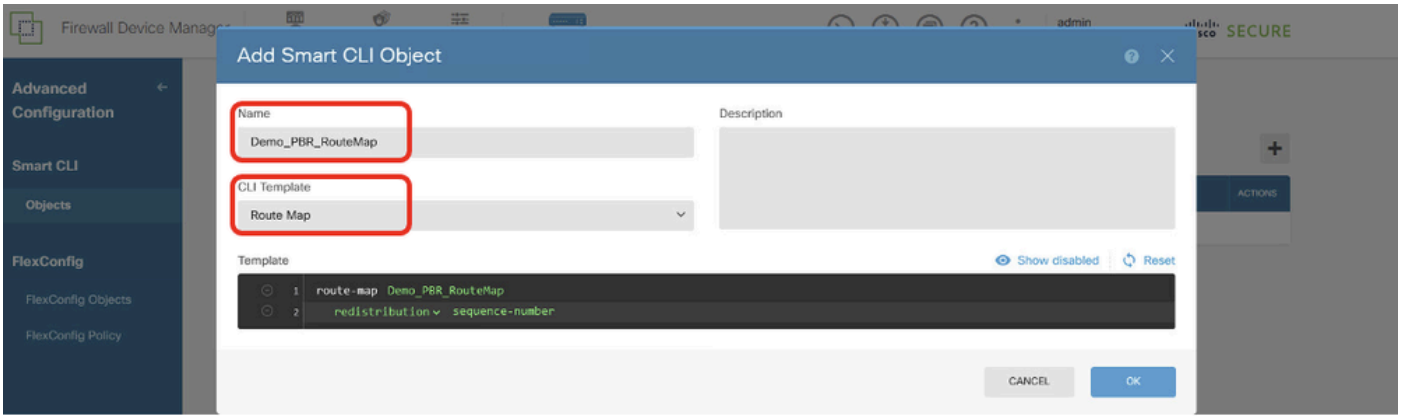
Step 13. Create route map for PBR. Navigate to **Device > Advanced Configuration > Smart CLI > Objects**. Click + button.



Site1FTD_Add_SmartCLI_Object

Step 13.1. Enter a name for the object and choose the CLI Template.

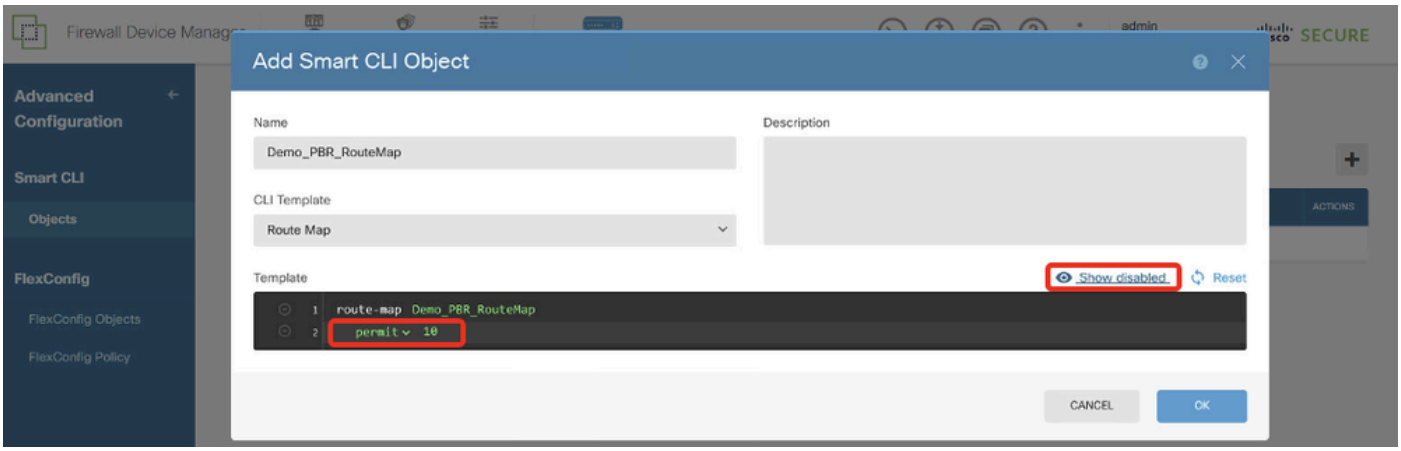
- Name: Demo_PBR_RouteMap
- CLI Template: Route Map



Site1FTD_Create_PBR_RouteMap_1

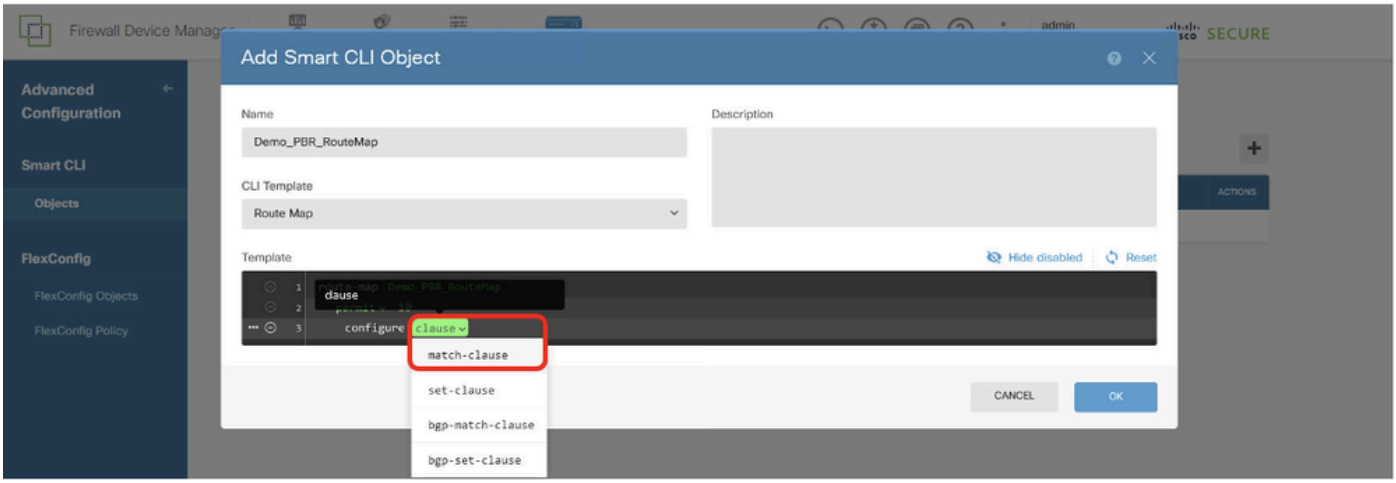
Step 13.2. Navigate to **Template** and configure. Click **OK** button to save.

Line 2, click **redistribution**. Choose **permit**. Click **sequence-number**, manual input **10**. Click **Show disabled**.



Site1FTD_Create_PBR_RouteMap_2

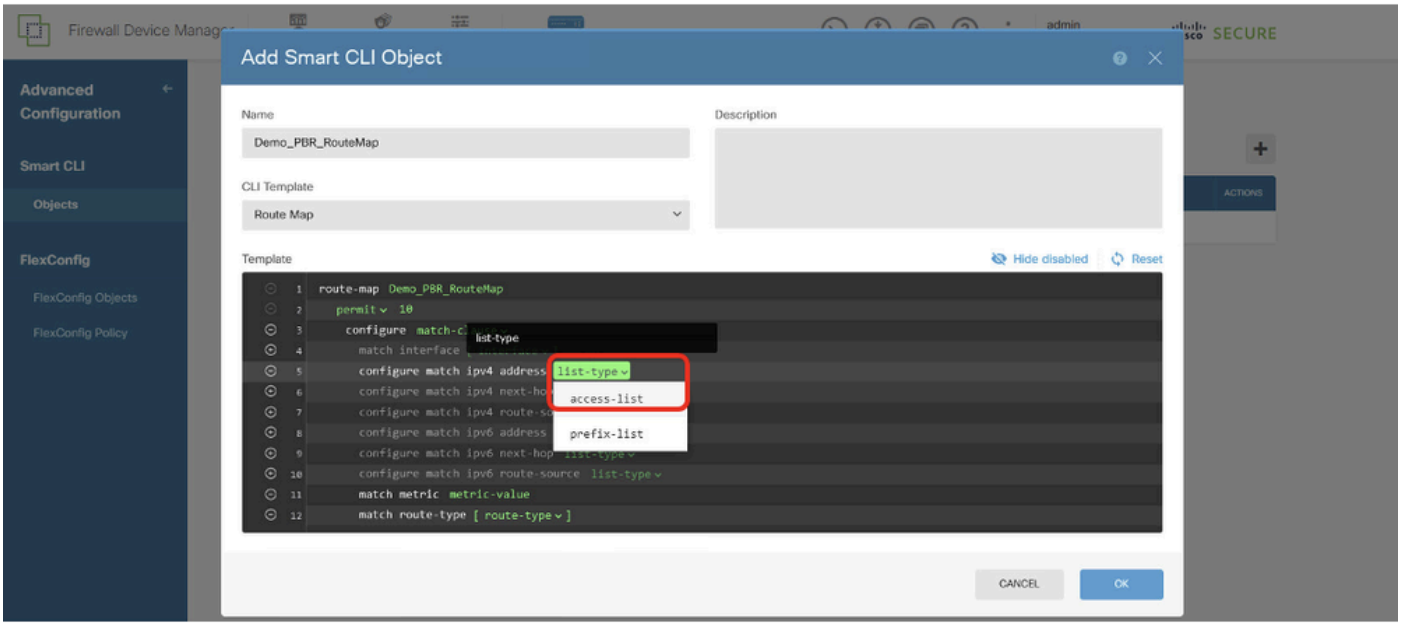
Line 3, click + to enable the line. Click **clause**. Choose **match-clause**.



Site1FTD_Create_PBR_RouteMap_3

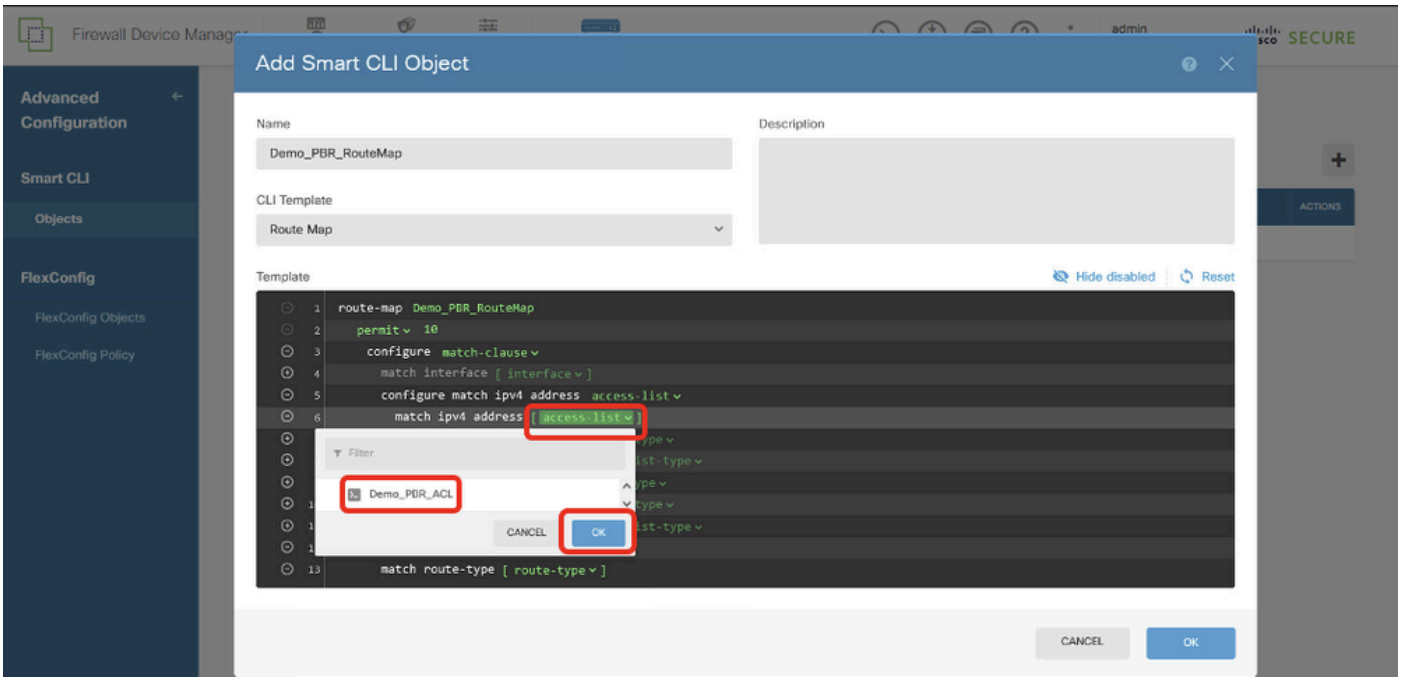
Line 4, click – to disable the line.

Line 5, click + to enable the line. Click **list-type**. Choose **access-list**.



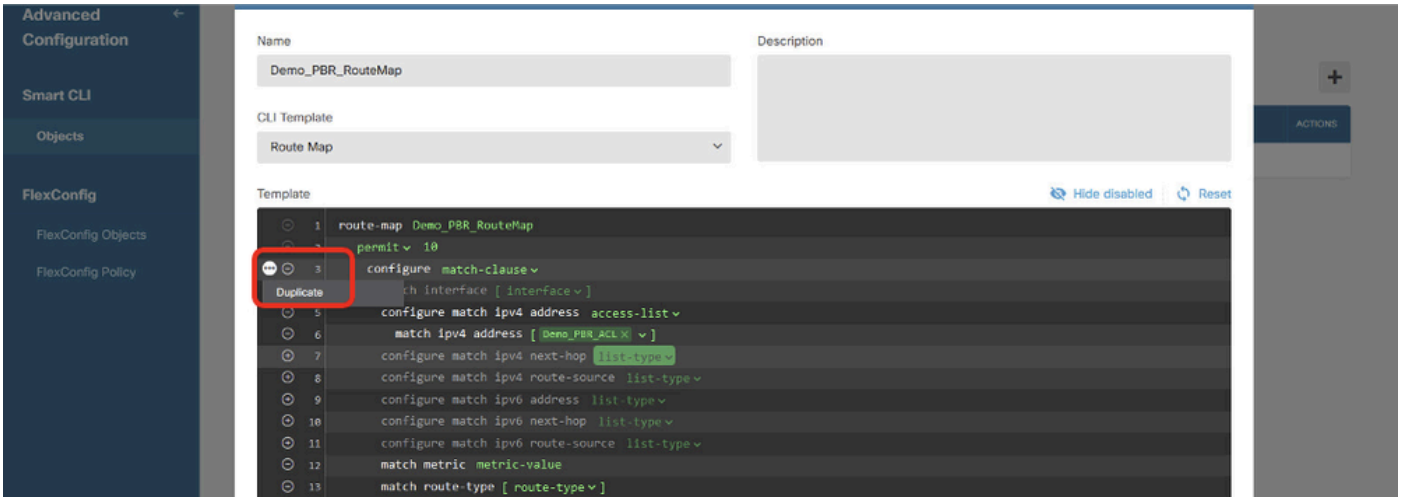
Site1FTD_Create_PBR_RouteMap_4

Line 6, click **access-list**. Choose the ACL name that is created in Step 12. In this example, it is **Demo_PBR_ACL**.



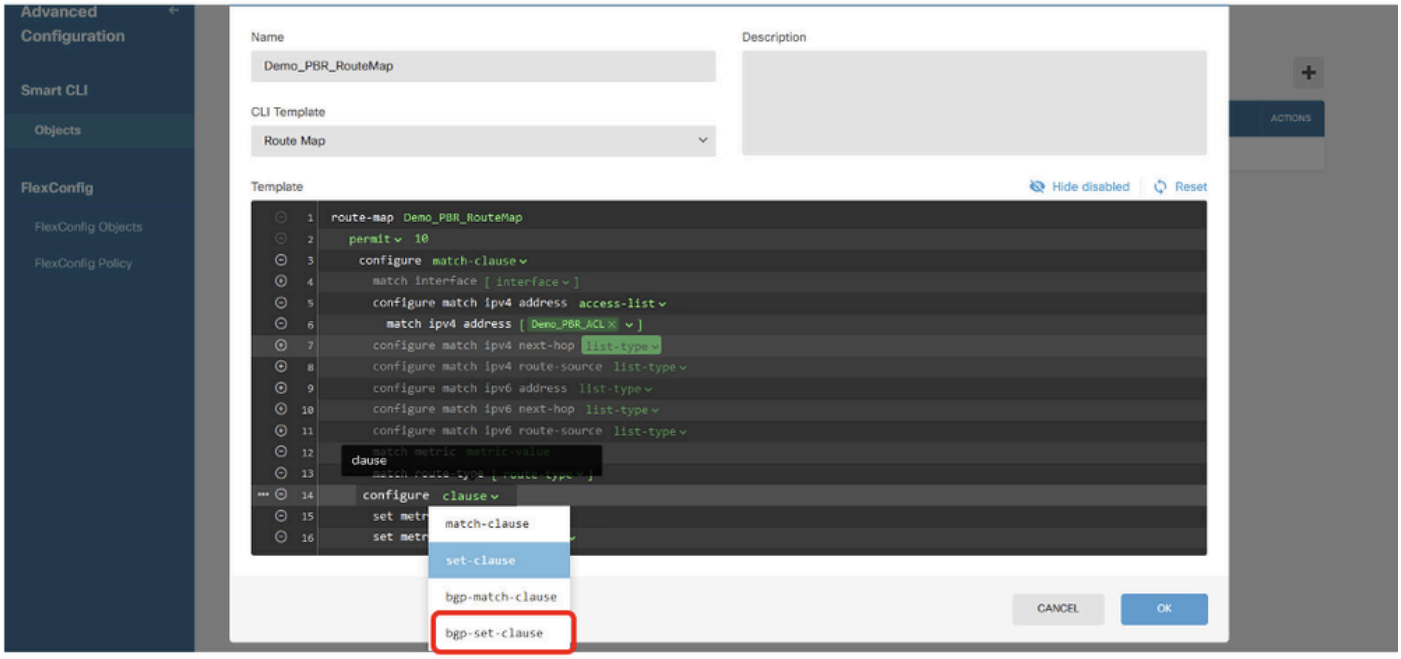
Site1FTD_Create_PBR_RouteMap_5

Move back to Line 3. Click the options **...** button and choose **Duplicate**.



Site1FTD_Create_PBR_RouteMap_6

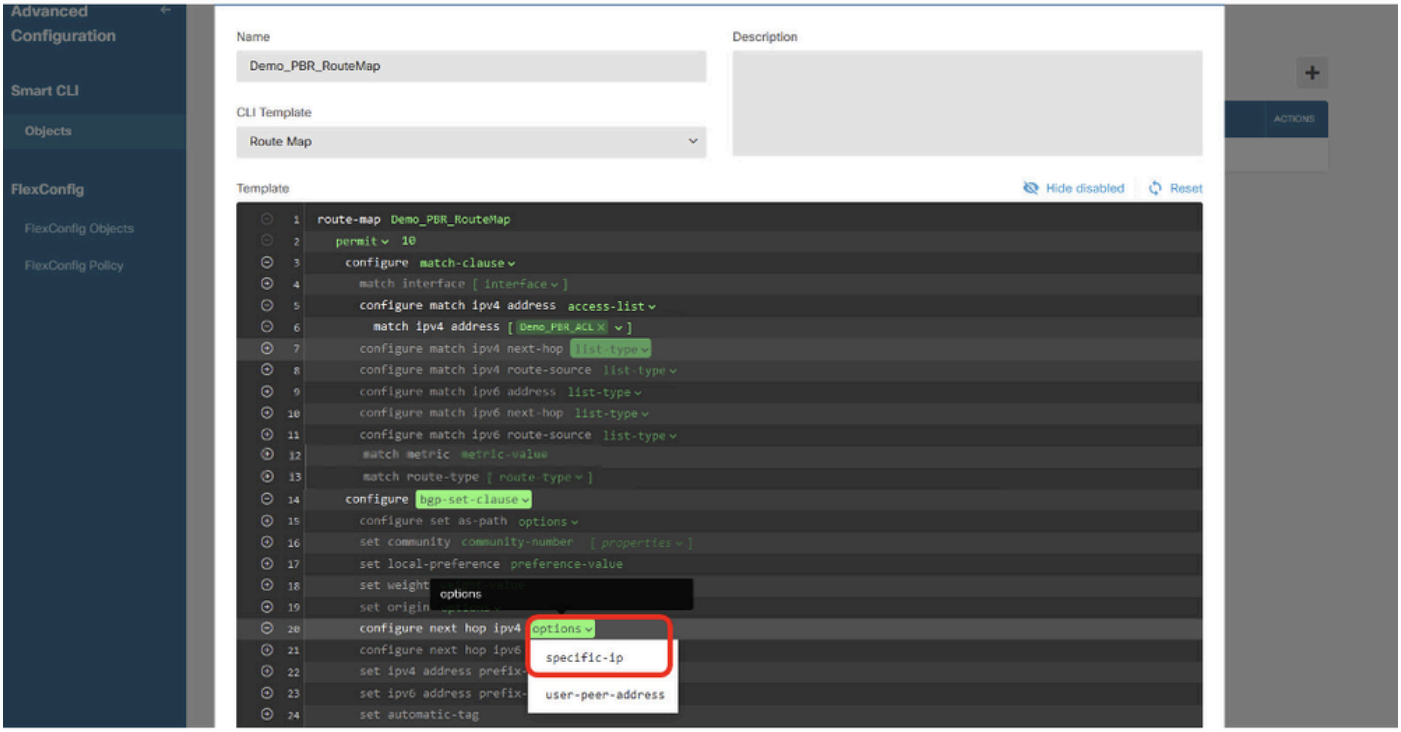
Line 14, click **clause** and choose **bgp-set-clause**.



Site1FTD_Create_PBR_RouteMap_7

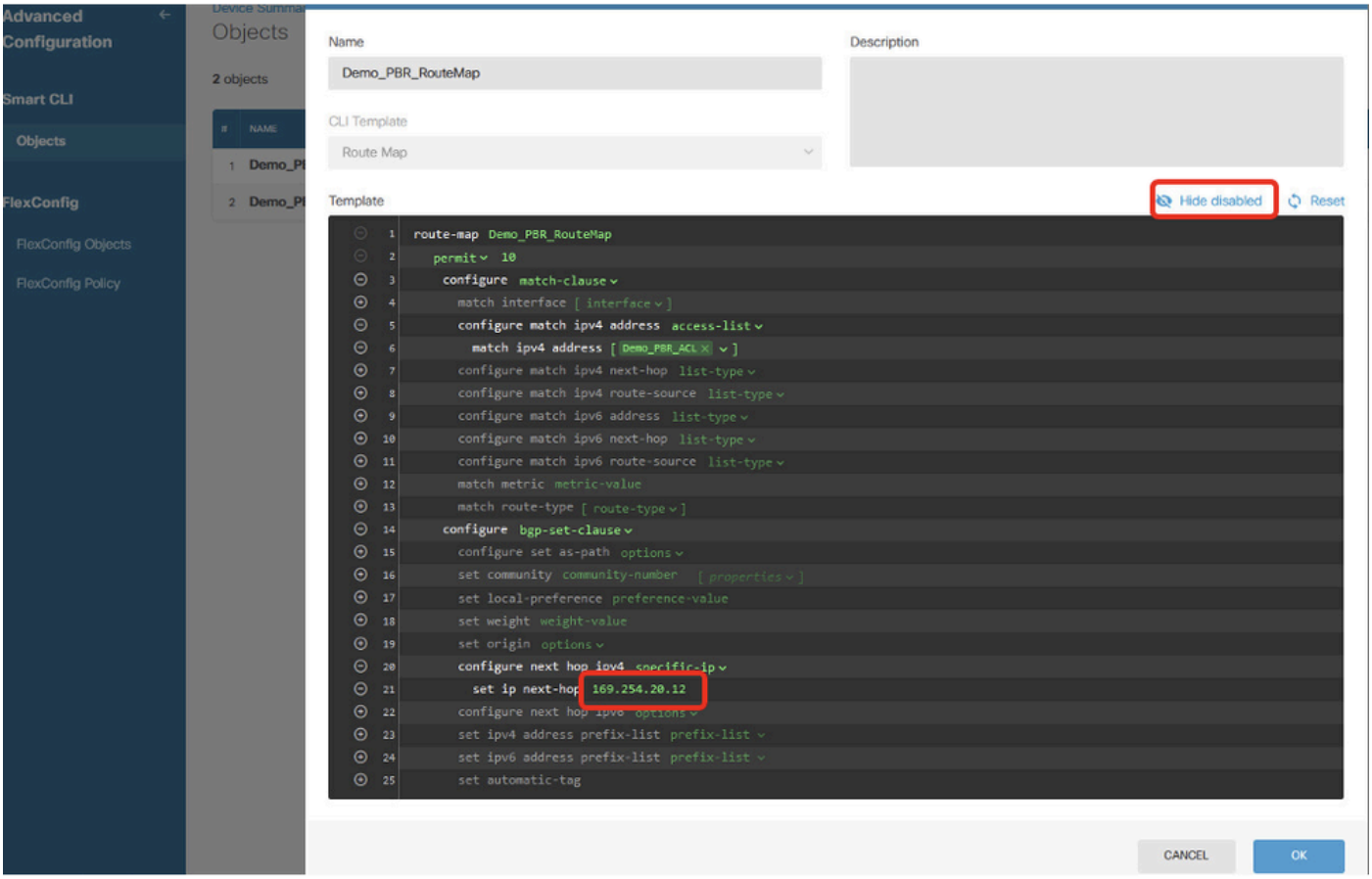
In Lines 12, 13, 15, 16, 17, 18, 19, 21, 22, 23, 24, click **–** button in order to disable.

Line 20, click **options** and choose **specific-ip**.



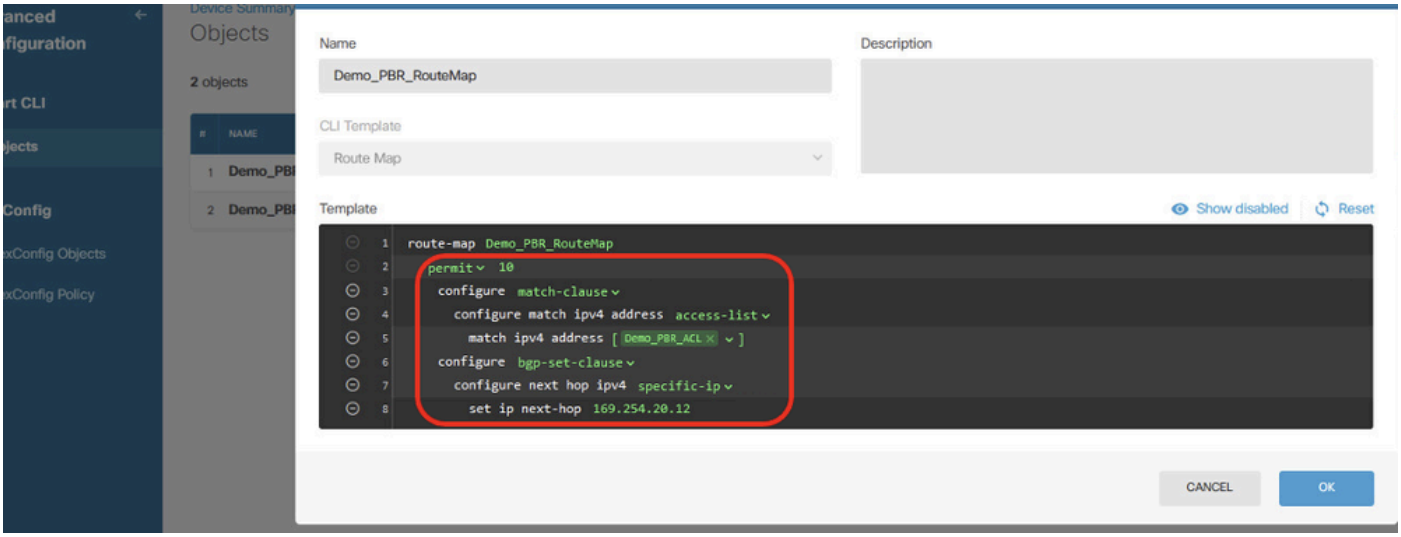
Site1FTD_Create_PBR_RouteMap_8

Line 21, click **ip-address**. Manual input next-hop IP address. In this example, it is IP address of peer Site2 FTD VTI tunnel2 (169.254.20.12). Click **Hide disabled**.



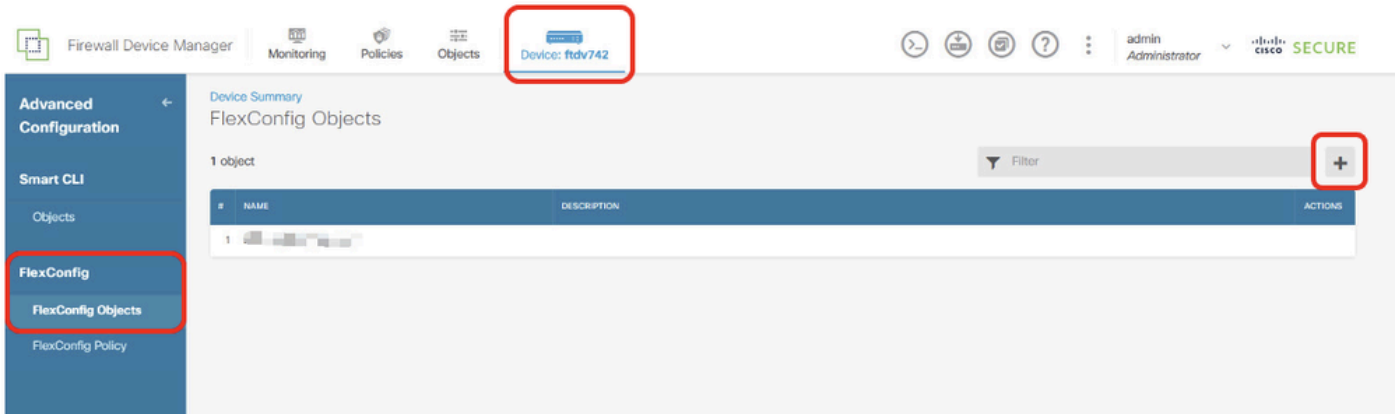
Site1FTD_Create_PBR_RouteMap_9

Review the configuration of route map.



Site1FTD_Create_PBR_RouteMap_10

Step 14. Create FlexConfig Object for PBR. Navigate to **Device > Advanced Configuration > FlexConfig Objects** and click + button.



Site1FTD_Create_PBR_FlexObj_1

Step 14.1. Enter a name for the object. In this example, **Demo_PBR_FlexObj**. In the **Template** and **Negate Template** editor, enter the command lines.

- Template:

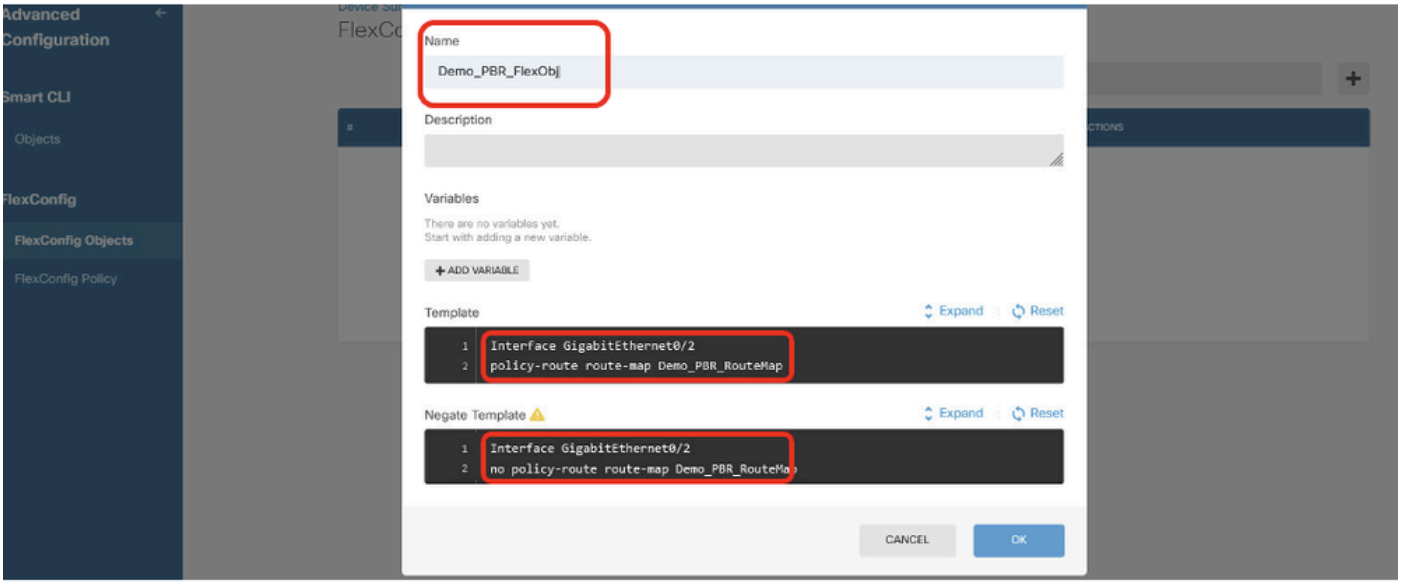
interface GigabitEthernet0/2

policy-route route-map Demo_PBR_RouteMap_Site2

- Negate Template:

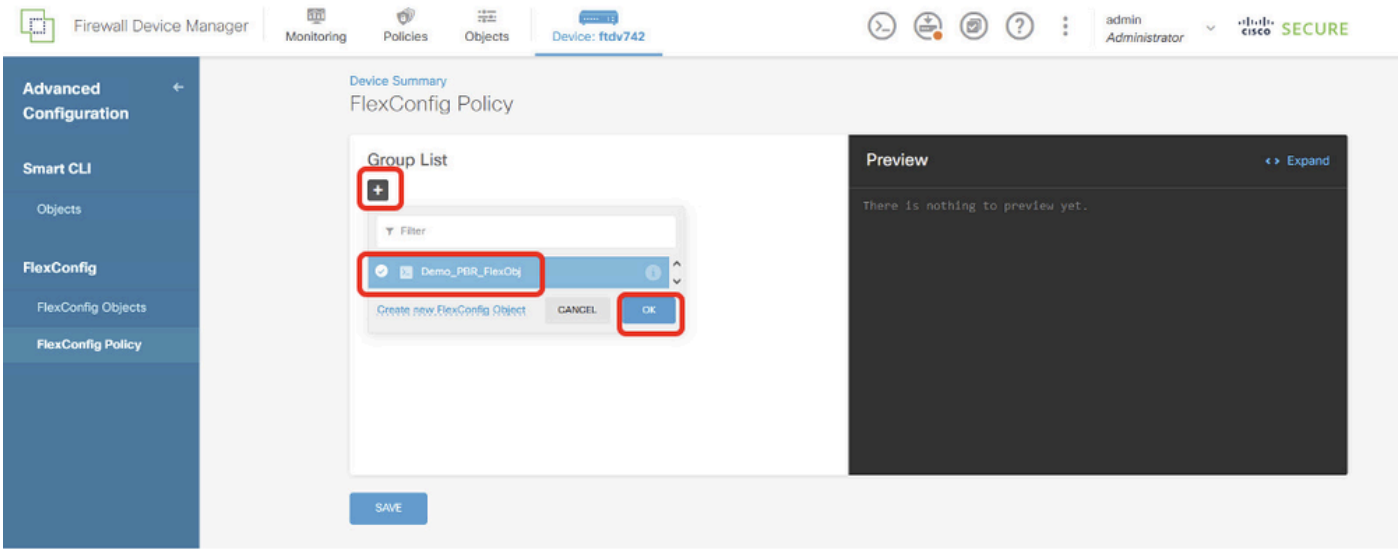
interface GigabitEthernet0/2

no policy-route route-map Demo_PBR_RouteMap_Site2



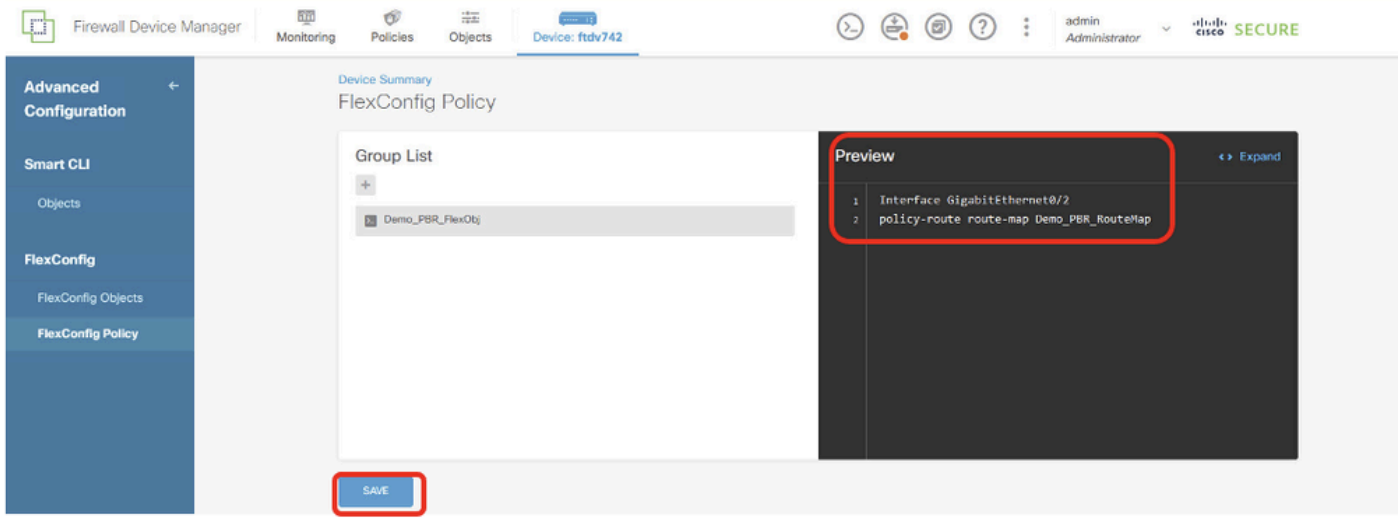
Site1FTD_Create_PBR_FlexObj_2

Step 15. Create FlexConfig Policy for PBR. Navigate to **Device > Advanced Configuration > FlexConfig Policy**. Click + button. Choose the FlexConfig Object name created in Step 14. Click **OK** button.



Site1FTD_Create_PBR_FlexPolicy_1

Step 15.1. Verify the command in **Preview** window. If it is good, click **Save**.



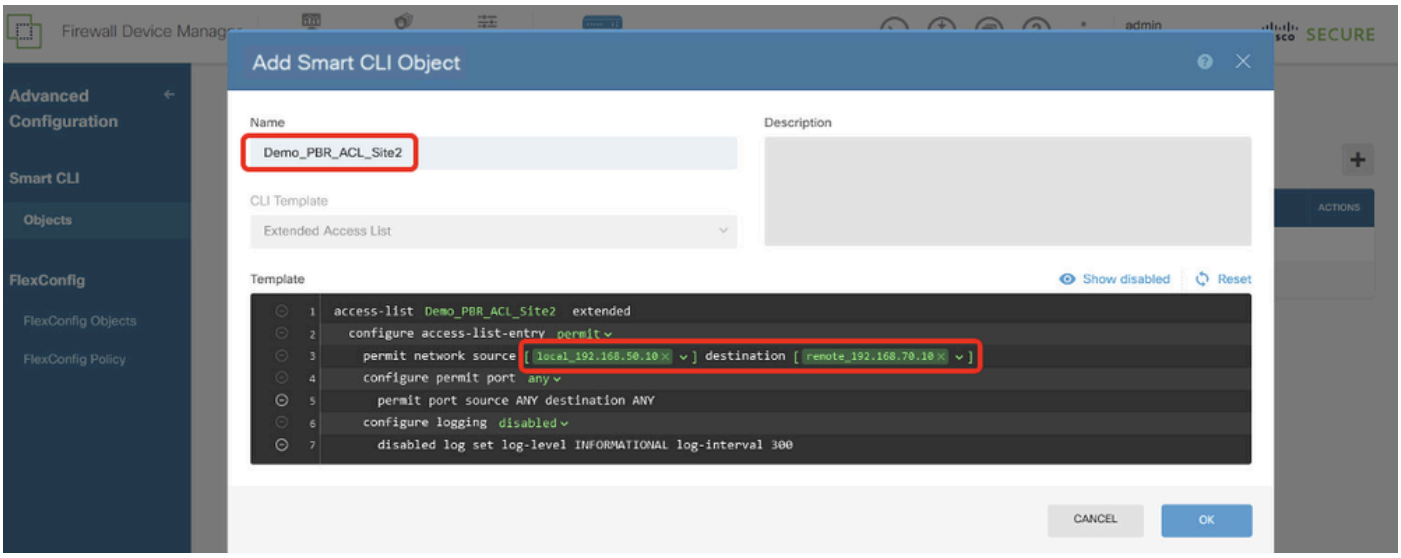
Site1FTD_Create_PBR_FlexPolicy_2

Step 16. Deploy the configuration changes.

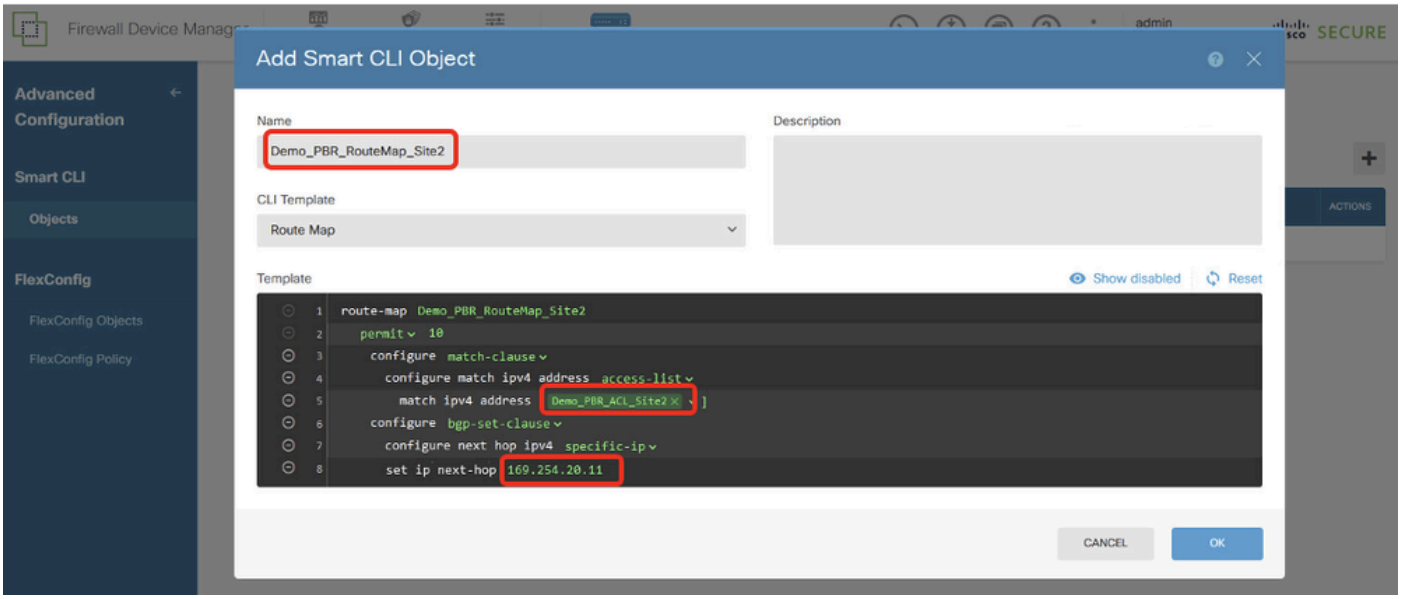
Site1FTD_Deployment_Changes

Site2 FTD PBR Configuration

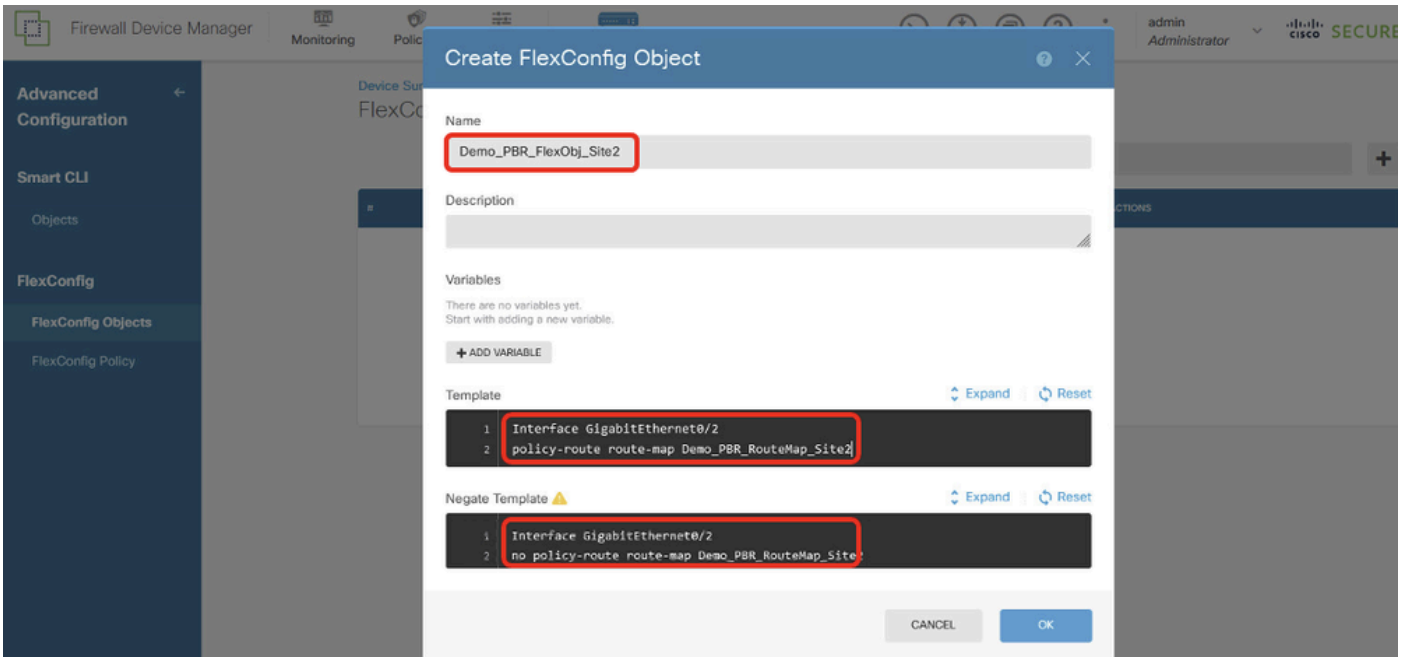
Step 17. Repeat Step 11. to Step 16. in order to create PBR with the corresponding parameters for Site2 FTD.



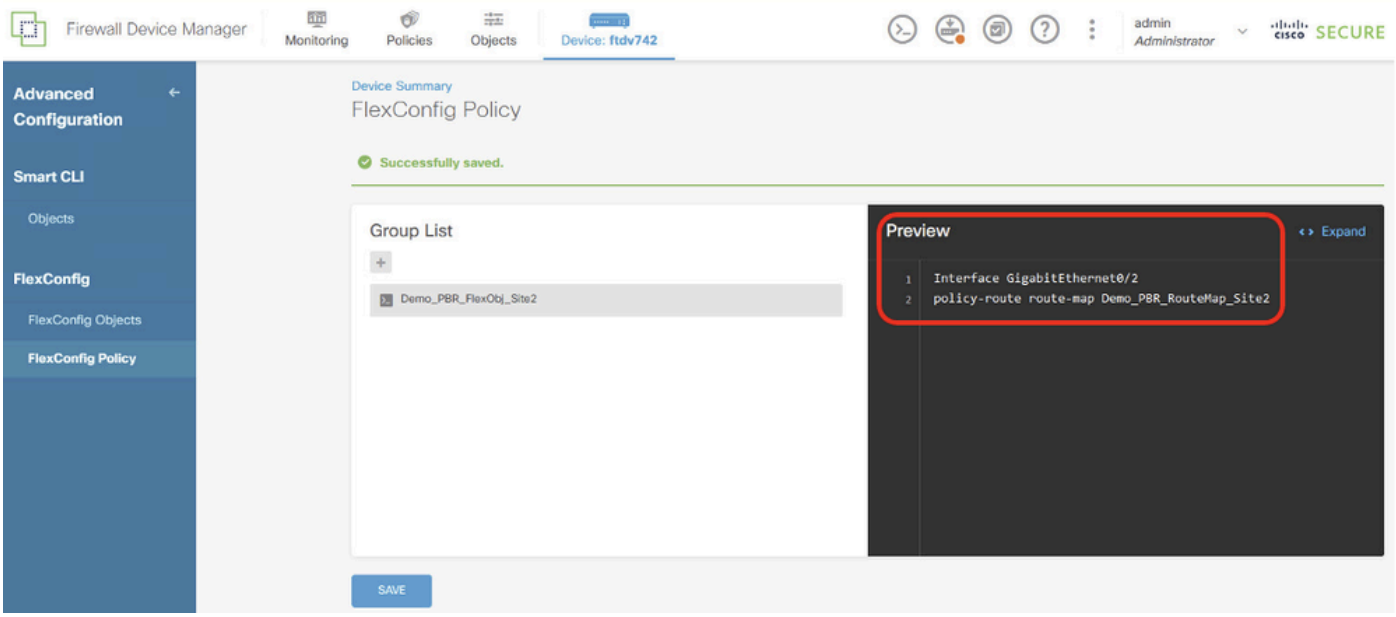
Site2FTD_Create_PBR_ACL



Site2FTD_Create_PBR_RouteMap



Site2FTD_Create_PBR_FlexObj

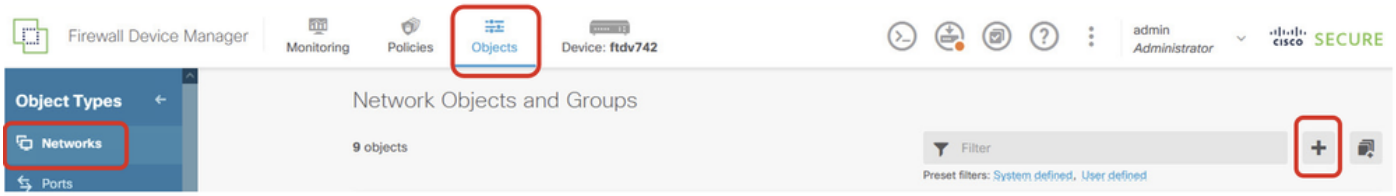


Site2FTD_Create_PBR_FlexPolicy

Configurations on SLA Monitor

Site1 FTD SLA Monitor Configuration

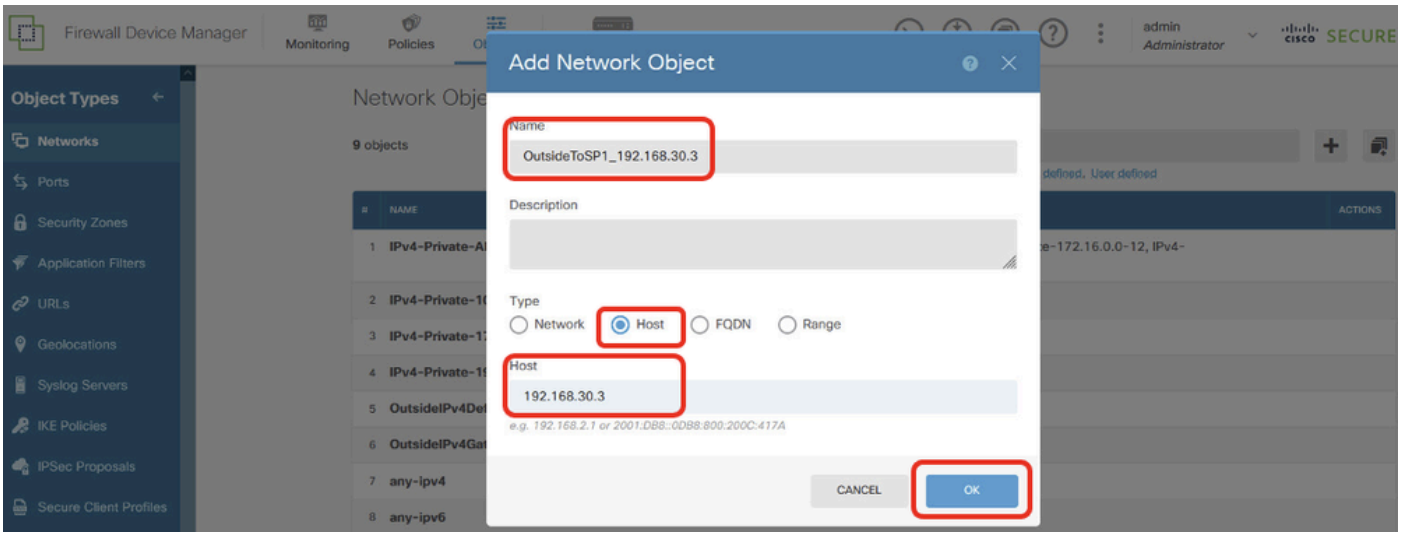
Step 18. Create new network objects to be used by SLA Monitors for Site1 FTD. Navigate to **Objects** > **Networks**, click + button.



Site1FTD_Create_Network_Object

Step 18.1. Create object for ISP1 gateway IP address. Provide necessary information. Click **OK** button.

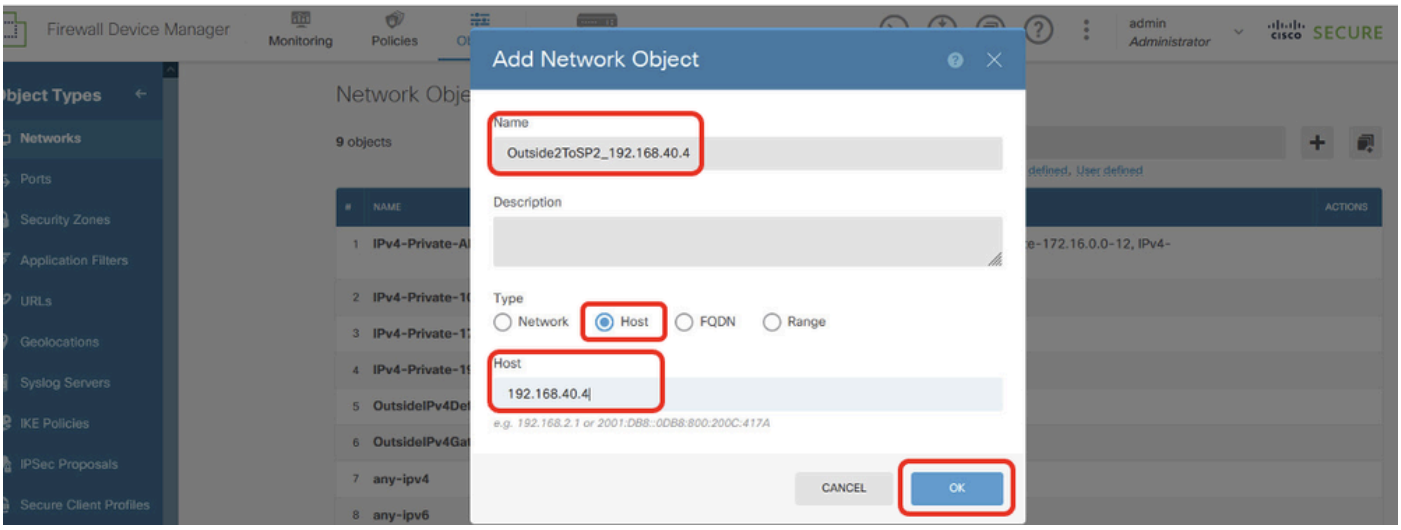
- Name: OutsideToSP1_192.168.30.3
- Type: Host
- Host: 192.168.30.3



Site1FTD_Create_SLAMonitor_NetObj_ISP1

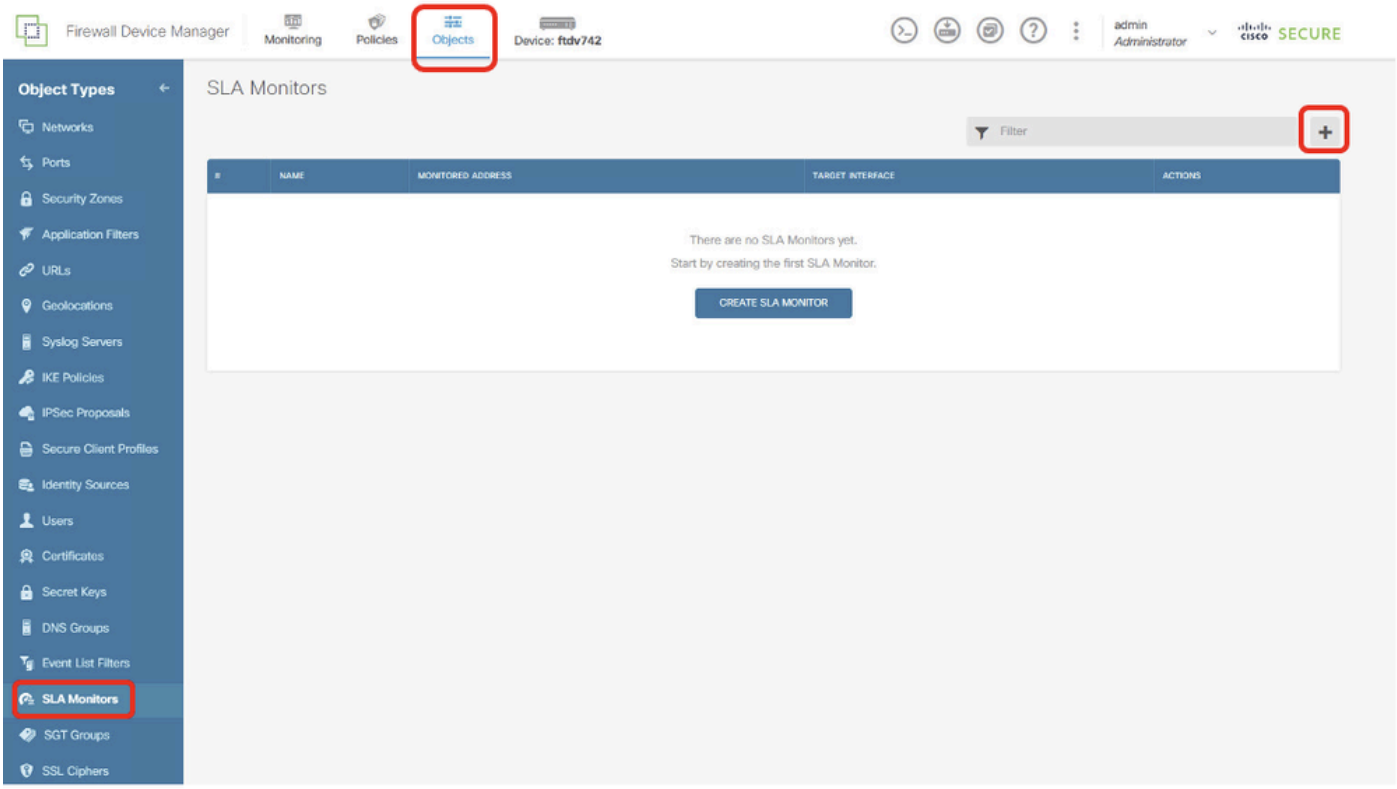
Step 18.2. Create object for ISP2 gateway IP address. Provide necessary information. Click **OK** button.

- Name: Outside2ToSP2_192.168.40.4
- Type: Host
- Host: 192.168.40.4



Site1FTD_Create_SLAMonitor_NetObj_ISP2

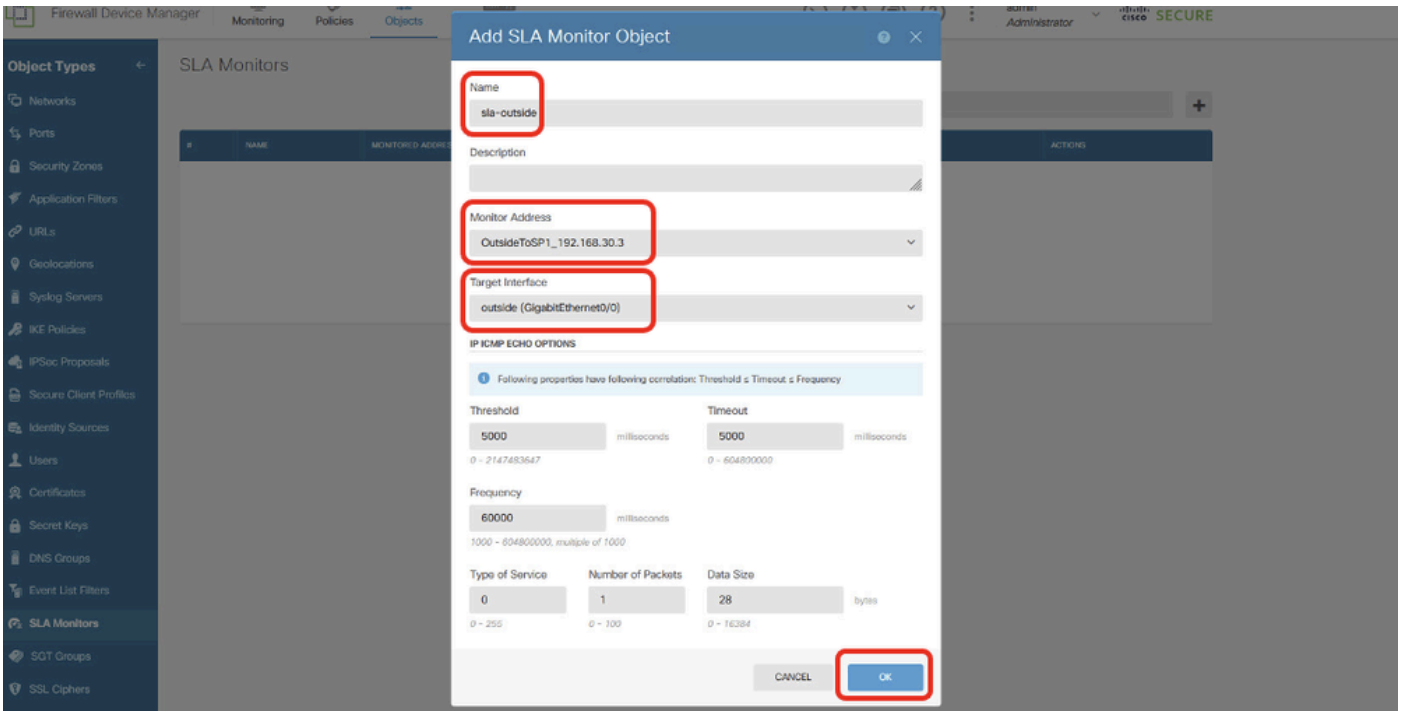
Step 19. Create SLA Monitor. Navigate to **Objects > Object Types > SLA Monitors**. Click + button in order to create a new SLA monitor.



Site1FTD_Create_SLAMonitor

Step 19.1. In the **Add SLA Monitor Object** window, provide necessary information for ISP1 gateway. Click **OK** button to save.

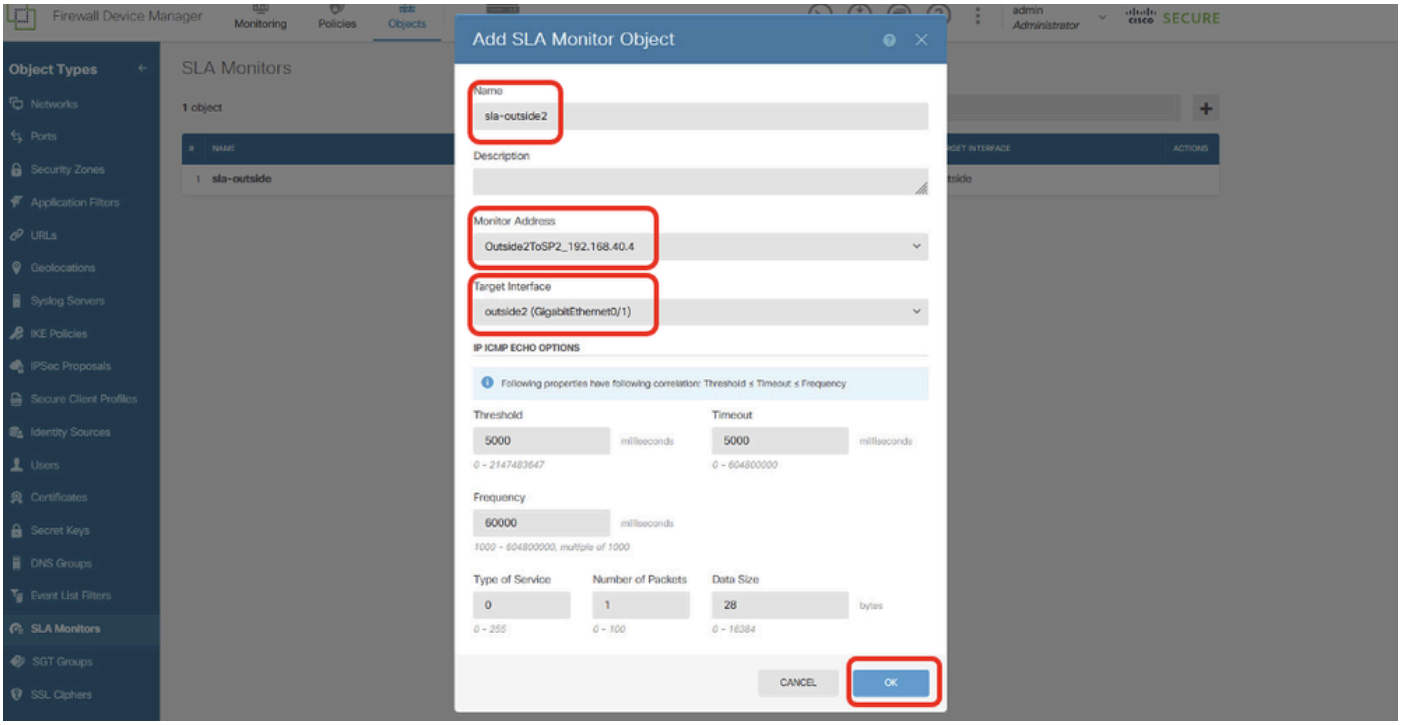
- Name: sla-outside
- Monitor Adress: OutsideToSP1_192.168.30.3
- Target Interface: outside(GigabitEthernet0/0)
- IP ICMP ECHO OPTIONS: default



Site1FTD_Create_SLAMonitor_NetObj_ISP1_Details

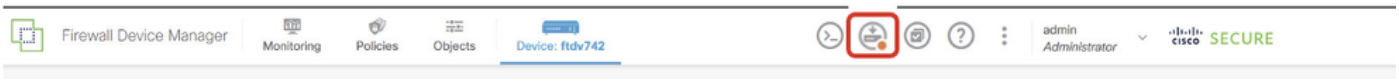
Step 19.2. Continue to click + button to create a new SLA monitor for ISP2 gateway. In the **Add SLA Monitor Object** window, provide necessary information for ISP2 gateway. Click **OK** button to save.

- Name: sla-outside2
- Monitor Adress: Outside2ToSP2_192.168.40.4
- Target Interface: outside2(GigabitEthernet0/1)
- IP ICMP ECHO OPTIONS: default



Site1FTD_Create_SLAMonitor_NetObj_ISP2_Details

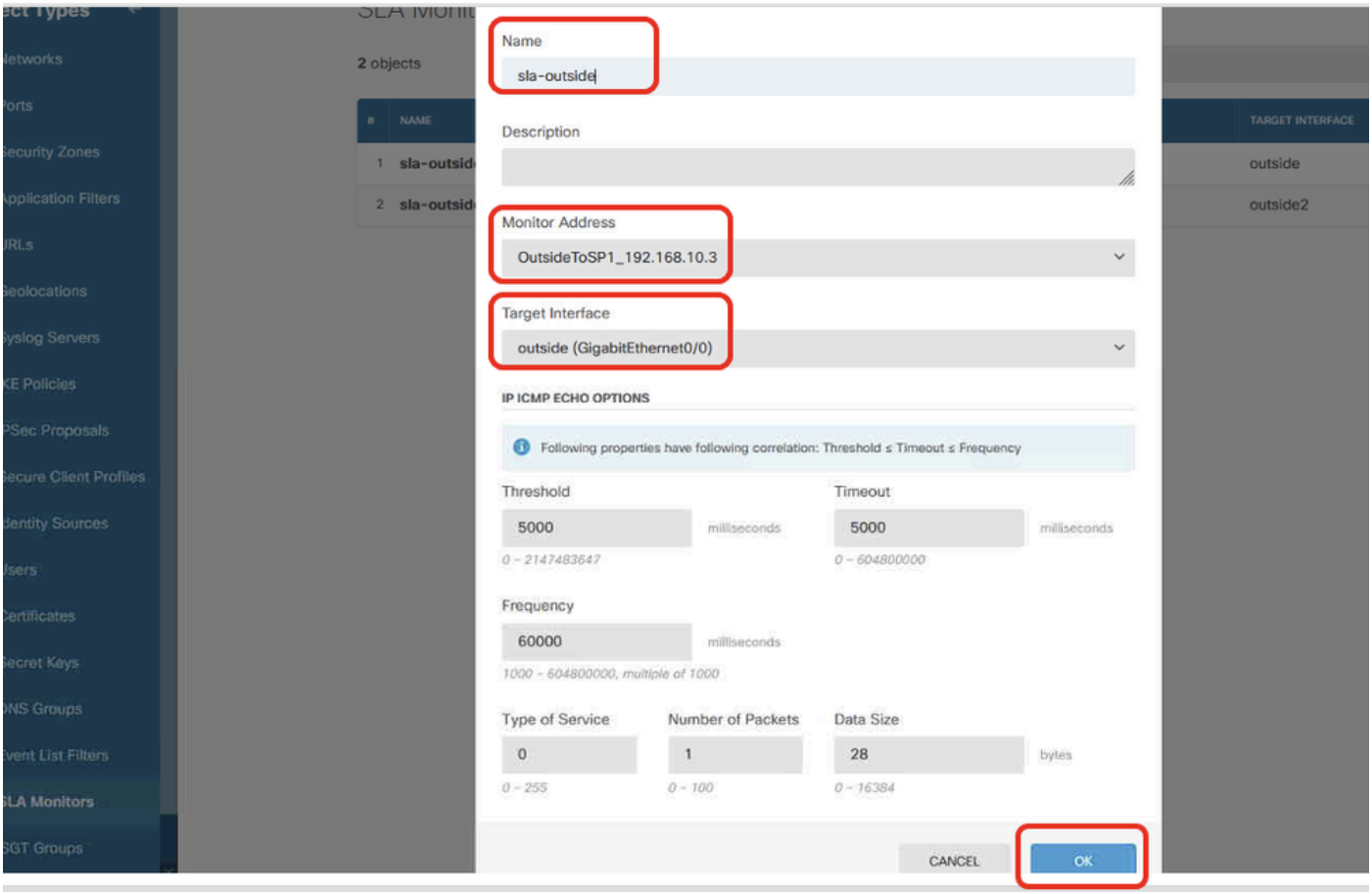
Step 20. Deploy the configuration changes.



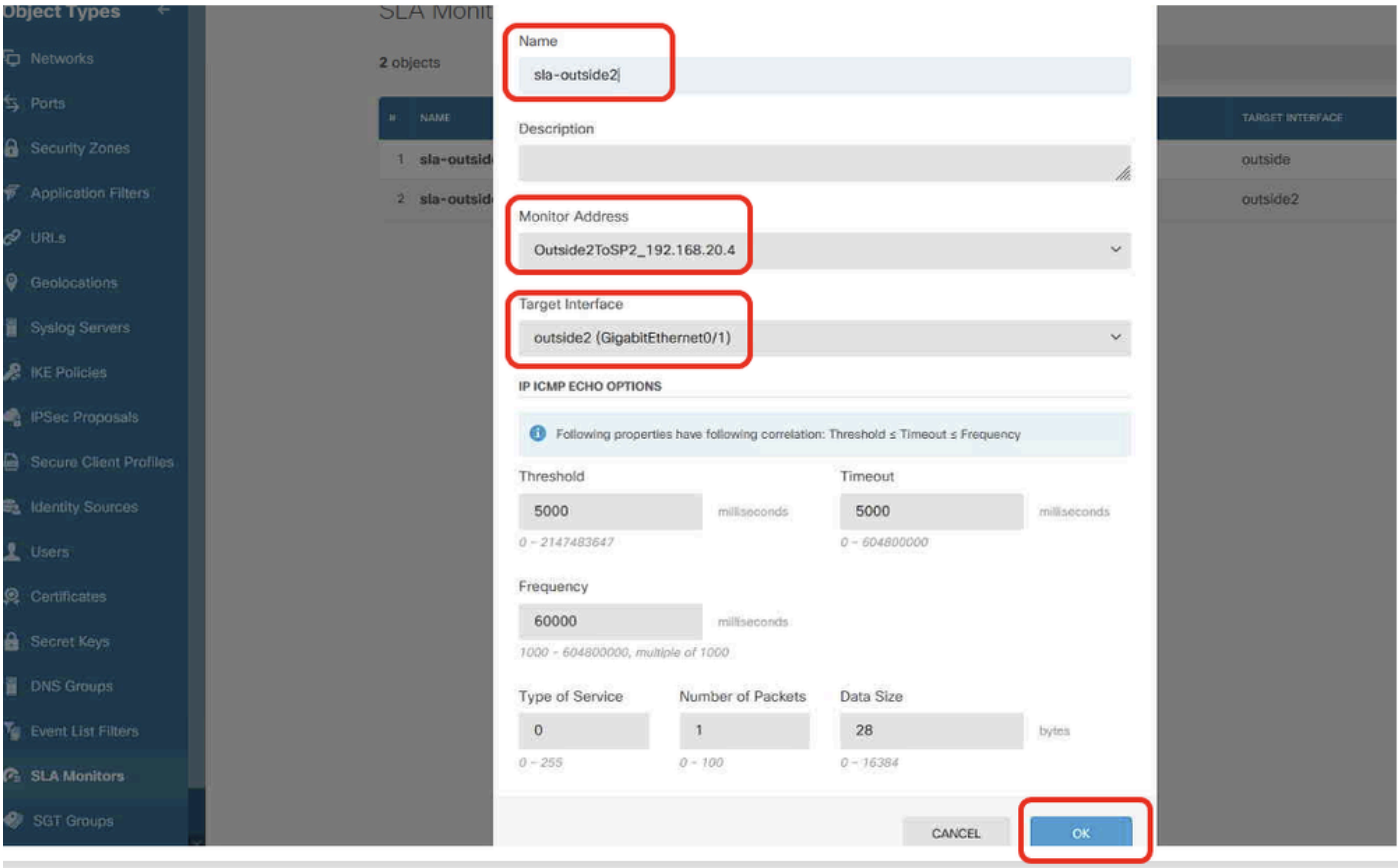
Site1FTD_Deployment_Changes

Site2 FTD SLA Monitor Configuration

Step 21. Repeat Step 18. to Step 20. create SLA Monitor with corresponding parameters on Site2 FTD.



Site2FTD_Create_SLAMonitor_NetObj_ISP1_Details

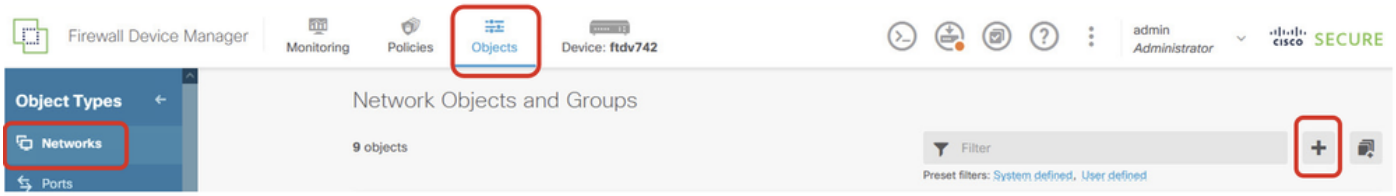


Site2FTD_Create_SLAMonitor_NetObj_ISP2_Details

Configurations on Static Route

Site1 FTD Static Route Configuration

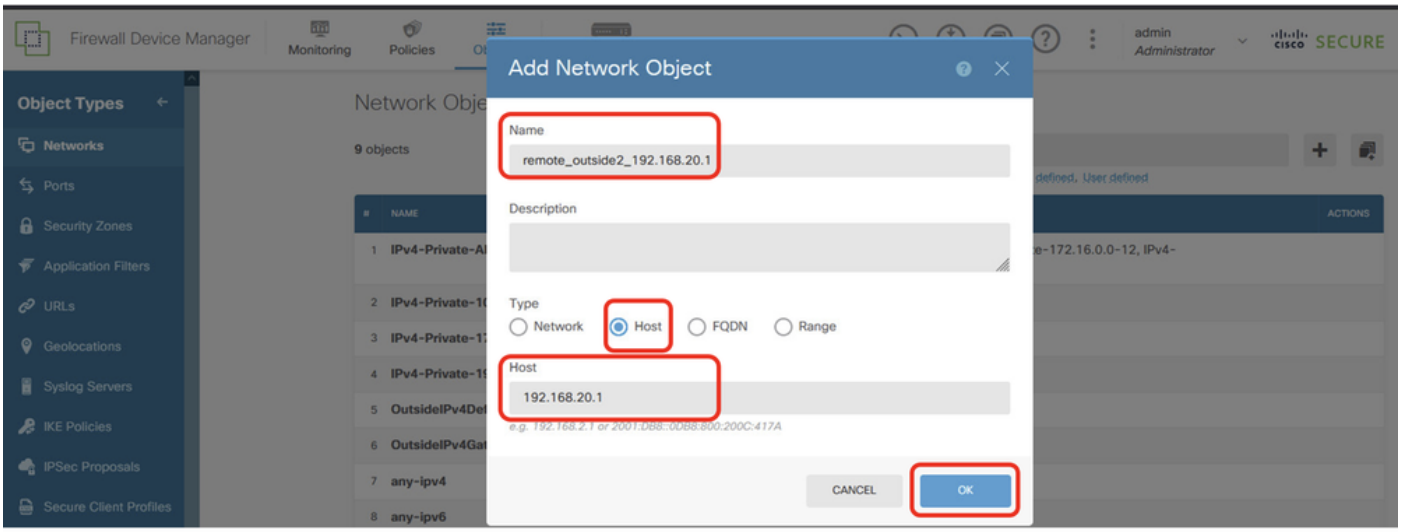
Step 22. Create new network objects to be used by static route for Site1 FTD. Navigate to **Objects** > **Networks**, click + button.



Site1FTD_Create_Obj

Step 22.1. Create object for outside2 IP address of peer Site2 FTD. Provide necessary information. Click **OK** button.

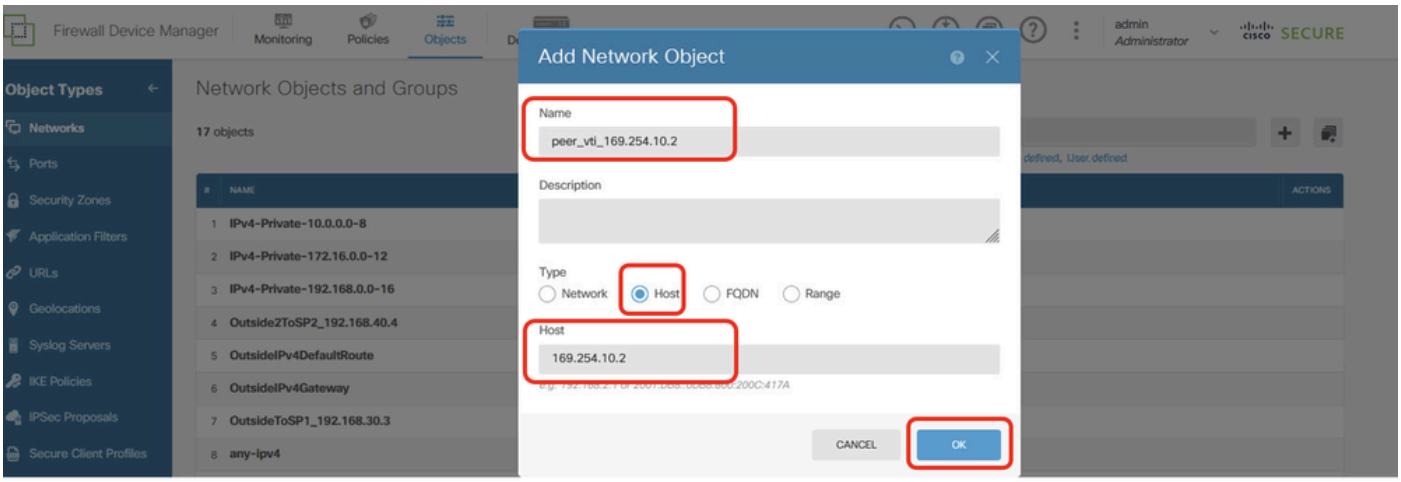
- Name: remote_outside2_192.168.20.1
- Type: HOST
- Network: 192.168.20.1



Site1FTD_Create_NetObj_StaticRoute_1

Step 22.2. Create object for VTI Tunnel1 IP address of peer Site2 FTD. Provide necessary information. Click **OK** button.

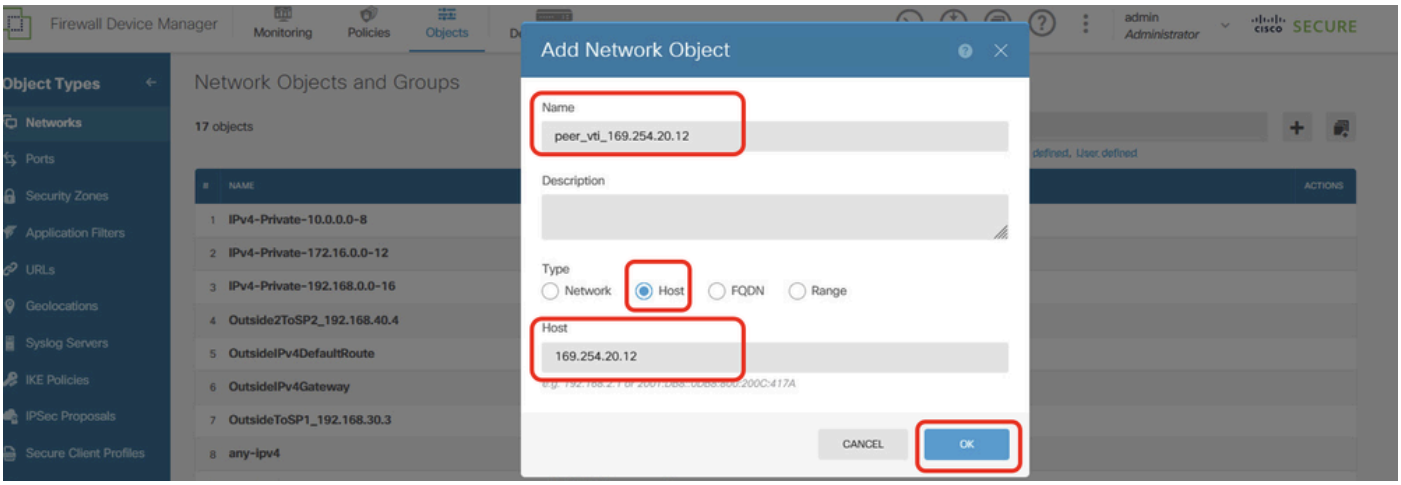
- Name: peer_vti_169.254.10.2
- Type: HOST
- Network:169.254.10.2



Site1FTD_Create_NetObj_StaticRoute_2

Step 22.3. Create object for VTI Tunnel2 IP address of peer Site2 FTD. Provide necessary information. Click **OK** button.

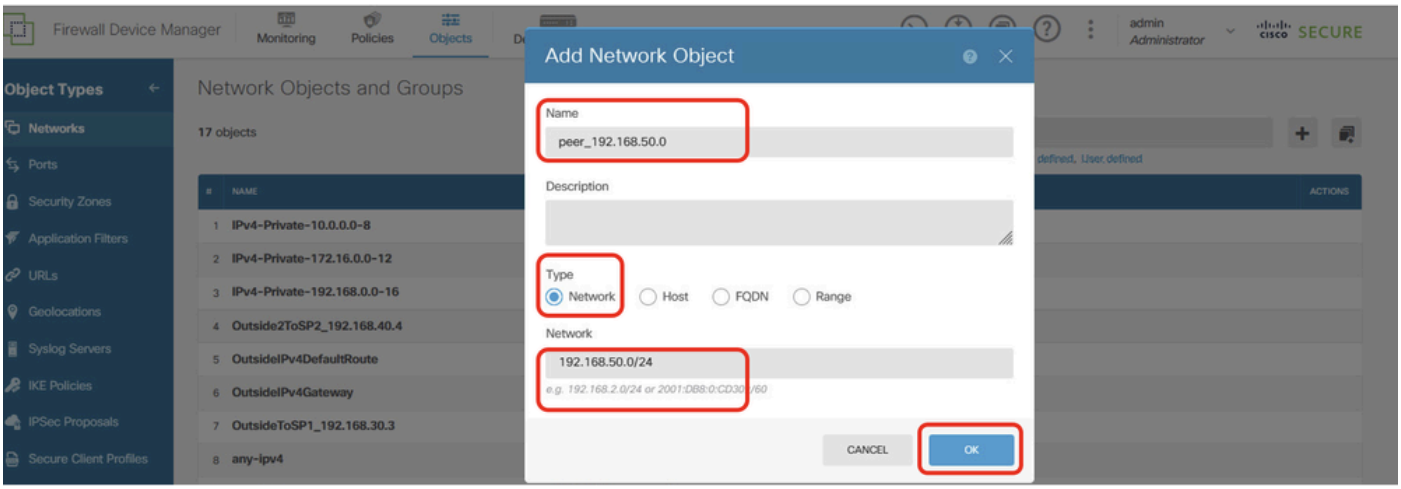
- Name: peer_vti_169.254.20.12
- Type: HOST
- Network:169.254.20.12



Site1FTD_Create_NetObj_StaticRoute_3

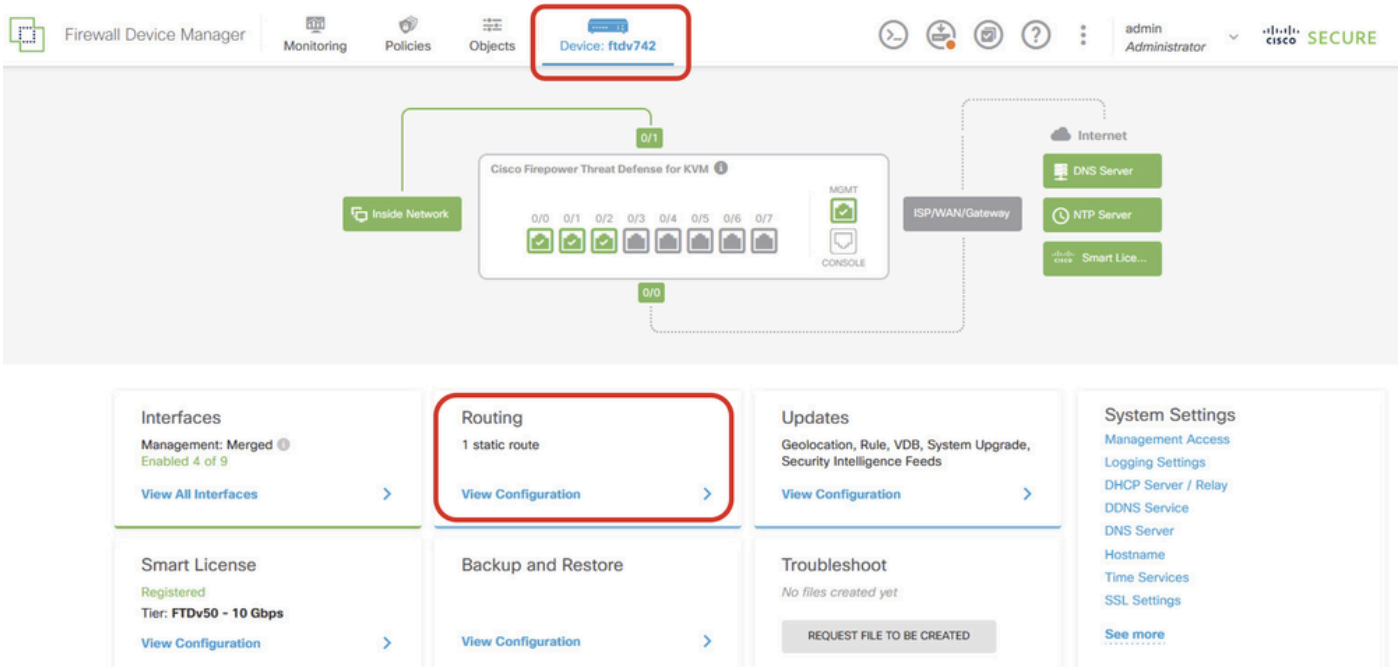
Step 22.4. Create object for inside network of peer Site2 FTD. Provide necessary information. Click **OK** button.

- Name: peer_192.168.50.0
- Type: NETWORK
- Network:192.168.50.0/24

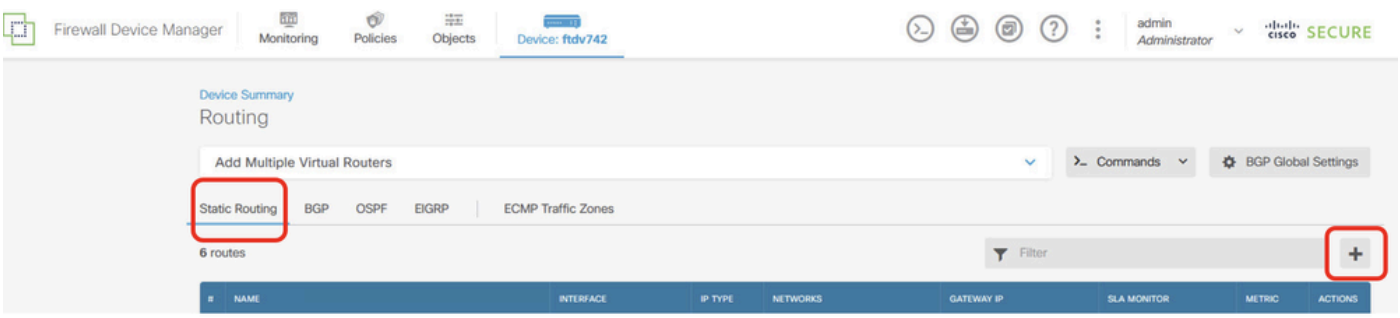


Site1FTD_Create_NetObj_StaticRoute_4

Step 23. Navigate to **Device > Routing**. Click **View Configuration**. Click **Static Routing** tab. Click + button to add new static route.



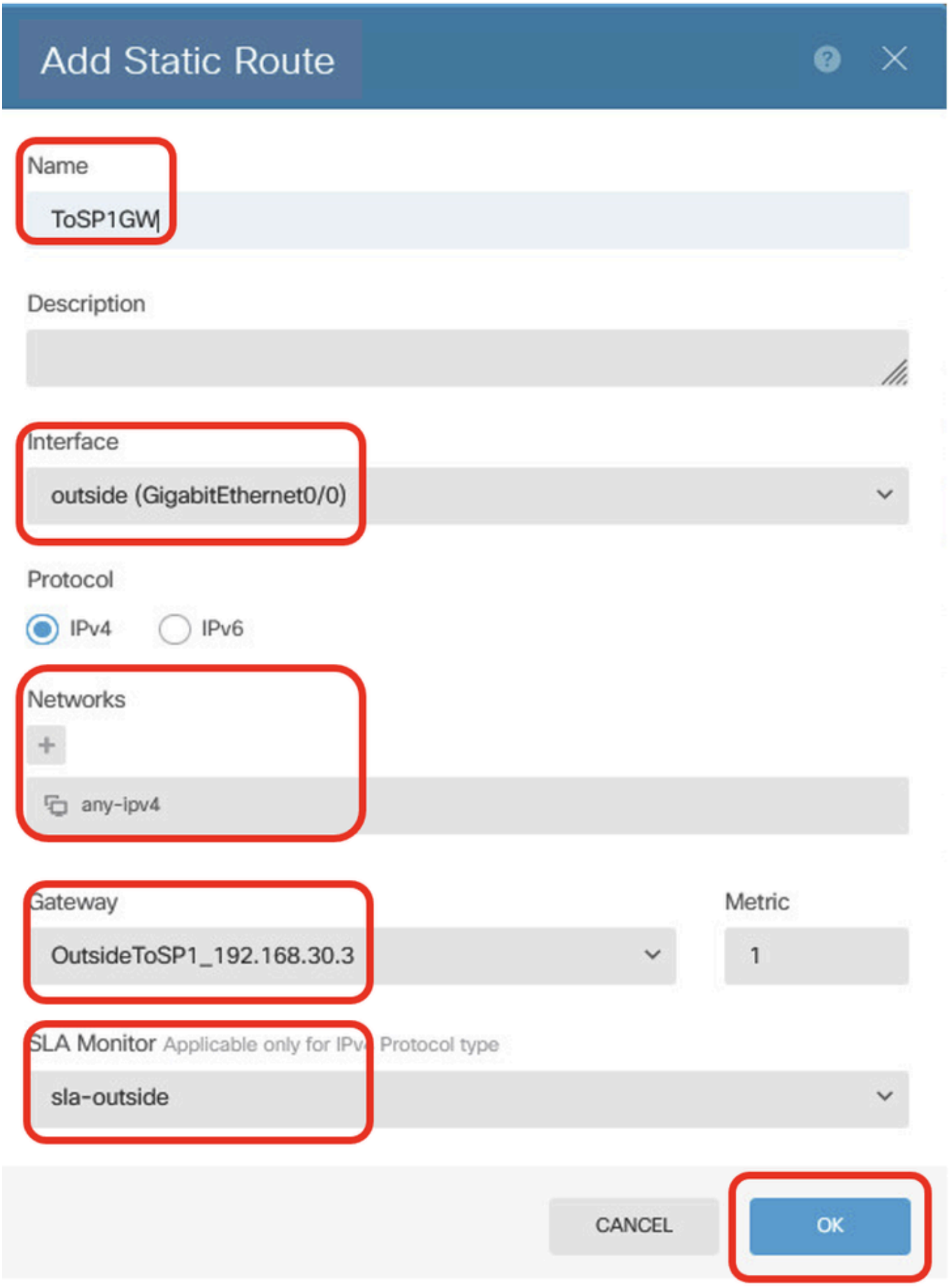
Site1FTD_View_Route_Configuration



Site1FTD_Add_Static_Route

Step 23.1. Create a default route using the ISP1 gateway with SLA monitoring. If the ISP1 gateway experiences an interruption, traffic switches to the backup default route via ISP2. Once ISP1 recovers, traffic reverts to using ISP1. Provide necessary information. Click **OK** button to save.

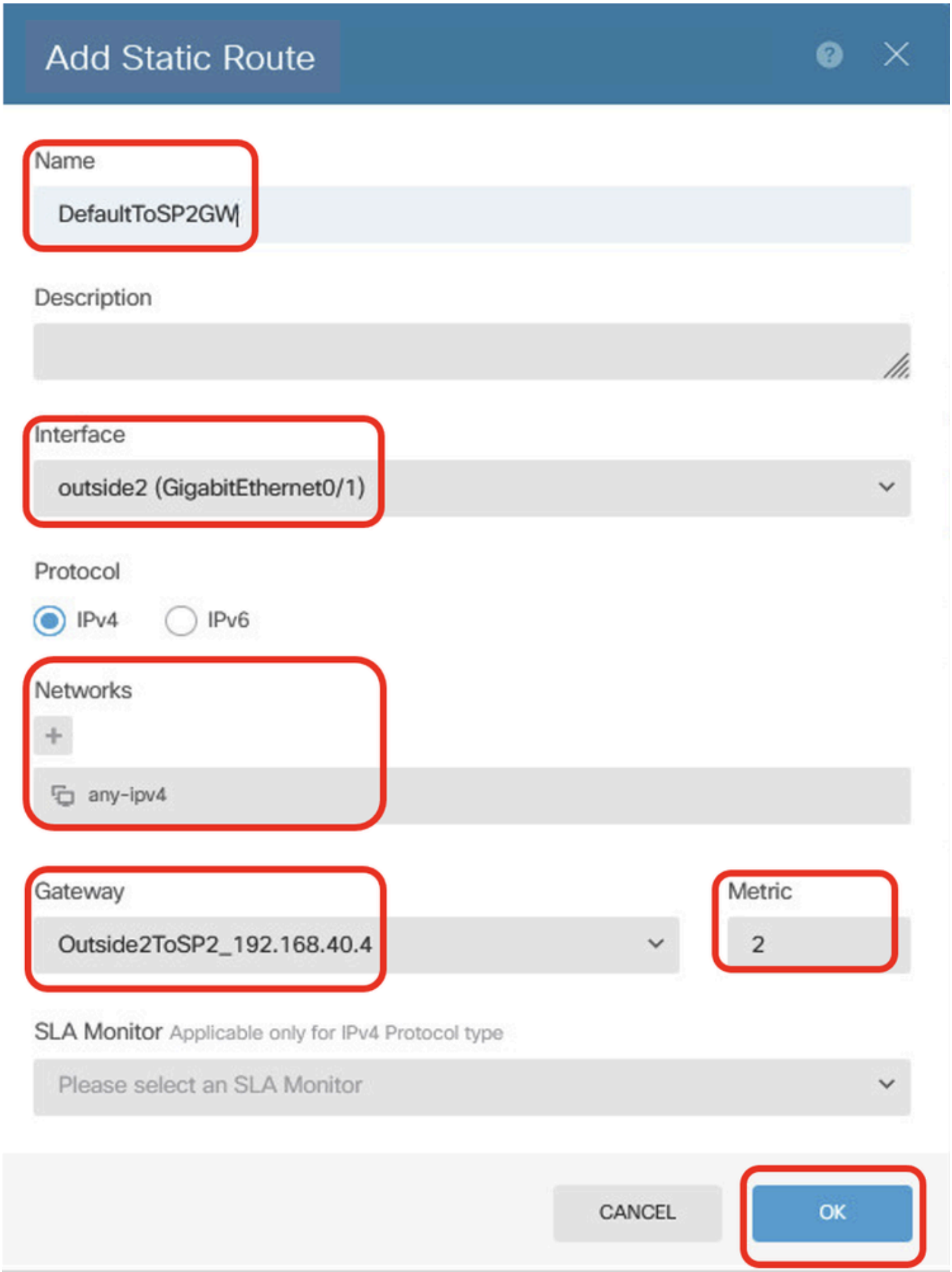
- Name: ToSP1GW
- Interface: outside(GigabitEthernet0/0)
- Protocol: IPv4
- Networks: any-ipv4
- Gateway: OutsideToSP1_192.168.30.3
- Metric: 1
- SLA Monitor: sla-outside



Site1FTD_Create_StaticRoute_1

Step 23.2. Create backup default route via gateway ISP2 gateway. Metric must be higher than 1. In this example, metric is 2. Provide necessary information. Click **OK** button to save.

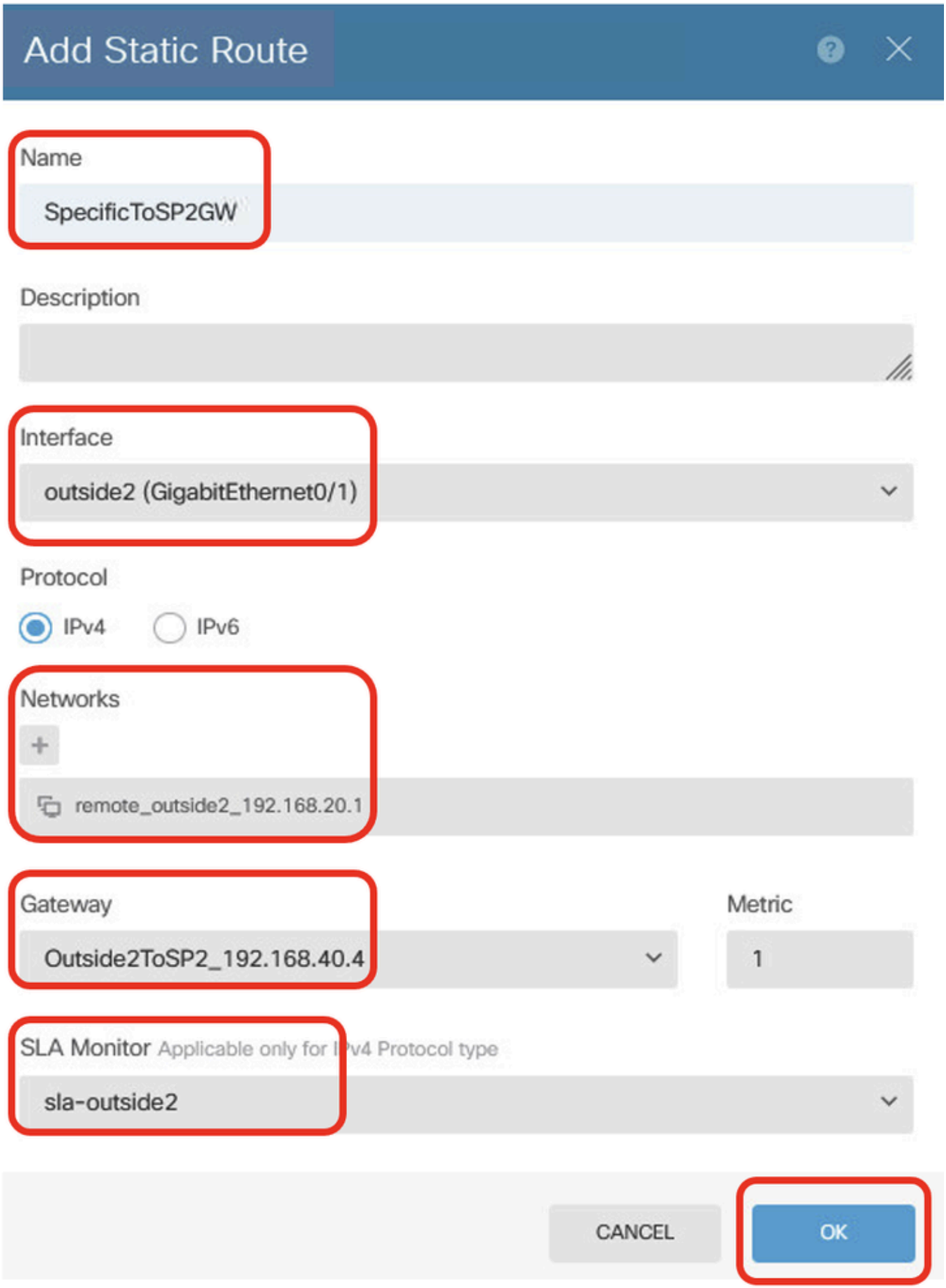
- Name: DefaultToSP2GW
- Interface: outside2(GigabitEthernet0/1)
- Protocol: IPv4
- Networks: any-ipv4
- Gateway: Outside2ToSP2_192.168.40.4
- Metric: 2



Site1FTD_Create_StaticRoute_2

Step 23.3. Create static route for destination traffic to outside2 IP address of peer Site2 FTD via ISP2 gateway, with SLA monitoring, used for establishing VPN with outside2 of Site2 FTD. Provide necessary information. Click **OK** button to save.

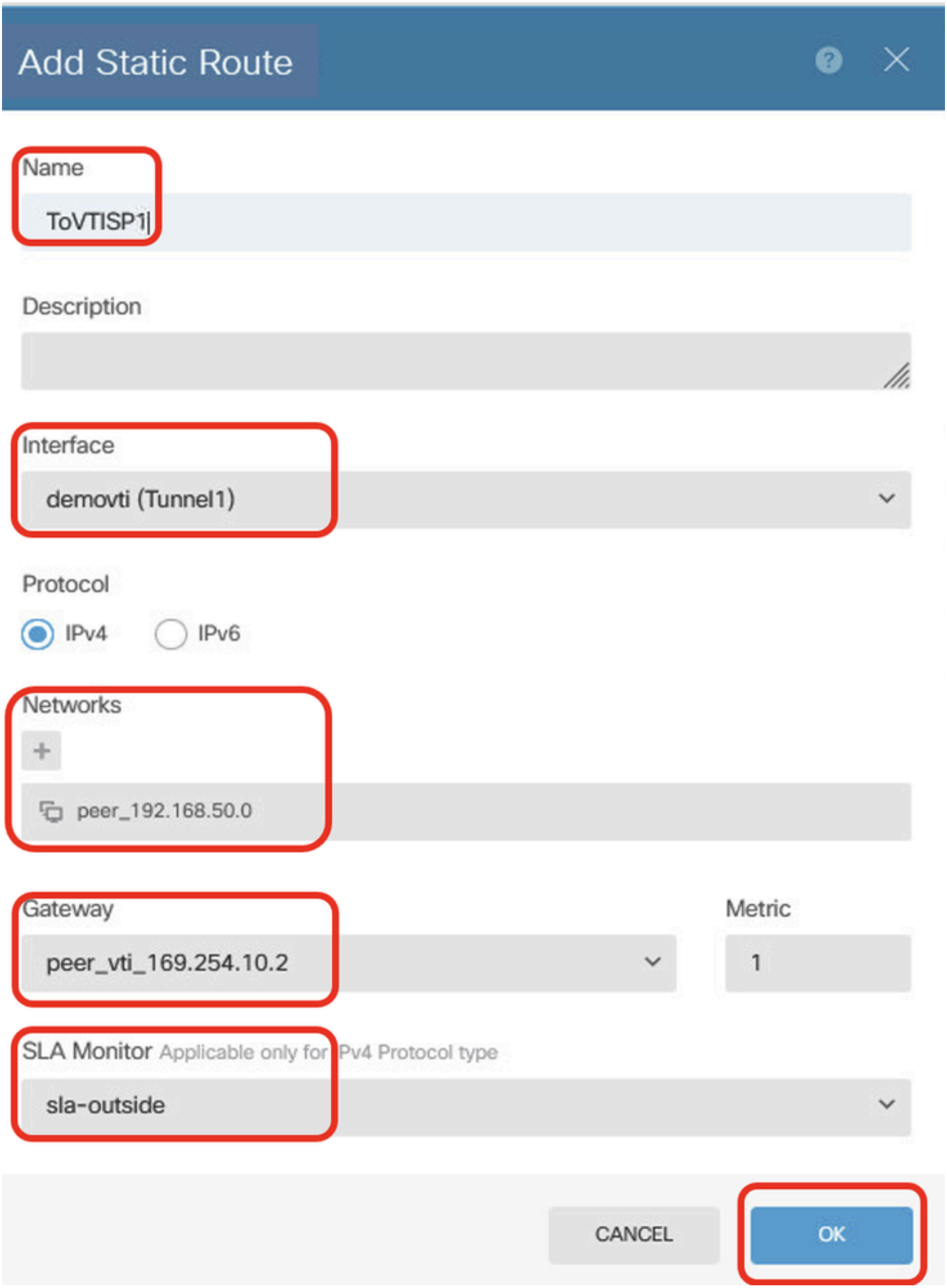
- Name: SpecificToSP2GW
- Interface: outside2(GigabitEthernet0/1)
- Protocol: IPv4
- Networks: remote_outside2_192.168.20.1
- Gateway: Outside2ToSP2_192.168.40.4
- Metric: 1
- SLA Monitor: sla-outside2



Site1FTD_Create_StaticRoute_3

Step 23.4. Create a static route for destination traffic to the inside network of peer Site2 FTD via peer VTI Tunnel 1 of Site2 FTD as the gateway, with SLA monitoring for encrypting client traffic via Tunnel 1. If the ISP1 gateway experiences an interruption, VPN traffic switches to VTI Tunnel 2 of ISP2. Once ISP1 recovers, traffic reverts to VTI Tunnel 1 of ISP1. Provide necessary information. Click **OK** button to save.

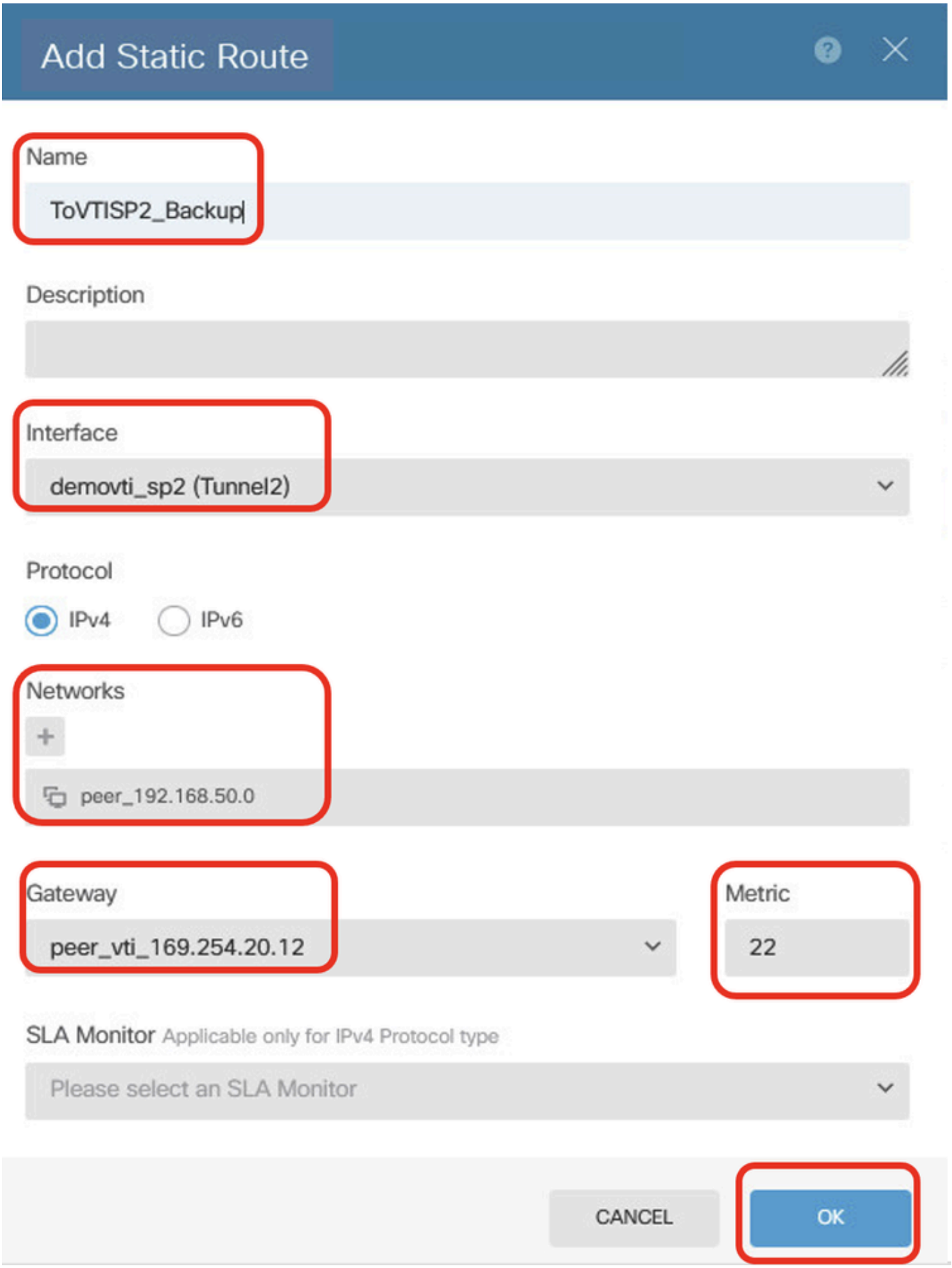
- Name: ToVTISP1
- Interface: demovti(Tunnel1)
- Protocol: IPv4
- Networks: peer_192.168.50.0
- Gateway: peer_vti_169.254.10.2
- Metric: 1
- SLA Monitor: sla-outside



Site1FTD_Create_StaticRoute_4

Step 23.5. Create a backup static route for destination traffic to the inside network of peer Site2 FTD via peer VTI Tunnel 2 of Site2 FTD as the gateway, used for encrypting client traffic via Tunnel 2. Set the metric to a value higher than 1. In this example, metric is 22. Provide necessary information. Click **OK** button to save.

- Name: ToVTISP2_Backup
- Interface: demovti_sp2(Tunnel2)
- Protocol: IPv4
- Networks: peer_192.168.50.0
- Gateway: peer_vti_169.254.20.12
- Metric: 22

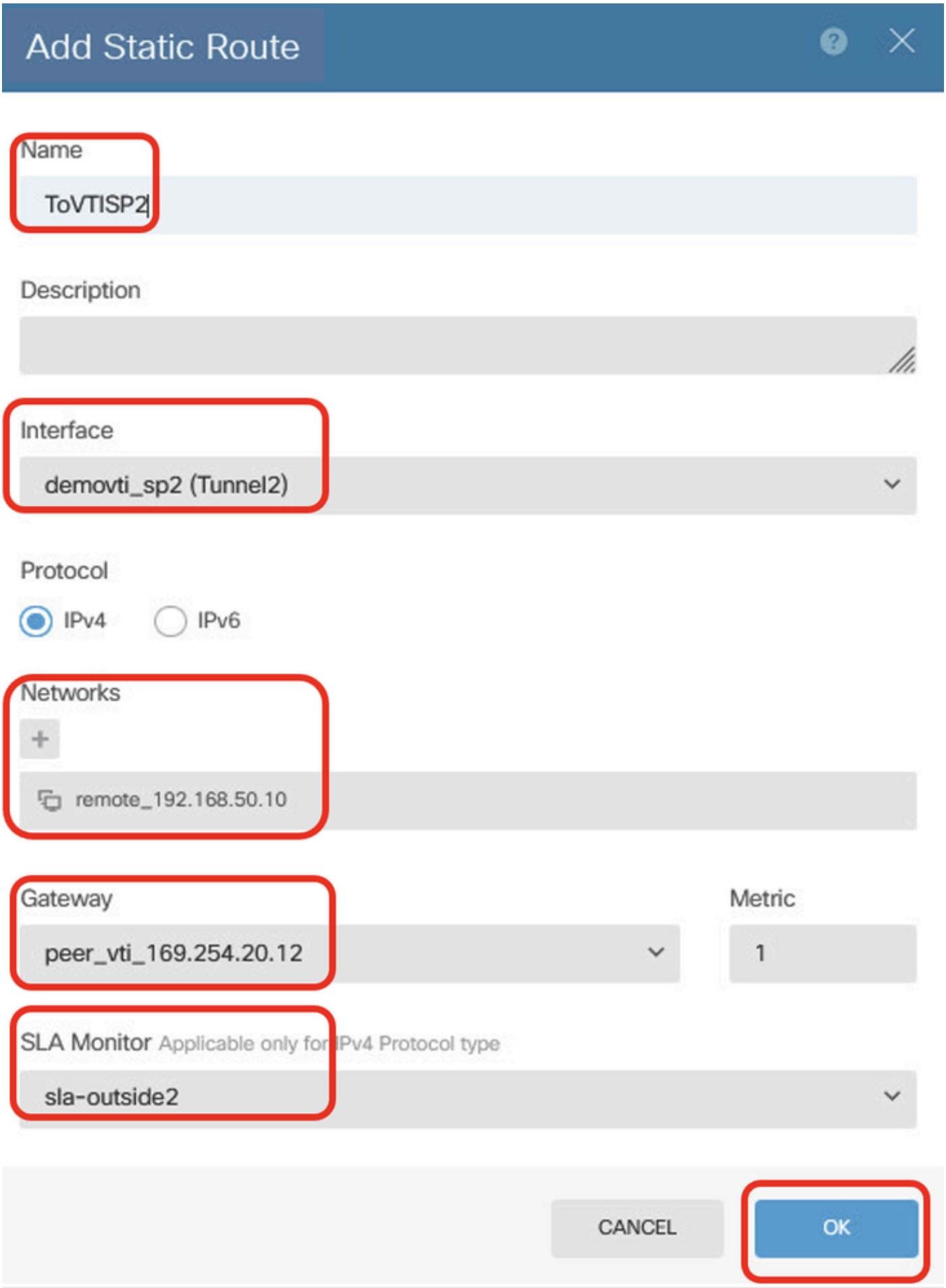


Site1FTD_Create_StaticRoute_5

Step 23.6. Create static route for PBR traffic. Destination traffic to Site2 Client2 via peer VTI Tunnel 2 of

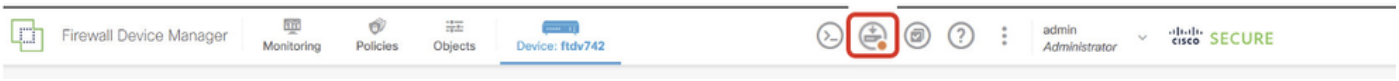
Site2 FTD as gateway, with SLA monitoring. Provide necessary information. Click **OK** button to save.

- Name: ToVTISP2
- Interface: demovti_sp2(Tunnel2)
- Protocol: IPv4
- Networks: remote_192.168.50.10
- Gateway: peer_vti_169.254.20.12
- Metric: 1
- SLA Monitor: sla-outside2



Site1FTD_Create_StaticRoute_6

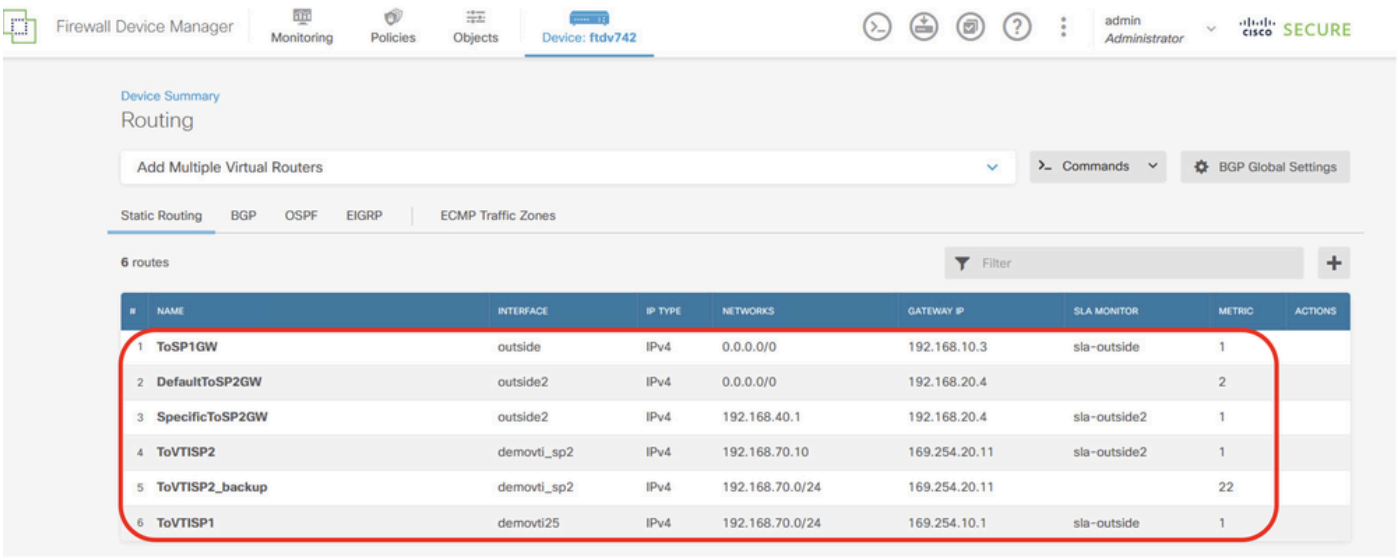
Step 24. Deploy the configuration changes.



Site1FTD_Deployment_Changes

Site2 FTD Static Route Configuration

Step 25. Repeat Steps 22 to 24 in order to create a static route with the corresponding parameters for Site2 FTD.



Site2FTD_Create_StaticRoute

Verify

Use this section in order to confirm that your configuration works properly. Navigate to the CLI of Site1 FTD and Site2 FTD via console or SSH.

Both ISP1 and ISP2 Work Fine

VPN

```
//Site1 FTD:

ftdv742# show crypto ikev2 sa

IKEv2 SAs:

Session-id:156, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
1072332533 192.168.30.1/500                               192.168.10.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/44895 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0xec031247/0xc2f3f549
```

```
IKEv2 SAs:

Session-id:148, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
1045734377 192.168.40.1/500                               192.168.20.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/77860 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0x47bfa607/0x82e8781d



// Site2 FTD:

ftdv742# show crypto ikev2 sa

IKEv2 SAs:

Session-id:44, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
499259237 192.168.10.1/500                               192.168.30.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/44985 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0xc2f3f549/0xec031247

IKEv2 SAs:

Session-id:36, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
477599833 192.168.20.1/500                               192.168.40.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/77950 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0x82e8781d/0x47bfa607
```

Route

```
// Site1 FTD:

ftdv742# show route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, V - VPN
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, + - replicated route
       SI - Static InterVRF, BI - BGP InterVRF
```

```
Gateway of last resort is 192.168.30.3 to network 0.0.0.0

S*       0.0.0.0 0.0.0.0 [1/0] via 192.168.30.3, outside
C        169.254.10.0 255.255.255.0 is directly connected, demovti
L        169.254.10.1 255.255.255.255 is directly connected, demovti
C        169.254.20.0 255.255.255.0 is directly connected, demovti_sp2
L        169.254.20.11 255.255.255.255 is directly connected, demovti_sp2
S        192.168.20.1 255.255.255.255 [1/0] via 192.168.40.4, outside2
C        192.168.30.0 255.255.255.0 is directly connected, outside
L        192.168.30.1 255.255.255.255 is directly connected, outside
C        192.168.40.0 255.255.255.0 is directly connected, outside2
L        192.168.40.1 255.255.255.255 is directly connected, outside2
S        192.168.50.0 255.255.255.0 [1/0] via 169.254.10.2, demovti
S        192.168.50.10 255.255.255.255 [1/0] via 169.254.20.12, demovti_sp2
C        192.168.70.0 255.255.255.0 is directly connected, inside
L        192.168.70.1 255.255.255.255 is directly connected, inside



// Site2 FTD:

ftdv742# show route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, V - VPN
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, + - replicated route
       SI - Static InterVRF, BI - BGP InterVRF
Gateway of last resort is 192.168.10.3 to network 0.0.0.0

S*       0.0.0.0 0.0.0.0 [1/0] via 192.168.10.3, outside
C        169.254.10.0 255.255.255.0 is directly connected, demovti25
L        169.254.10.2 255.255.255.255 is directly connected, demovti25
C        169.254.20.0 255.255.255.0 is directly connected, demovti_sp2
L        169.254.20.12 255.255.255.255 is directly connected, demovti_sp2
C        192.168.10.0 255.255.255.0 is directly connected, outside
L        192.168.10.1 255.255.255.255 is directly connected, outside
C        192.168.20.0 255.255.255.0 is directly connected, outside2
L        192.168.20.1 255.255.255.255 is directly connected, outside2
S        192.168.40.1 255.255.255.255 [1/0] via 192.168.20.4, outside2
C        192.168.50.0 255.255.255.0 is directly connected, inside
L        192.168.50.1 255.255.255.255 is directly connected, inside
S        192.168.70.0 255.255.255.0 [1/0] via 169.254.10.1, demovti25
S        192.168.70.10 255.255.255.255 [1/0] via 169.254.20.11, demovti_sp2
```

SLA Monitor

```
// Site1 FTD:

ftdv742# show sla monitor configuration
SA Agent, Infrastructure Engine-II
Entry number: 188426425
Owner:
Tag:
```

```
Type of operation to perform: echo
Target address: 192.168.40.4
Interface: outside2
Number of packets: 1
Request size (ARR data portion): 28
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Verify data: No
Operation frequency (seconds): 60
Next Scheduled Start Time: Start Time already passed
Group Scheduled : FALSE
Life (seconds): Forever
Entry Ageout (seconds): never
Recurring (Starting Everyday): FALSE
Status of entry (SNMP RowStatus): Active
Enhanced History:

Entry number: 855903900
Owner:
Tag:
Type of operation to perform: echo
Target address: 192.168.30.3
Interface: outside
Number of packets: 1
Request size (ARR data portion): 28
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Verify data: No
Operation frequency (seconds): 60
Next Scheduled Start Time: Start Time already passed
Group Scheduled : FALSE
Life (seconds): Forever
Entry Ageout (seconds): never
Recurring (Starting Everyday): FALSE
Status of entry (SNMP RowStatus): Active
Enhanced History:


ftdv742# show sla monitor operational-state
Entry number: 188426425
Modification time: 08:37:05.132 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1748
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 30
Latest operation start time: 13:44:05.173 UTC Thu Aug 15 2024
Latest operation return code: OK
RTT Values:
RTTAvg: 30    RTTMin: 30    RTTMax: 30
NumOfRTT: 1    RTTSum: 30    RTTSum2: 900

Entry number: 855903900
Modification time: 08:37:05.133 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1748
Number of operations skipped: 0
```

```
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 30
Latest operation start time: 13:44:05.178 UTC Thu Aug 15 2024
Latest operation return code: OK
RTT Values:
RTTAvg: 30    RTTMin: 30    RTTMax: 30
NumOfRTT: 1    RTTSum: 30    RTTSum2: 900




// Site2 FTD:

ftdv742#  show sla monitor configuration
SA Agent, Infrastructure Engine-II
Entry number: 550063734
Owner:
Tag:
Type of operation to perform: echo
Target address: 192.168.20.4
Interface: outside2
Number of packets: 1
Request size (ARR data portion): 28
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Verify data: No
Operation frequency (seconds): 60
Next Scheduled Start Time: Start Time already passed
Group Scheduled : FALSE
Life (seconds): Forever
Entry Ageout (seconds): never
Recurring (Starting Everyday): FALSE
Status of entry (SNMP RowStatus): Active
Enhanced History:

Entry number: 609724264
Owner:
Tag:
Type of operation to perform: echo
Target address: 192.168.10.3
Interface: outside
Number of packets: 1
Request size (ARR data portion): 28
Operation timeout (milliseconds): 5000
Type Of Service parameters: 0x0
Verify data: No
Operation frequency (seconds): 60
Next Scheduled Start Time: Start Time already passed
Group Scheduled : FALSE
Life (seconds): Forever
Entry Ageout (seconds): never
Recurring (Starting Everyday): FALSE
Status of entry (SNMP RowStatus): Active
Enhanced History:

ftdv742# show sla monitor operational-state
Entry number: 550063734
```

```
Modification time: 09:05:52.864 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1718
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 190
Latest operation start time: 13:42:52.916 UTC Thu Aug 15 2024
Latest operation return code: OK
RTT Values:
RTTAvg: 190    RTTMin: 190    RTTMax: 190
NumOfRTT: 1    RTTSum: 190    RTTSum2: 36100

Entry number: 609724264
Modification time: 09:05:52.856 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1718
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 190
Latest operation start time: 13:42:52.921 UTC Thu Aug 15 2024
Latest operation return code: OK
RTT Values:
RTTAvg: 190    RTTMin: 190    RTTMax: 190
NumOfRTT: 1    RTTSum: 190    RTTSum2: 36100
```

Ping Test

Scenario 1. Site1 Client1 ping Site2 Client1.

Before ping, check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD.

In this example, Tunnel1 shows 1497 packets for encapsulation and 1498 packets for decapsulation.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 1497, #pkts encrypt: 1497, #pkts digest: 1497
      #pkts decaps: 1498, #pkts decrypt: 1498, #pkts verify: 1498
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
interface: demovti_sp2
      #pkts encaps: 16, #pkts encrypt: 16, #pkts digest: 16
      #pkts decaps: 15, #pkts decrypt: 15, #pkts verify: 15
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

Site1 Client1 ping Site2 Client1 successfully.

```
Site1_Client1#ping 192.168.50.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.50.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 10/97/227 ms
```

Check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD after ping successfully.

In this example, Tunnel 1 shows 1502 packets for encapsulation and 1503 packets for decapsulation, with both counters increasing by 5 packets, matching the 5 ping echo requests. This indicates that pings of Site1 Client1 to Site2 Client1 are routed via ISP1 Tunnel 1. Tunnel 2 shows no increase in encapsulation or decapsulation counters, confirming it is not being used for this traffic.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 1502, #pkts encrypt: 1502, #pkts digest: 1502
      #pkts decaps: 1503, #pkts decrypt: 1503, #pkts verify: 1503
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
interface: demovti_sp2
      #pkts encaps: 16, #pkts encrypt: 16, #pkts digest: 16
      #pkts decaps: 15, #pkts decrypt: 15, #pkts verify: 15
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

Scenario 2. Site1 Client2 ping Site2 Client2.

Before ping, check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD.

In this example, Tunnel2 shows 21 packets for encapsulation and 20 packets for decapsulation.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 1520, #pkts encrypt: 1520, #pkts digest: 1520
      #pkts decaps: 1521, #pkts decrypt: 1521, #pkts verify: 1521
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
interface: demovti_sp2
      #pkts encaps: 21, #pkts encrypt: 21, #pkts digest: 21
      #pkts decaps: 20, #pkts decrypt: 20, #pkts verify: 20
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

Site1 Client2 ping Site2 Client2 successfully.

```
Site1_Client2#ping 192.168.50.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.50.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/39/87 ms
```

Check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD after ping successfully.

In this example, Tunnel 2 shows 26 packets for encapsulation and 25 packets for decapsulation, with both counters increasing by 5 packets, matching the 5 ping echo requests. This indicates that pings of Site1 Client2 to Site2 Client2 are routed via ISP2 Tunnel 2. Tunnel 1 shows no increase in encapsulation or decapsulation counters, confirming it is not being used for this traffic.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 1520, #pkts encrypt: 1520, #pkts digest: 1520
      #pkts decaps: 1521, #pkts decrypt: 1521, #pkts verify: 1521
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
interface: demovti_sp2
      #pkts encaps: 26, #pkts encrypt: 26, #pkts digest: 26
      #pkts decaps: 25, #pkts decrypt: 25, #pkts verify: 25
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

ISP1 Experiences an Interruption While ISP2 Works Fine

In this example, manual shutdown the interface E0/1 on ISP1 to simulate the ISP1 experiencing an interruption.

```
Internet_SP1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Internet_SP1(config)#
Internet_SP1(config)#interface E0/1
Internet_SP1(config-if)#shutdown
Internet_SP1(config-if)#exit
Internet_SP1(config)#
```

VPN

The Tunnel1 went down. Only Tunnel2 is active with IKEV2 SA.

```
// Site1 FTD:

ftdv742# show interface tunnel 1
Interface Tunnel1 "demovti", is down, line protocol is down
  Hardware is Virtual Tunnel    MAC address N/A, MTU 1500
```

```
    IP address 169.254.10.1, subnet mask 255.255.255.0
  Tunnel Interface Information:
    Source interface: outside    IP address: 192.168.30.1
    Destination IP address: 192.168.10.1
    IPsec MTU Overhead : 0
    Mode: ipsec ipv4    IPsec profile: ipsec_profile|e4084d322d


ftdv742# show crypto ikev2 sa

IKEv2 SAs:

Session-id:148, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
1045734377 192.168.40.1/500                               192.168.20.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/80266 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0x47bfa607/0x82e8781d



// Site2 FTD:

ftdv742# show interface tunnel 1
Interface Tunnel1 "demovti25", is down, line protocol is down
  Hardware is Virtual Tunnel    MAC address N/A, MTU 1500
    IP address 169.254.10.2, subnet mask 255.255.255.0
  Tunnel Interface Information:
    Source interface: outside    IP address: 192.168.10.1
    Destination IP address: 192.168.30.1
    IPsec MTU Overhead : 0
    Mode: ipsec ipv4    IPsec profile: ipsec_profile|e4084d322d
ftdv742#

ftdv742# show crypto ikev2 sa

IKEv2 SAs:

Session-id:36, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
477599833 192.168.20.1/500                               192.168.40.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/80382 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0x82e8781d/0x47bfa607
```

Route

In route table, the backup routes take effect.

```
// Site1 FTD:
```

```
ftdv742# show route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, V - VPN
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, + - replicated route
       SI - Static InterVRF, BI - BGP InterVRF
Gateway of last resort is 192.168.40.4 to network 0.0.0.0

S*       0.0.0.0 0.0.0.0 [2/0] via 192.168.40.4, outside2
C        169.254.20.0 255.255.255.0 is directly connected, demovti_sp2
L        169.254.20.11 255.255.255.255 is directly connected, demovti_sp2
S        192.168.20.1 255.255.255.255 [1/0] via 192.168.40.4, outside2
C        192.168.30.0 255.255.255.0 is directly connected, outside
L        192.168.30.1 255.255.255.255 is directly connected, outside
C        192.168.40.0 255.255.255.0 is directly connected, outside2
L        192.168.40.1 255.255.255.255 is directly connected, outside2
S        192.168.50.0 255.255.255.0 [22/0] via 169.254.20.12, demovti_sp2
S        192.168.50.10 255.255.255.255 [1/0] via 169.254.20.12, demovti_sp2
C        192.168.70.0 255.255.255.0 is directly connected, inside
L        192.168.70.1 255.255.255.255 is directly connected, inside



// Site2 FTD:

ftdv742# show route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, V - VPN
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, + - replicated route
       SI - Static InterVRF, BI - BGP InterVRF
Gateway of last resort is 192.168.10.3 to network 0.0.0.0

S*       0.0.0.0 0.0.0.0 [1/0] via 192.168.10.3, outside
C        169.254.20.0 255.255.255.0 is directly connected, demovti_sp2
L        169.254.20.12 255.255.255.255 is directly connected, demovti_sp2
C        192.168.10.0 255.255.255.0 is directly connected, outside
L        192.168.10.1 255.255.255.255 is directly connected, outside
C        192.168.20.0 255.255.255.0 is directly connected, outside2
L        192.168.20.1 255.255.255.255 is directly connected, outside2
S        192.168.40.1 255.255.255.255 [1/0] via 192.168.20.4, outside2
C        192.168.50.0 255.255.255.0 is directly connected, inside
L        192.168.50.1 255.255.255.255 is directly connected, inside
S        192.168.70.0 255.255.255.0 [22/0] via 169.254.20.11, demovti_sp2
S        192.168.70.10 255.255.255.255 [1/0] via 169.254.20.11, demovti_sp2
```

SLA Monitor

On Site1 FTD, the SLA monitor shows entry number 855903900 timeout (Target address is 192.168.30.3) for ISP1.

```
// Site1 FTD:

ftdv742# show sla monitor operational-state
Entry number: 188426425
Modification time: 08:37:05.131 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1786
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 100
Latest operation start time: 14:22:05.132 UTC Thu Aug 15 2024
Latest operation return code: OK
RTT Values:
RTTAvg: 100    RTTMin: 100    RTTMax: 100
NumOfRTT: 1    RTTSum: 100    RTTSum2: 10000

Entry number: 855903900
Modification time: 08:37:05.132 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1786
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: TRUE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): NoConnection/Busy/Timeout
Latest operation start time: 14:22:05.134 UTC Thu Aug 15 2024
Latest operation return code: Timeout
RTT Values:
RTTAvg: 0    RTTMin: 0    RTTMax: 0
NumOfRTT: 0    RTTSum: 0    RTTSum2: 0

ftdv742# show track
Track 1
  Response Time Reporter 855903900 reachability
  Reachability is Down
  7 changes, last change 00:11:03
  Latest operation return code: Timeout
  Tracked by:
    STATIC-IP-ROUTING 0
Track 2
  Response Time Reporter 188426425 reachability
  Reachability is Up
  4 changes, last change 13:15:11
  Latest operation return code: OK
  Latest RTT (millisecs) 140
  Tracked by:
    STATIC-IP-ROUTING 0
```

Ping Test

Before ping, check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD.

In this example, Tunnel2 shows 36 packets for encapsulation and 35 packets for decapsulation.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti_sp2
      #pkts encaps: 36, #pkts encrypt: 36, #pkts digest: 36
      #pkts decaps: 35, #pkts decrypt: 35, #pkts verify: 35
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

Site1 Client1 ping Site2 Client1 successfully.

```
Site1_Client1#ping 192.168.50.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.50.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 22/133/253 ms
```

Site1 Client2 ping Site2 Client2 successfully.

```
Site1_Client2#ping 192.168.50.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.50.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 34/56/87 ms
```

Check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD after ping sucessfully.

In this example, Tunnel 2 shows 46 packets for encapsulation and 45 packets for decapsulation, with both counters increasing by 10 packets, matching the 10 ping echo requests. This indicates that the ping packets are routed via ISP2 Tunnel 2.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti_sp2
      #pkts encaps: 46, #pkts encrypt: 46, #pkts digest: 46
      #pkts decaps: 45, #pkts decrypt: 45, #pkts verify: 45
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

ISP2 Experiences an Interruption While ISP1 Works Fine

In this example, manual shutdown the interface E0/1 on ISP2 to simulate the ISP2 experiencing an interruption.

```
Internet_SP2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Internet_SP2(config)#
Internet_SP2(config)#int e0/1
Internet_SP2(config-if)#shutdown
Internet_SP2(config-if)#^Z
Internet_SP2#
```

VPN

The Tunnel2 went down. Only Tunnel1 is active with IKEV2 SA.

```
// Site1 FTD:

ftdv742# show interface tunnel 2
Interface Tunnel2 "demovti_sp2", is down, line protocol is down
  Hardware is Virtual Tunnel    MAC address N/A, MTU 1500
    IP address 169.254.20.11, subnet mask 255.255.255.0
  Tunnel Interface Information:
    Source interface: outside2    IP address: 192.168.40.1
    Destination IP address: 192.168.20.1
    IPsec MTU Overhead : 0
    Mode: ipsec ipv4    IPsec profile: ipsec_profile|e4084d322d

ftdv742# show crypto ikev2 sa

IKEv2 SAs:

Session-id:159, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
1375077093 192.168.30.1/500                               192.168.10.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/349 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0x40f407b4/0x26598bcc



// Site2 FTD:

ftdv742# show int tunnel 2
Interface Tunnel2 "demovti_sp2", is down, line protocol is down
  Hardware is Virtual Tunnel    MAC address N/A, MTU 1500
    IP address 169.254.20.12, subnet mask 255.255.255.0
  Tunnel Interface Information:
    Source interface: outside2    IP address: 192.168.20.1
    Destination IP address: 192.168.40.1
    IPsec MTU Overhead : 0
    Mode: ipsec ipv4    IPsec profile: ipsec_profile|e4084d322d
```

```
ftdv742# show crypto ikev2 sa

IKEv2 SAs:

Session-id:165, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                          Remote
1025640731 192.168.10.1/500                               192.168.30.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/379 sec
Child sa: local selector  0.0.0.0/0 - 255.255.255.255/65535
          remote selector 0.0.0.0/0 - 255.255.255.255/65535
          ESP spi in/out: 0x26598bcc/0x40f407b4
```

Route

In route table, ISP2 related route disapeared for PBR traffic.

```
// Site1 FTD:

ftdv742# show route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, V - VPN
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, + - replicated route
       SI - Static InterVRF, BI - BGP InterVRF
Gateway of last resort is 192.168.30.3 to network 0.0.0.0

S*       0.0.0.0 0.0.0.0 [1/0] via 192.168.30.3, outside
C        169.254.10.0 255.255.255.0 is directly connected, demovti
L        169.254.10.1 255.255.255.255 is directly connected, demovti
C        192.168.30.0 255.255.255.0 is directly connected, outside
L        192.168.30.1 255.255.255.255 is directly connected, outside
C        192.168.40.0 255.255.255.0 is directly connected, outside2
L        192.168.40.1 255.255.255.255 is directly connected, outside2
S        192.168.50.0 255.255.255.0 [1/0] via 169.254.10.2, demovti
C        192.168.70.0 255.255.255.0 is directly connected, inside
L        192.168.70.1 255.255.255.255 is directly connected, inside



// Site2 FTD:

ftdv742# show route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, V - VPN
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, + - replicated route
```

```
       SI - Static InterVRF, BI - BGP InterVRF
Gateway of last resort is 192.168.10.3 to network 0.0.0.0

S*       0.0.0.0 0.0.0.0 [1/0] via 192.168.10.3, outside
C        169.254.10.0 255.255.255.0 is directly connected, demovti25
L        169.254.10.2 255.255.255.255 is directly connected, demovti25
C        192.168.10.0 255.255.255.0 is directly connected, outside
L        192.168.10.1 255.255.255.255 is directly connected, outside
C        192.168.20.0 255.255.255.0 is directly connected, outside2
L        192.168.20.1 255.255.255.255 is directly connected, outside2
S        192.168.40.1 255.255.255.255 [1/0] via 192.168.20.4, outside2
C        192.168.50.0 255.255.255.0 is directly connected, inside
L        192.168.50.1 255.255.255.255 is directly connected, inside
S        192.168.70.0 255.255.255.0 [1/0] via 169.254.10.1, demovti25
```

SLA Monitor

On Site1 FTD, the SLA monitor shows entry number 188426425 timeout (Target address is 192.168.40.4) for ISP2.

```
// Site1 FTD:

ftdv742# show sla monitor operational-state
Entry number: 188426425
Modification time: 08:37:05.133 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1816
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: TRUE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): NoConnection/Busy/Timeout
Latest operation start time: 14:52:05.174 UTC Thu Aug 15 2024
Latest operation return code: Timeout
RTT Values:
RTTAvg: 0    RTTMin: 0    RTTMax: 0
NumOfRTT: 0    RTTSum: 0    RTTSum2: 0

Entry number: 855903900
Modification time: 08:37:05.135 UTC Wed Aug 14 2024
Number of Octets Used by this Entry: 2056
Number of operations attempted: 1816
Number of operations skipped: 0
Current seconds left in Life: Forever
Operational state of entry: Active
Last time this entry was reset: Never
Connection loss occurred: FALSE
Timeout occurred: FALSE
Over thresholds occurred: FALSE
Latest RTT (milliseconds): 10
Latest operation start time: 14:52:05.177 UTC Thu Aug 15 2024
Latest operation return code: OK
RTT Values:
RTTAvg: 10    RTTMin: 10    RTTMax: 10
```

```
NumOfRTT: 1    RTTSum: 10    RTTSum2: 100


ftdv742#  show track
Track 1
  Response Time Reporter 855903900 reachability
  Reachability is Up
  8 changes, last change 00:14:37
  Latest operation return code: OK
  Latest RTT (millisecs) 60
  Tracked by:
    STATIC-IP-ROUTING 0
Track 2
  Response Time Reporter 188426425 reachability
  Reachability is Down
  5 changes, last change 00:09:30
  Latest operation return code: Timeout
  Tracked by:
    STATIC-IP-ROUTING 0
```

Ping Test

Before ping, check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD.

In this example, Tunnel 1 shows 74 packets for encapsulation and 73 packets for decapsulation.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 74, #pkts encrypt: 74, #pkts digest: 74
      #pkts decaps: 73, #pkts decrypt: 73, #pkts verify: 73
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

Site1 Client1 ping Site2 Client1 successfully.

```
Site1_Client1#ping 192.168.50.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.50.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 30/158/255 ms
```

Site1 Client2 ping Site2 Client2 successfully.

```
Site1_Client2#ping 192.168.50.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.50.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 6/58/143 ms
```

Check the counters of **show crypto ipsec sa | inc interface:|encap|decap** on Site1 FTD after ping successfully.

In this example, Tunnel 1 shows 84 packets for encapsulation and 83 packets for decapsulation, with both counters increasing by 10 packets, matching the 10 ping echo requests. This indicates that the ping packets are routed via ISP1 Tunnel 1.

```
// Site1 FTD:

ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 84, #pkts encrypt: 84, #pkts digest: 84
      #pkts decaps: 83, #pkts decrypt: 83, #pkts verify: 83
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
```

Troubleshoot

This section provides information you can use in order to troubleshoot your configuration.

You can use these debug commands in order to troubleshoot the VPN section.

```
debug crypto ikev2 platform 255
debug crypto ikev2 protocol 255
debug crypto ipsec 255
debug vti 255
```

You can use these debug commands to troubleshoot the PBR section.

```
debug policy-route
```

You can use these debug commands to troubleshoot the SLA Monitor section.

```
ftdv742# debug sla monitor ?
  error  Output IP SLA Monitor Error Messages
  trace  Output IP SLA Monitor Trace Messages
```