Configure VRF Aware Route-Based Site-to-Site VPN on FTD Managed by FDM

Contents

Introduction

This document describes how to configure VRF aware route-based site-to-site VPN on FTD managed by FDM.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- Basic understanding of VPN
- Basic understanding of Virtual Routing and Forwarding (VRF)
- 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
- Cisco ASAv version 9.20.3

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.

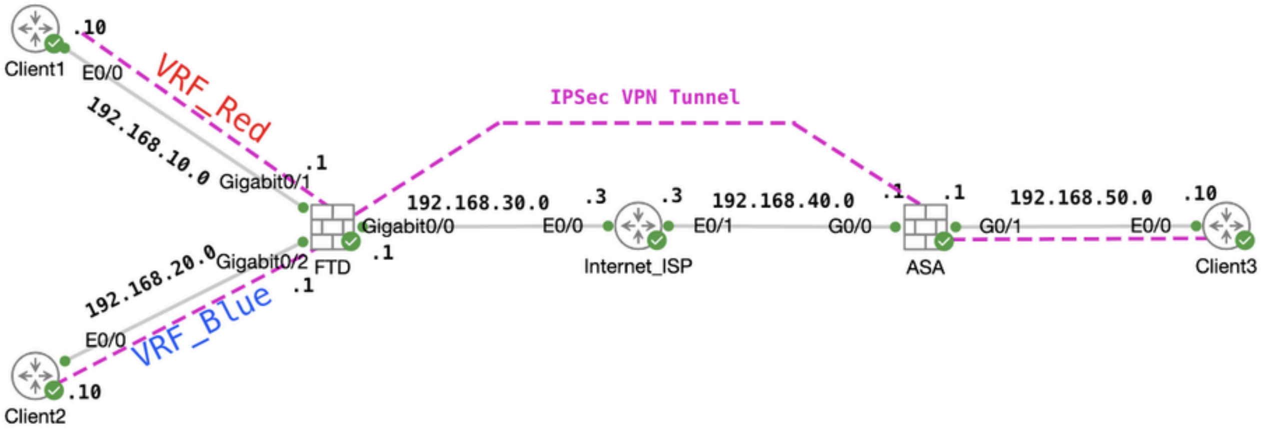
Background Information

Virtual Routing and Forwarding (VRF) on Firepower Device Manager (FDM) allows you to create multiple isolated routing instances on a single Firepower Threat Defense (FTD) device. Each VRF instance operates as a separate virtual router with its own routing table, enabling logical separation of network traffic and providing enhanced security and traffic management capabilities.

This document explains how to configure VRF aware IPSec VPN with VTI. VRF Red network and VRF Blue network are behind FTD. Client1 in VRF Red network and Client2 in VRF Blue would communicate with Client 3 behind ASA through the IPSec VPN tunnel.

Configure

Network Diagram

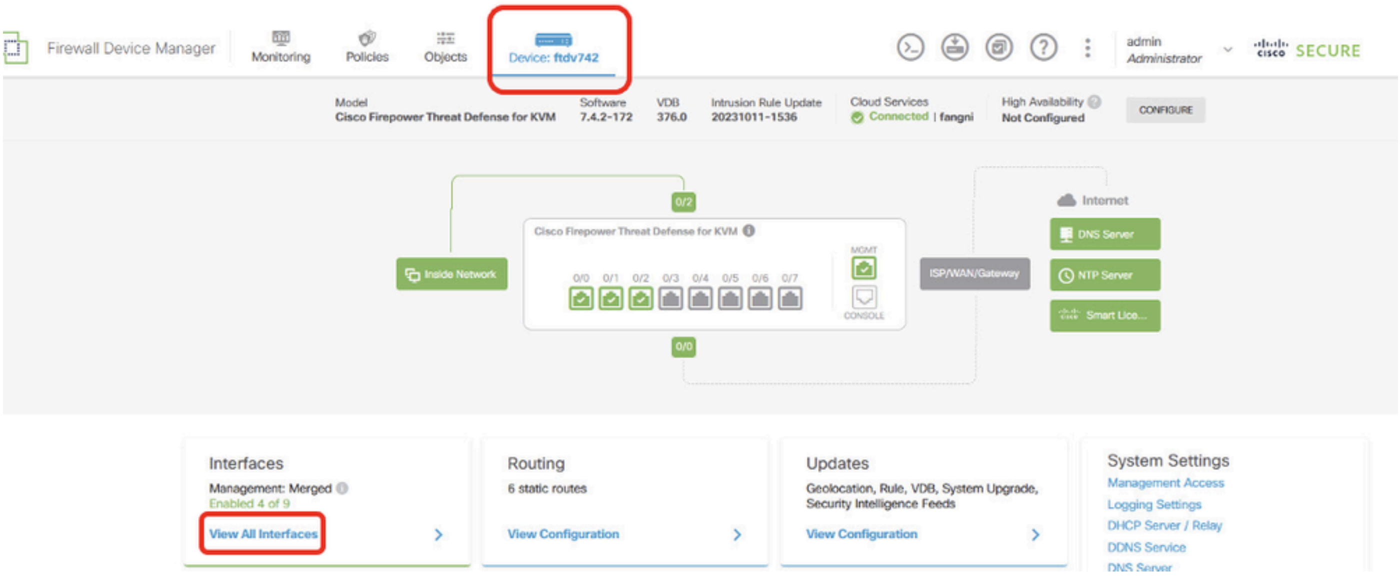


Topology

Configure the FTD

Step 1. It is essential to ensure that the preliminary configuration of IP interconnectivity between nodes has been duly completed. The Client1 and Client2 are with FTD Inside IP address as gateway. The Client3 is with ASA inside IP address as gateway.

Step 2. Create virtual tunnel interface. Login the FDM GUI of FTD. Navigate to **Device > Interfaces** . Click **View All Interfaces** .



Model: Cisco Firepower Threat Defense for KVM
Software: 7.4.2-172
VDB: 376.0
Intrusion Rule Update: 20231011-1536
Cloud Services: Connected | fangni
High Availability: Not Configured

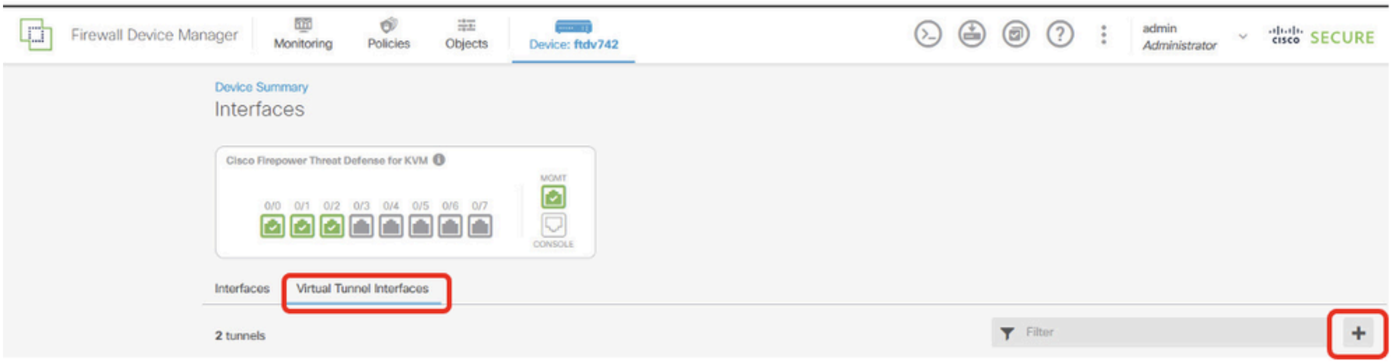
Management: Merged
Enabled 4 of 9

6 static routes

Geolocation, Rule, VDB, System Upgrade, Security Intelligence Feeds

FTD_View_Interfaces

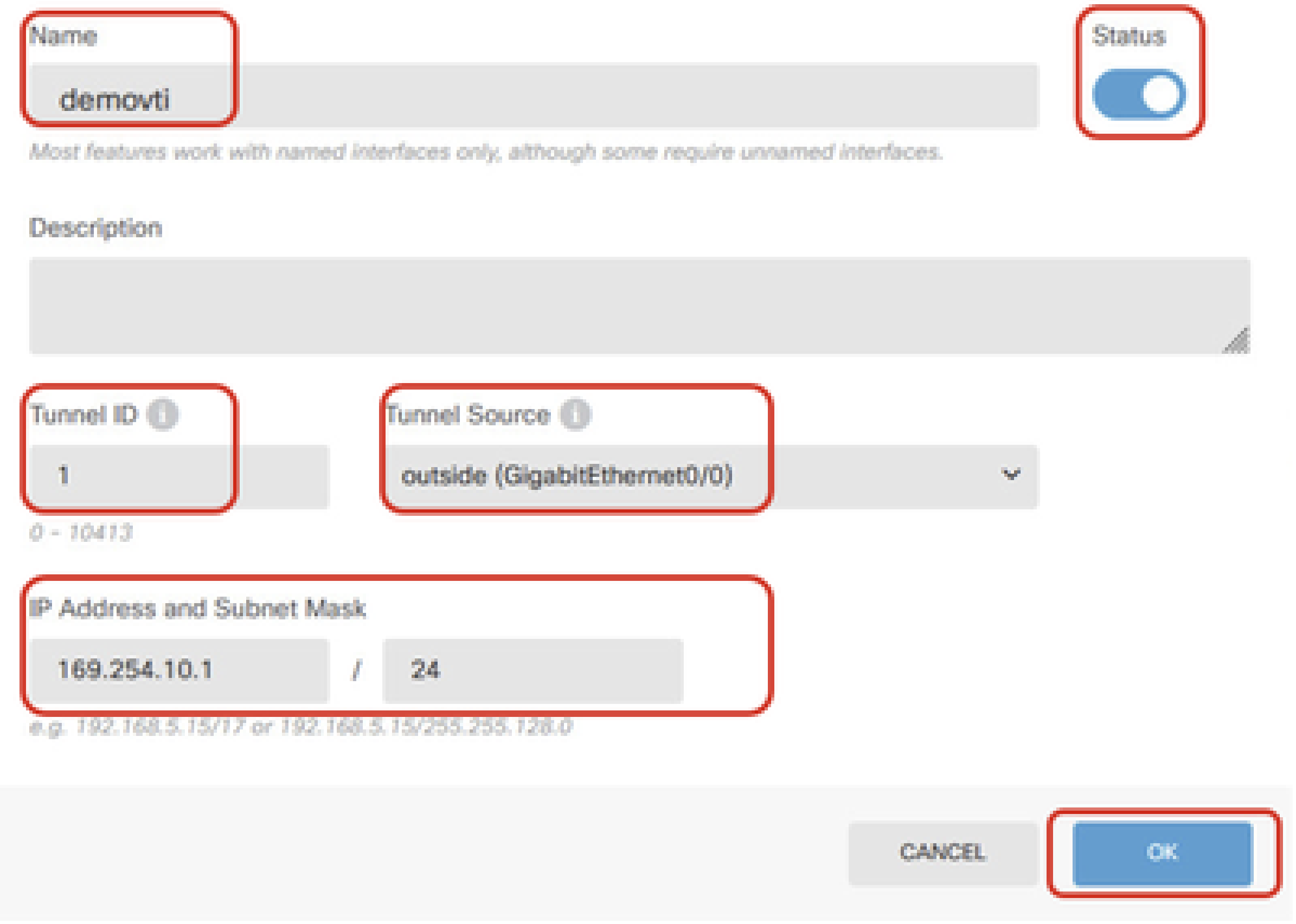
Step 2.1. Click **Virtual Tunnel Interfaces** tab. Click + button.



FTD_Create_VTI

Step 2.2. Provide necessary information. 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



Name: demovti

Status: on

Most features work with named interfaces only, although some require unnamed interfaces.

Description:

Tunnel ID: 1

0 - 10413

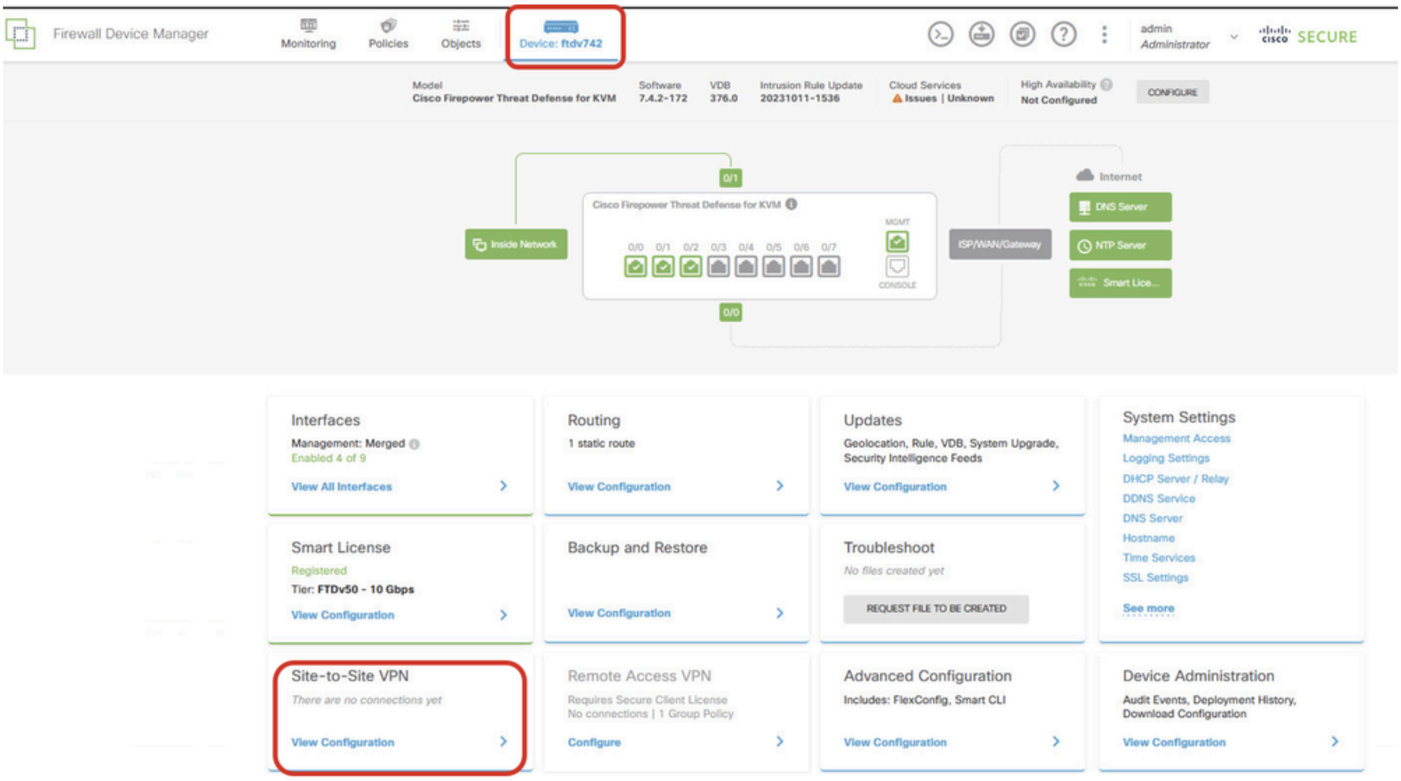
Tunnel Source: outside (GigabitEthernet0/0)

IP Address and Subnet Mask: 169.254.10.1 / 24

e.g. 192.168.5.15/17 or 192.168.5.15/255.255.128.0

FTD_Create_VTI_Details

Step 3. Navigate to **Device > Site-to-Site VPN** . Click **View Configuration** button.



Model: Cisco Firepower Threat Defense for KVM

Software: 7.4.2-172

VDB: 376.0

Intrusion Rule Update: 20231011-1536

Cloud Services: ⚠ Issues | Unknown

High Availability: Not Configured

Cisco Firepower Threat Defense for KVM

Interfaces
Management: Merged
Enabled 4 of 9
View All Interfaces >

Routing
1 static route
View Configuration >

Updates
Geolocation, Rule, VDB, System Upgrade, Security Intelligence Feeds
View Configuration >

System Settings
Management Access
Logging Settings
DHCP Server / Relay
DDNS Service
DNS Server
Hostname
Time Services
SSL Settings
See more

Smart License
Registered
Tier: FTDv50 - 10 Gbps
View Configuration >

Backup and Restore
View Configuration >

Troubleshoot
No files created yet
REQUEST FILE TO BE CREATED

Site-to-Site VPN
There are no connections yet
View Configuration >

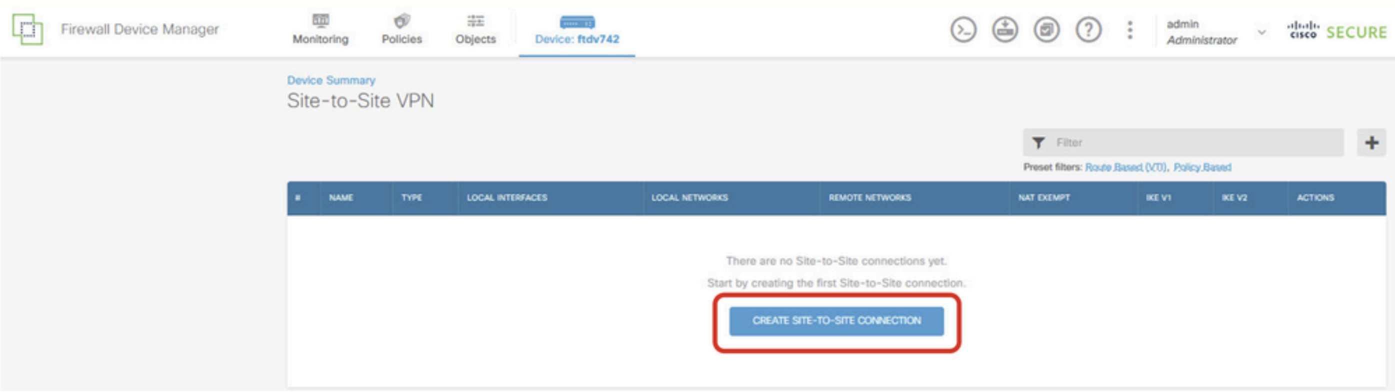
Remote Access VPN
Requires Secure Client License
No connections | 1 Group Policy
Configure >

Advanced Configuration
Includes: FlexConfig, Smart CLI
View Configuration >

Device Administration
Audit Events, Deployment History, Download Configuration
View Configuration >

FTD_Site-to-Site_VPN_View_Configurations

Step 3.1. Start to create new site-to-site VPN. Click **CREATE SITE-TO-SITE CONNECTION** button. Or click + button.



Device Summary

Site-to-Site VPN

Preset filters: Route Based (VTI), Policy Based

#	NAME	TYPE	LOCAL INTERFACES	LOCAL NETWORKS	REMOTE NETWORKS	NAT EXEMPT	IKE V1	IKE V2	ACTIONS

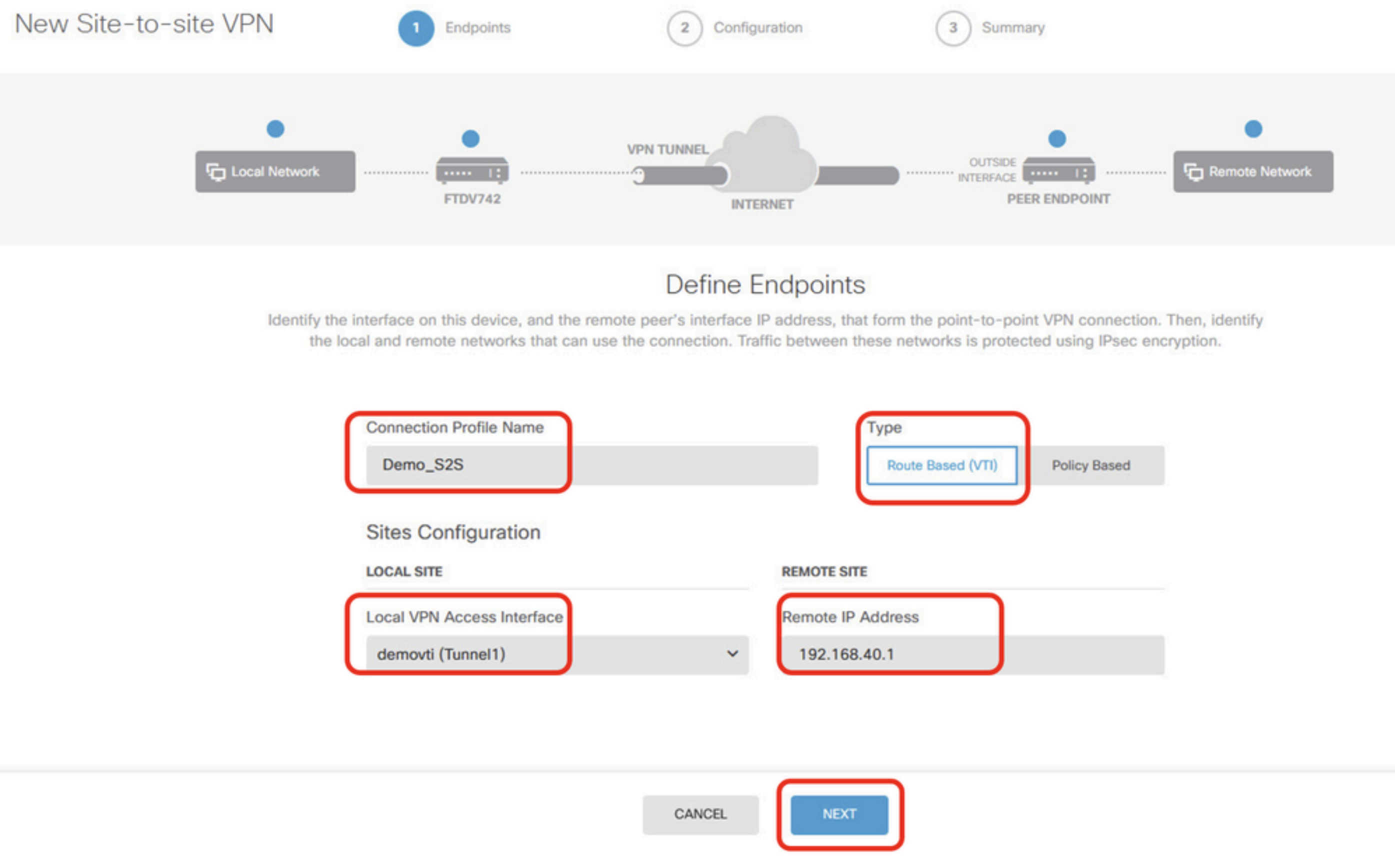
There are no Site-to-Site connections yet.

Start by creating the first Site-to-Site connection.

FTD_Create_Site2Site_Connection

Step 3.2. Provide necessary information. Click **NEXT** button.

- Connection Profile Name: Demo_S2S
- Type: Route Based (VTI)
- Local VPN Access Interface: demovti (created in Step 2)
- Remote IP Address: 192.168.40.1 (this is peer ASA outside IP address)



New Site-to-site VPN

Define Endpoints

Identify the interface on this device, and the remote peer's interface IP address, that form the point-to-point VPN connection. Then, identify the local and remote networks that can use the connection. Traffic between these networks is protected using IPsec encryption.

Connection Profile Name: Demo_S2S

Type: Route Based (VTI)

Sites Configuration

LOCAL SITE

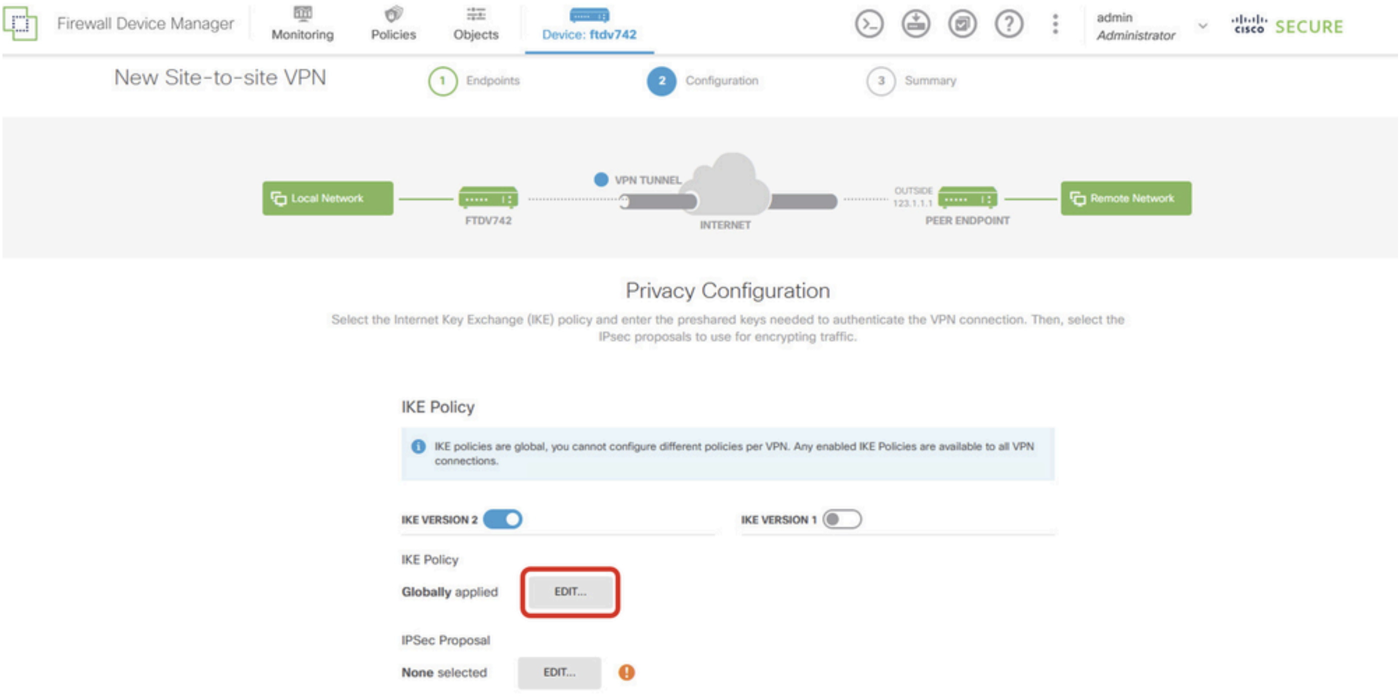
Local VPN Access Interface: demovti (Tunnel1)

REMOTE SITE

Remote IP Address: 192.168.40.1

FTD_Site-to-Site_VPN_Endpoints

Step 3.3. Navigate to IKE Policy. Click **EDIT** button.



Privacy Configuration

Select the Internet Key Exchange (IKE) policy and enter the preshared keys needed to authenticate the VPN connection. Then, select the IPsec proposals to use for encrypting traffic.

IKE Policy

IKE policies are global, you cannot configure different policies per VPN. Any enabled IKE Policies are available to all VPN connections.

IKE VERSION 2 ●
IKE VERSION 1 ○

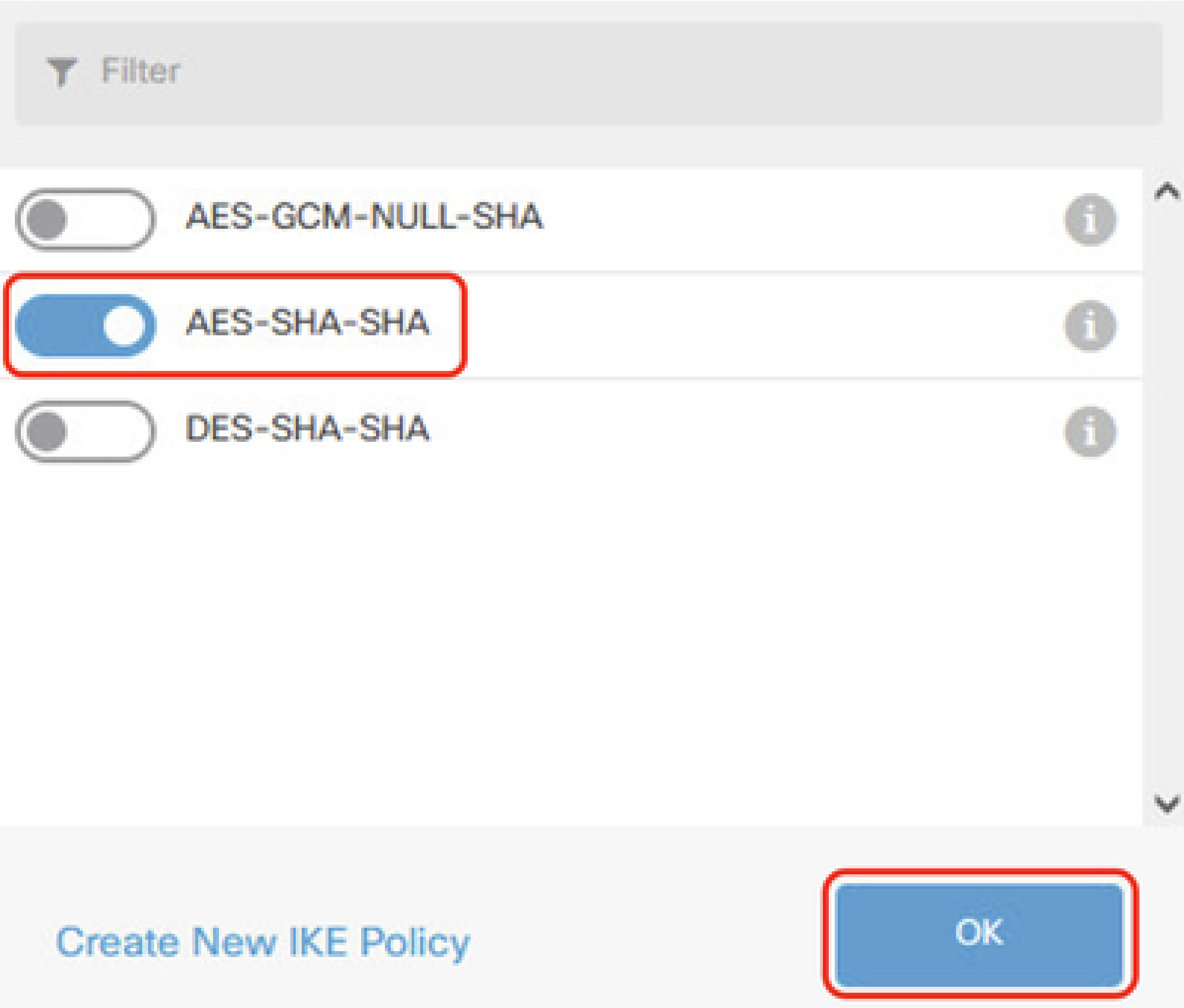
IKE Policy
Globally applied EDIT...

IPSec Proposal
None selected EDIT...

FTD_Edit_IKE_Policy

Step 3.4. For IKE policy, you can use pre-defined or you can create a new one by clicking **Create New IKE Policy** .

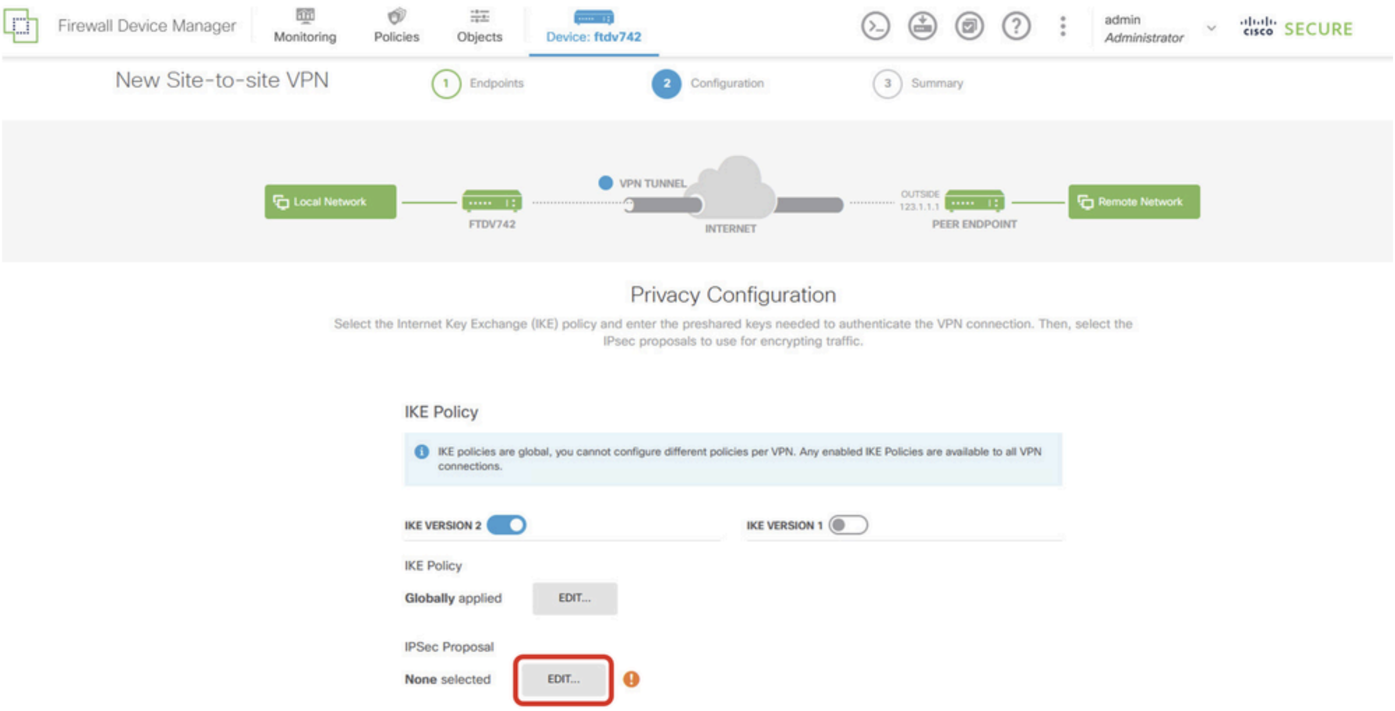
In this example, toggle an existing IKE policy name **AES-SHA-SHA** . Click **OK** button to save.



- ○ AES-GCM-NULL-SHA
- ● AES-SHA-SHA
- ○ DES-SHA-SHA

FTD_Enable_IKE_Policy

Step 3.5. Navigate to IPSec Proposal. Click **EDIT** button.



Privacy Configuration

Select the Internet Key Exchange (IKE) policy and enter the preshared keys needed to authenticate the VPN connection. Then, select the IPsec proposals to use for encrypting traffic.

IKE Policy

IKE policies are global, you cannot configure different policies per VPN. Any enabled IKE Policies are available to all VPN connections.

IKE VERSION 2 ●

IKE VERSION 1 ○

IKE Policy

Globally applied

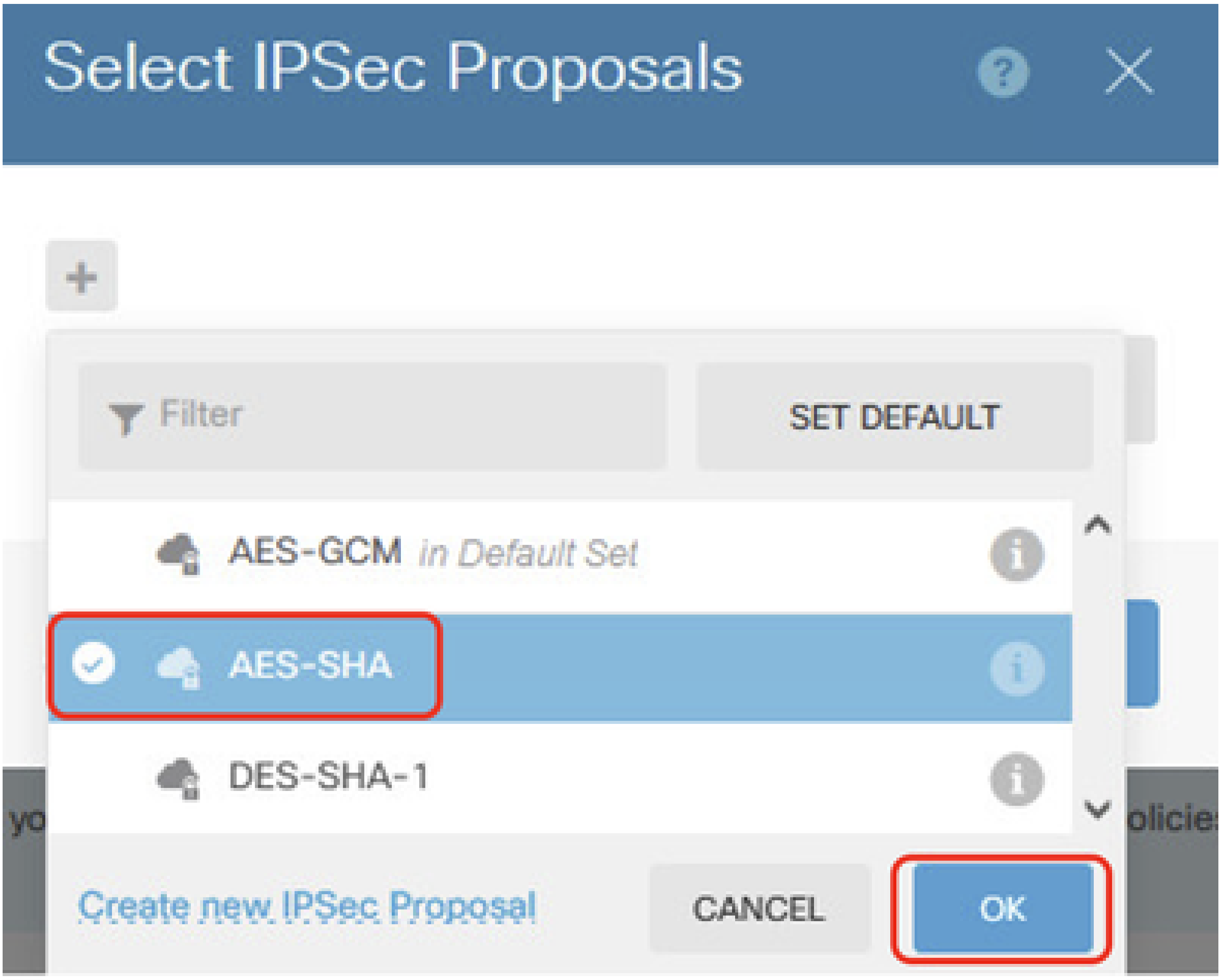
IPSec Proposal

None selected

FTD_Edit_IPSec_Proposal

Step 3.6. For IPSec proposal, you can use pre-defined or you can create a new one by clicking **Create new IPSec Proposal** .

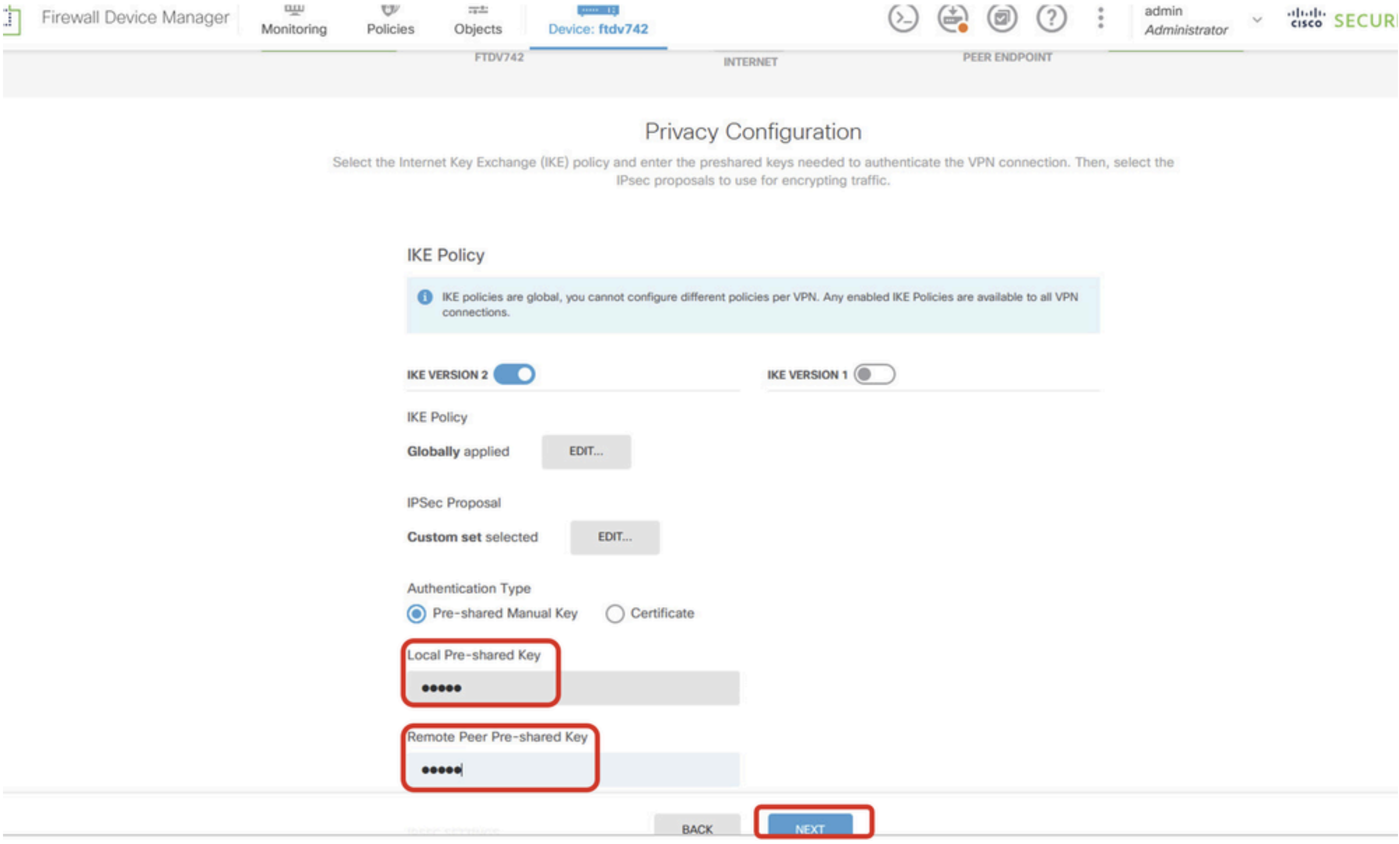
In this example, toggle an existing IPSec Proposal name **AES-SHA** . Click **OK** button to save.



FTD_Enable_IPSec_Proposal

Step 3.7. Scroll down the page and configure the pre-shared key. Click **NEXT** button.

Please note down this pre-shared key and configure it on ASA later.



Privacy Configuration

Select the Internet Key Exchange (IKE) policy and enter the preshared keys needed to authenticate the VPN connection. Then, select the IPsec proposals to use for encrypting traffic.

IKE Policy

IKE policies are global, you cannot configure different policies per VPN. Any enabled IKE Policies are available to all VPN connections.

IKE VERSION 2 ● IKE VERSION 1 ○

IKE Policy

Globally applied EDIT...

IPSec Proposal

Custom set selected EDIT...

Authentication Type

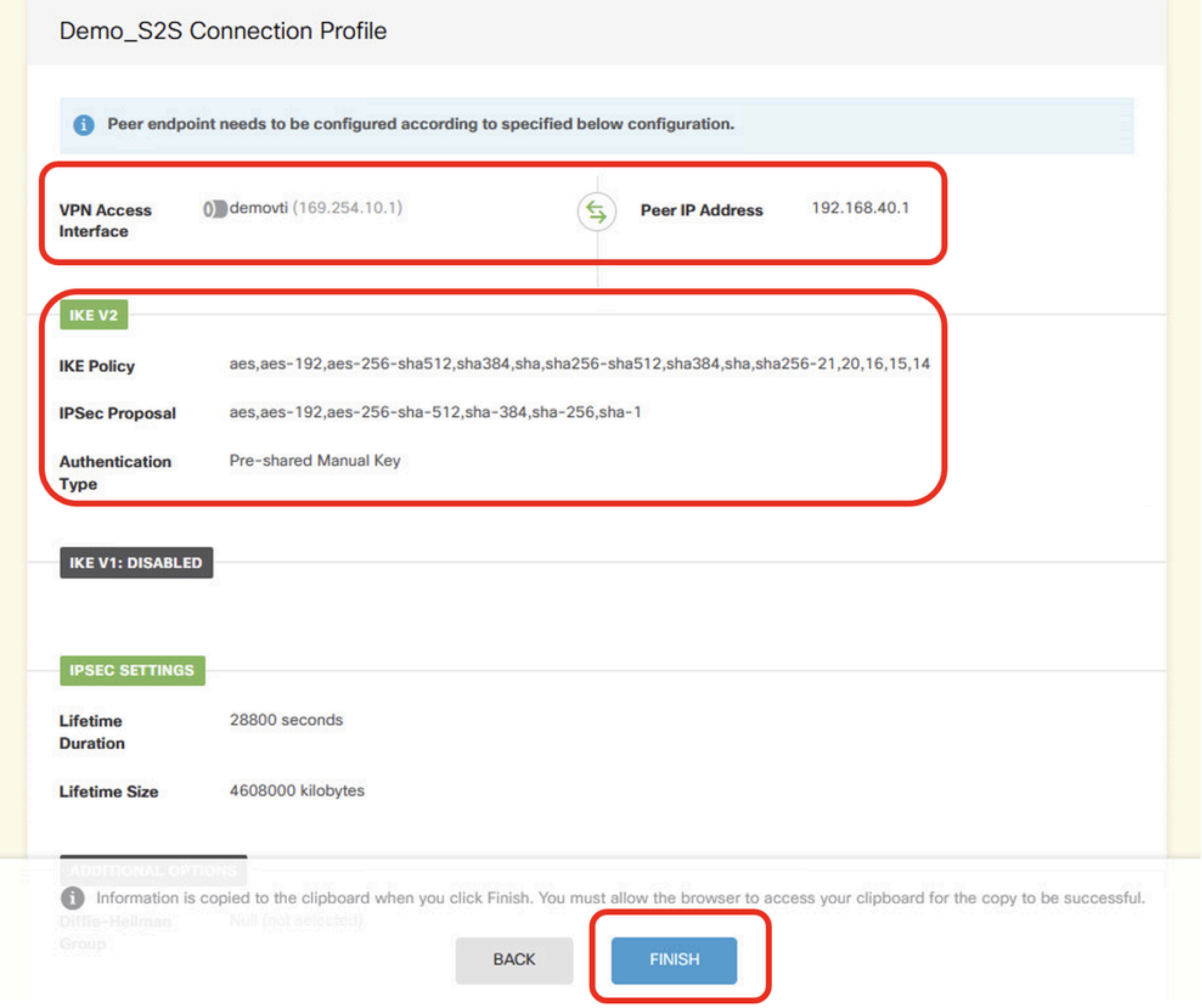
● Pre-shared Manual Key ○ Certificate

Local Pre-shared Key: •••••

Remote Peer Pre-shared Key: •••••

FTD_Configure_Pre_Shared_Key

Step 3.8. Review the VPN configuration. If anything needs to be modified, click **BACK** button. If everything is good, click **FINISH** button.



Demo_S2S Connection Profile

Peer endpoint needs to be configured according to specified below configuration.

VPN Access Interface: demovti (169.254.10.1)

Peer IP Address: 192.168.40.1

IKE V2

IKE Policy: aes,aes-192,aes-256-sha512,sha384,sha,sha256-sha512,sha384,sha,sha256-21,20,16,15,14

IPSec Proposal: aes,aes-192,aes-256-sha-512,sha-384,sha-256,sha-1

Authentication Type: Pre-shared Manual Key

IKE V1: DISABLED

IPSEC SETTINGS

Lifetime Duration: 28800 seconds

Lifetime Size: 4608000 kilobytes

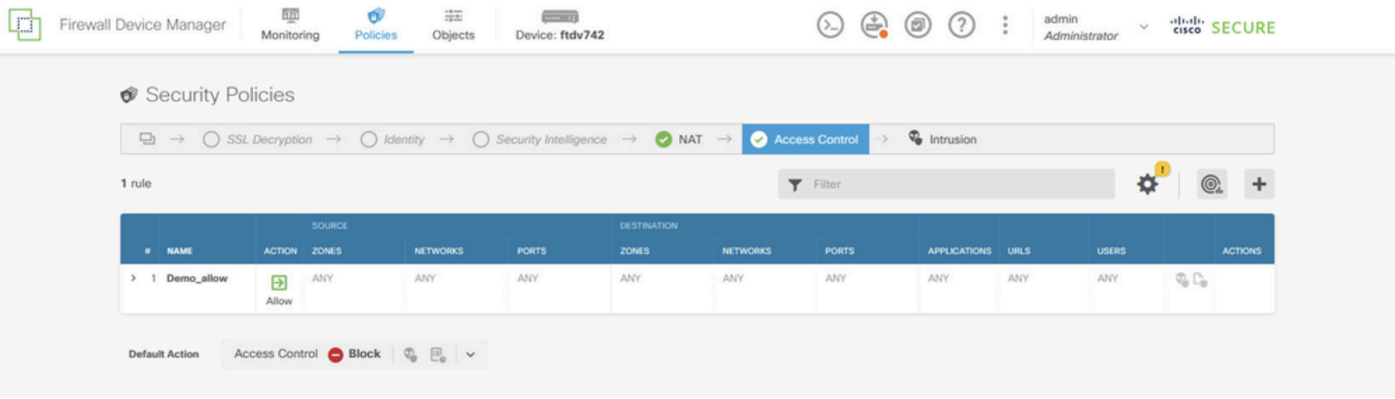
ADDITIONAL OPTIONS

Diffie-Hellman Group: Null (not selected)

Information is copied to the clipboard when you click Finish. You must allow the browser to access your clipboard for the copy to be successful.

FTD_Review_VPN_Configuration

Step 3.9. Create Access Control rule to allow traffic pass through the FTD. In this example, allow all for demo purpose. Please modify your policy based on your actual needs.



Security Policies

SSL Decryption → Identity → Security Intelligence → NAT → Access Control → Intrusion

1 rule

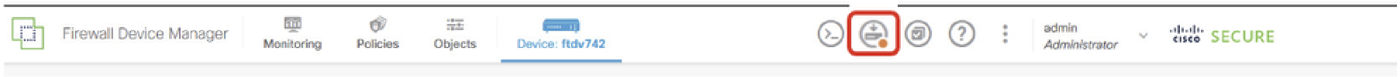
			SOURCE			DESTINATION						
#	NAME	ACTION	ZONES	NETWORKS	PORTS	ZONES	NETWORKS	PORTS	APPLICATIONS	URLS	USERS	ACTIONS
1	Demo_allow	Allow	ANY	ANY	ANY	ANY	ANY	ANY	ANY	ANY	ANY	

Default Action: Access Control ⛔ Block

FTD_ACP_Example

Step 3.10. (Optional) Configure NAT exempt rule for the client traffic on FTD if there is dynamic NAT configured for client to access internet. In this example, there is no need to configure a NAT exempt rule because there is no dynamic NAT configured on FTD.

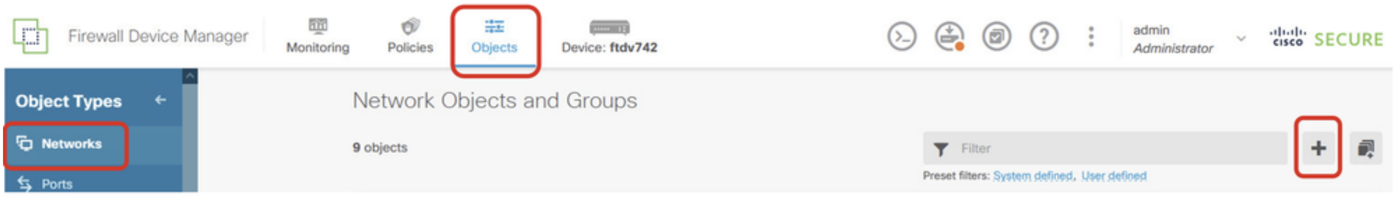
Step 3.11. Deploy the configuration changes.



FTD_Deployment_Changes

Step 4. Configure virtual routers.

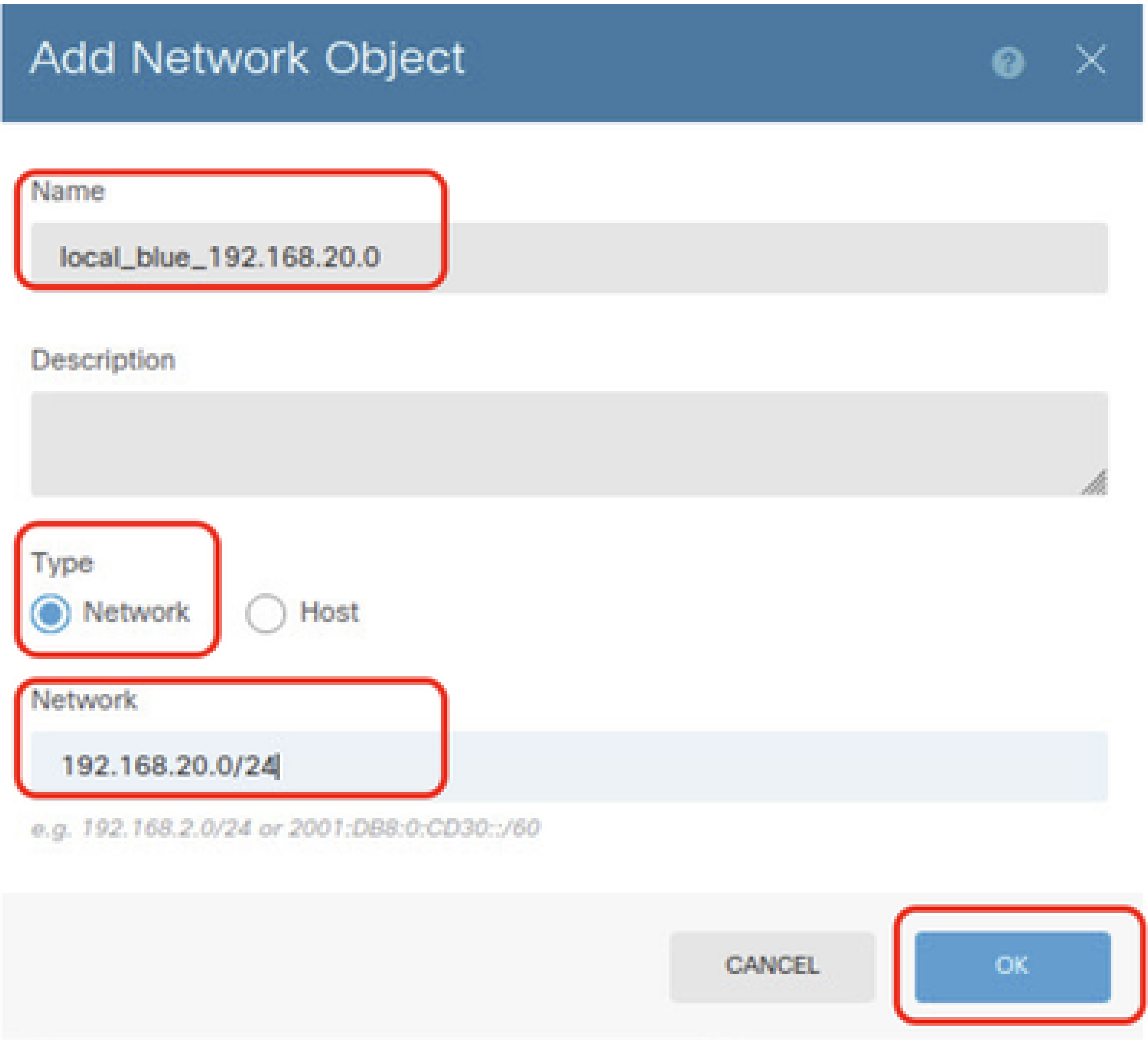
Step 4.1. Create network objects for static route. Navigate to **Objects > Networks** , click **+** button.



FTD_Create_NetObjects

Step 4.2. Provide necessary information of each network object. Click **OK** button.

- Name: local_blue_192.168.20.0
- Type: Network
- Network: 192.168.20.0/24



Name

local_blue_192.168.20.0

Description

Type

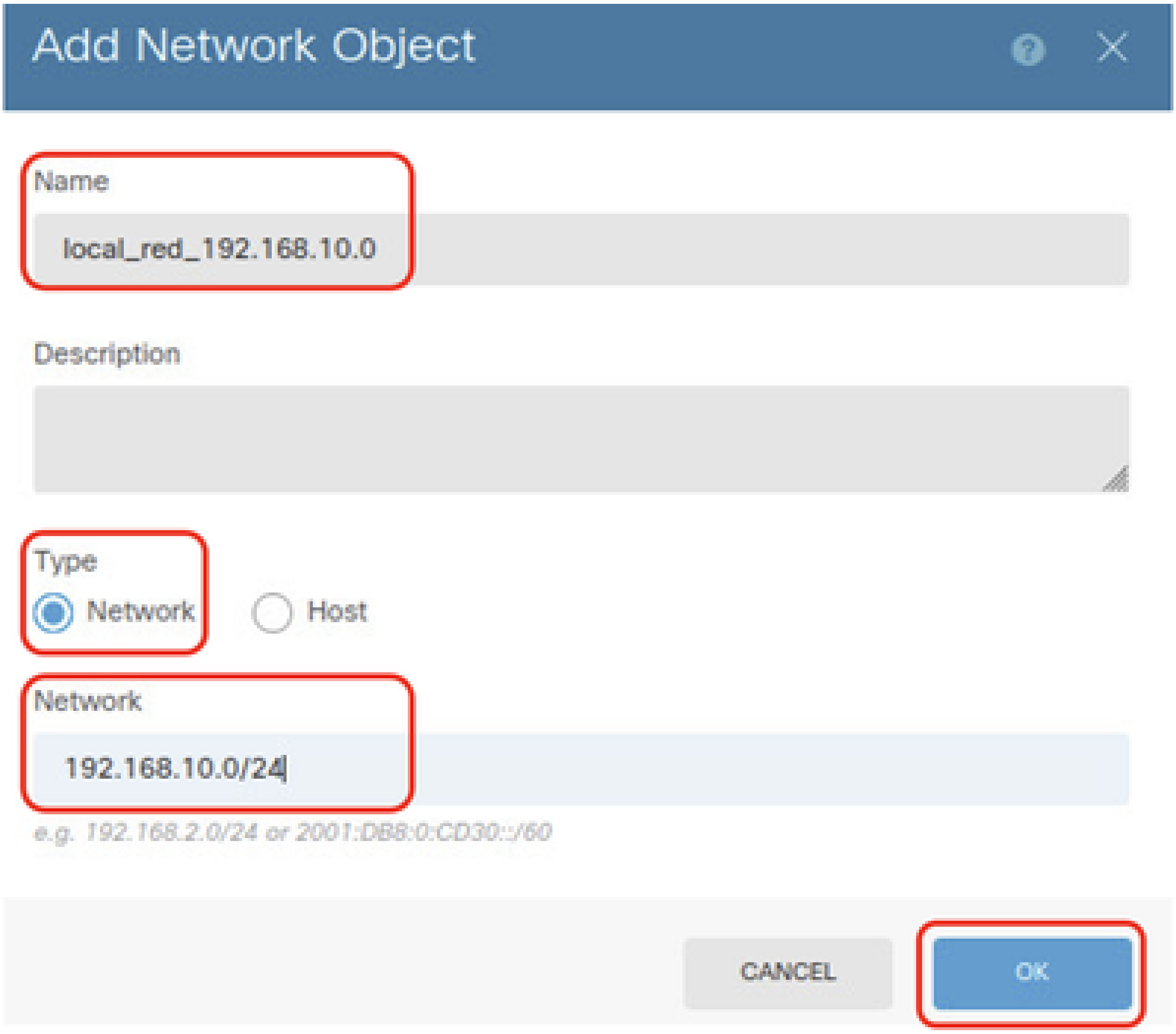
● Network ○ Host

Network

192.168.20.0/24

FTD_VRF_Blue_Network

- Name: local_red_192.168.10.0
- Type: Network
- Network: 192.168.10.0/24



Add Network Object

Name

local_red_192.168.10.0

Description

Type

● Network ○ Host

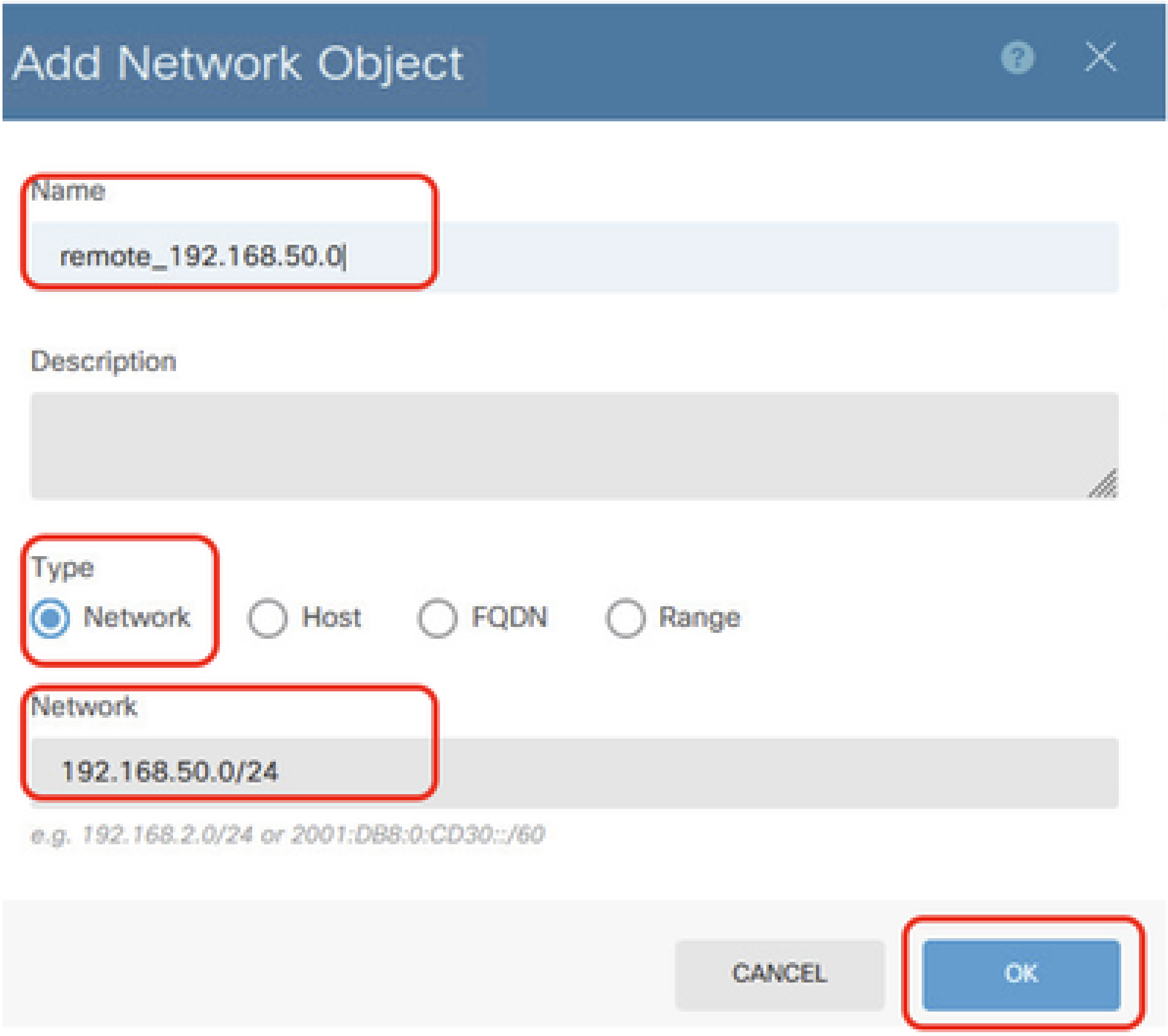
Network

192.168.10.0/24

e.g. 192.168.2.0/24 or 2001:DB8:0:CD30::/60

FTD_VRF_Red_Network

- Name: remote_192.168.50.0
- Type: Network
- Network: 192.168.50.0/24



Add Network Object

Name

remote_192.168.50.0

Description

Type

● Network ○ Host ○ FQDN ○ Range

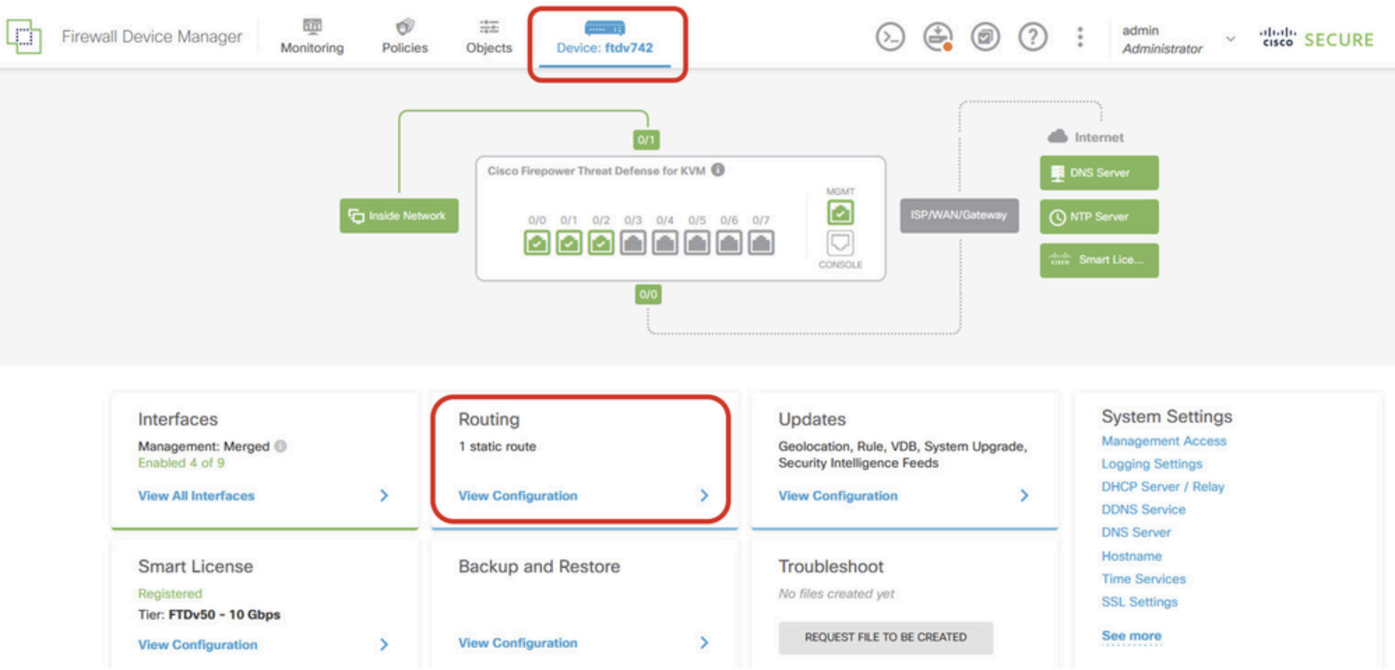
Network

192.168.50.0/24

e.g. 192.168.2.0/24 or 2001:DB8:0:CD30::/60

FTD_Remote_Network

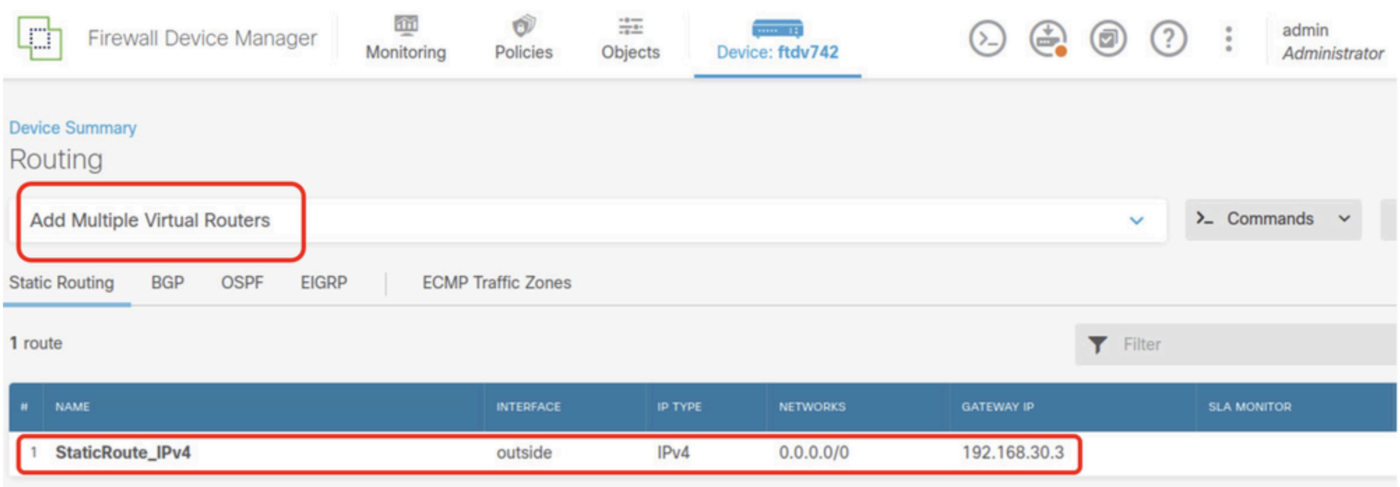
Step 4.3. Create first virtual router. Navigate to **Device > Routing** . Click **View Configuration** .



FTD_View_Routing_Configuration

Step 4.4. Click **Add Multiple Virtual Routers** .

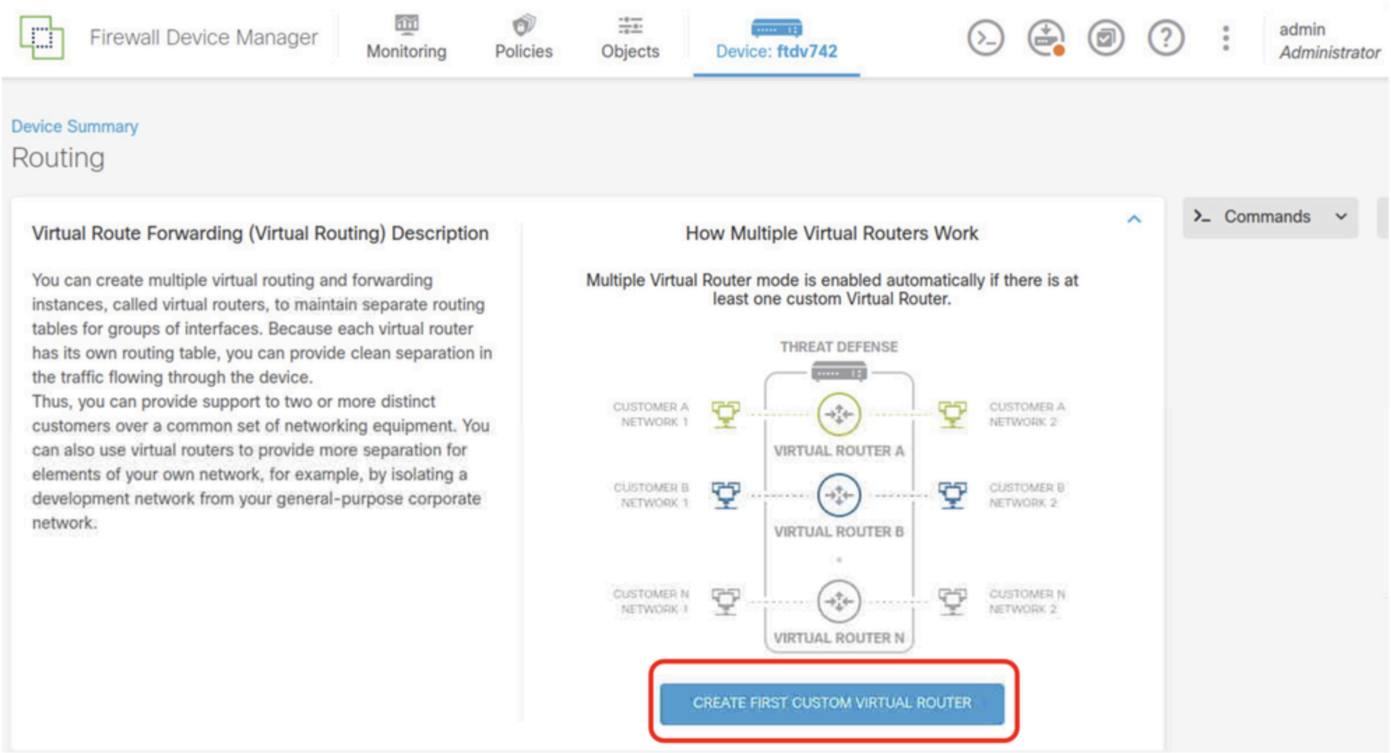
Note: a static route through outside interface has already been configured during FDM initialization. If you do not have it, please configure it manually.



#	NAME	INTERFACE	IP TYPE	NETWORKS	GATEWAY IP	SLA MONITOR
1	StaticRoute_IPv4	outside	IPv4	0.0.0.0/0	192.168.30.3	

FTD_Add_First_Virtual_Router1

Step 4.5. Click **CREATE FIRST CUSTOM VIRTUAL ROUTER** .



Device Summary

Routing

Virtual Route Forwarding (Virtual Routing) Description

You can create multiple virtual routing and forwarding instances, called virtual routers, to maintain separate routing tables for groups of interfaces. Because each virtual router has its own routing table, you can provide clean separation in the traffic flowing through the device.
Thus, you can provide support to two or more distinct customers over a common set of networking equipment. You can also use virtual routers to provide more separation for elements of your own network, for example, by isolating a development network from your general-purpose corporate network.

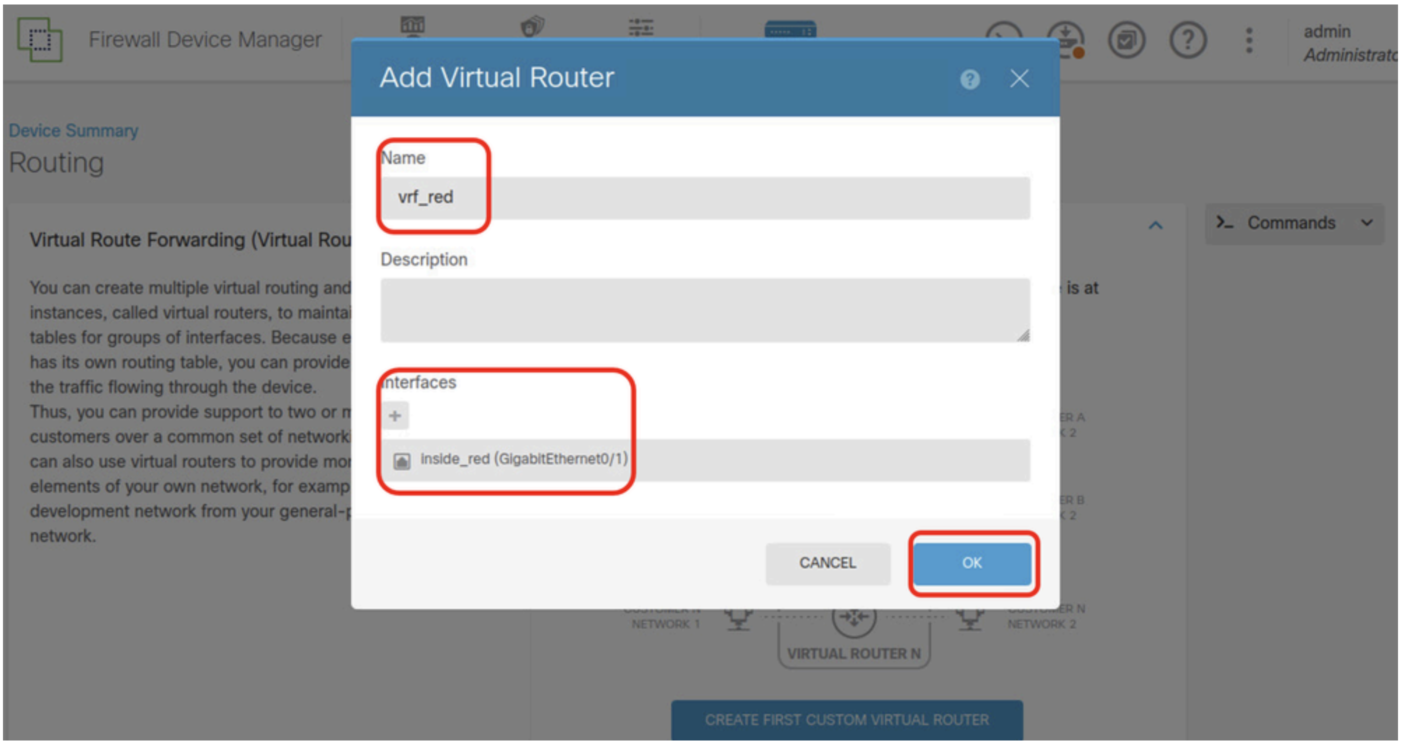
How Multiple Virtual Routers Work

Multiple Virtual Router mode is enabled automatically if there is at least one custom Virtual Router.

FTD_Add_First_Virtual_Router2

Step 4.6. Provide necessary information of first virtual router. Click **OK** button. After first virtual router creation, a vrf name **Global** would be shown automatically.

- Name: vrf_red
- Interfaces: inside_red (GigabitEthernet0/1)



Add Virtual Router

Name

vrf_red

Description

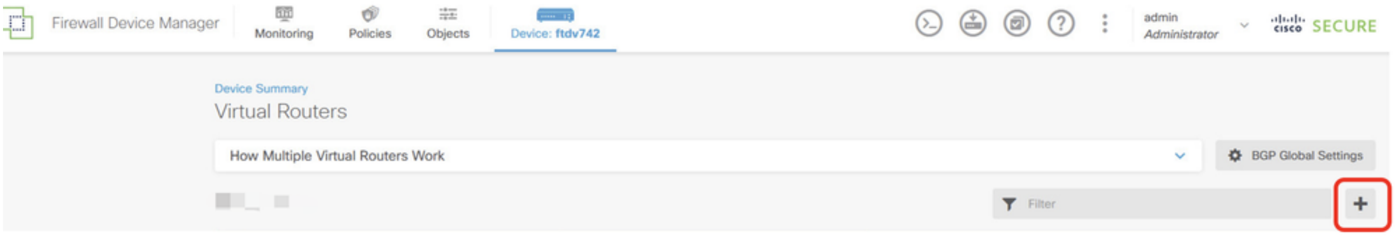
Interfaces

+

inside_red (GigabitEthernet0/1)

FTD_Add_First_Virtual_Router3

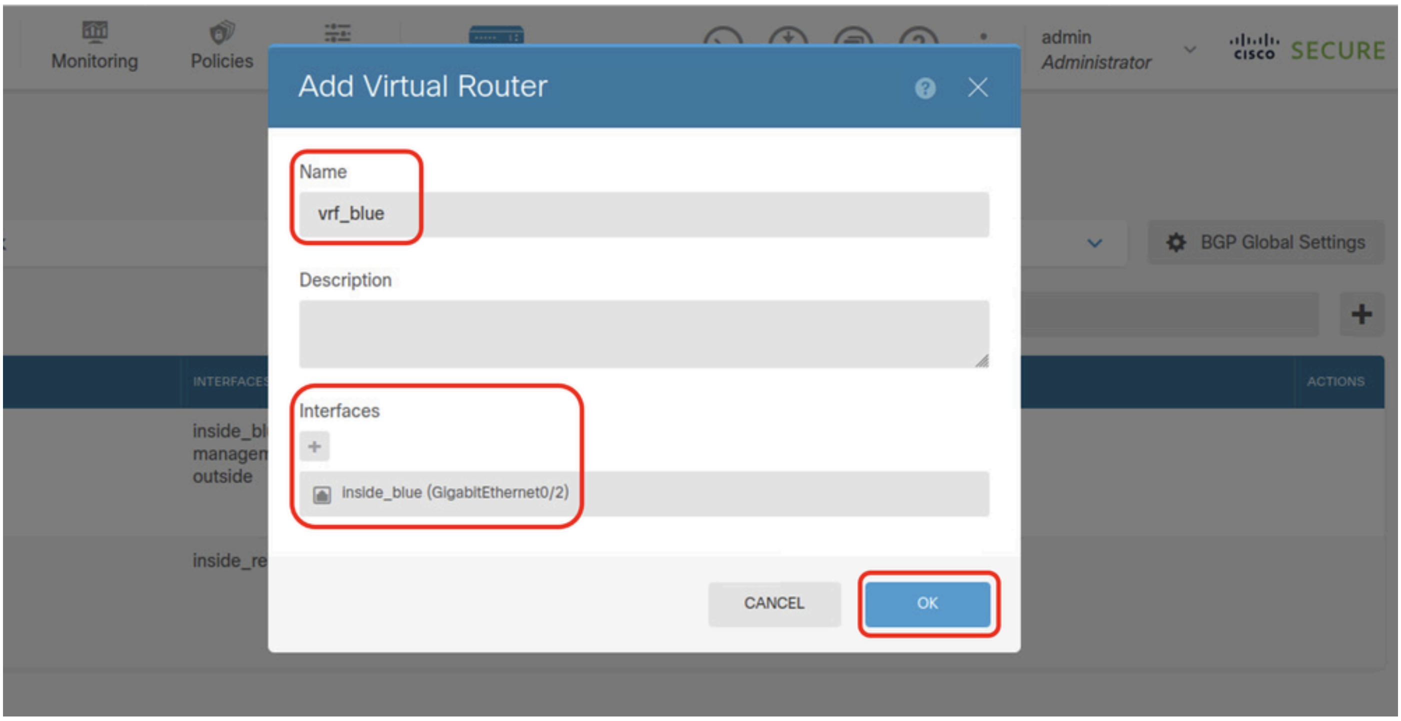
Step 4.7. Create second virtual router. Navigate to **Device > Routing** . Click **View Configuration** . Click + button.



FTD_Add_Second_Virtual_Router

Step 4.8. Provide necessary information of second virtual router. Click **OK** button

- Name: vrf_blue
- Interfaces: inside_blue (GigabitEthernet0/2)


Add Virtual Router

Name: vrf_blue

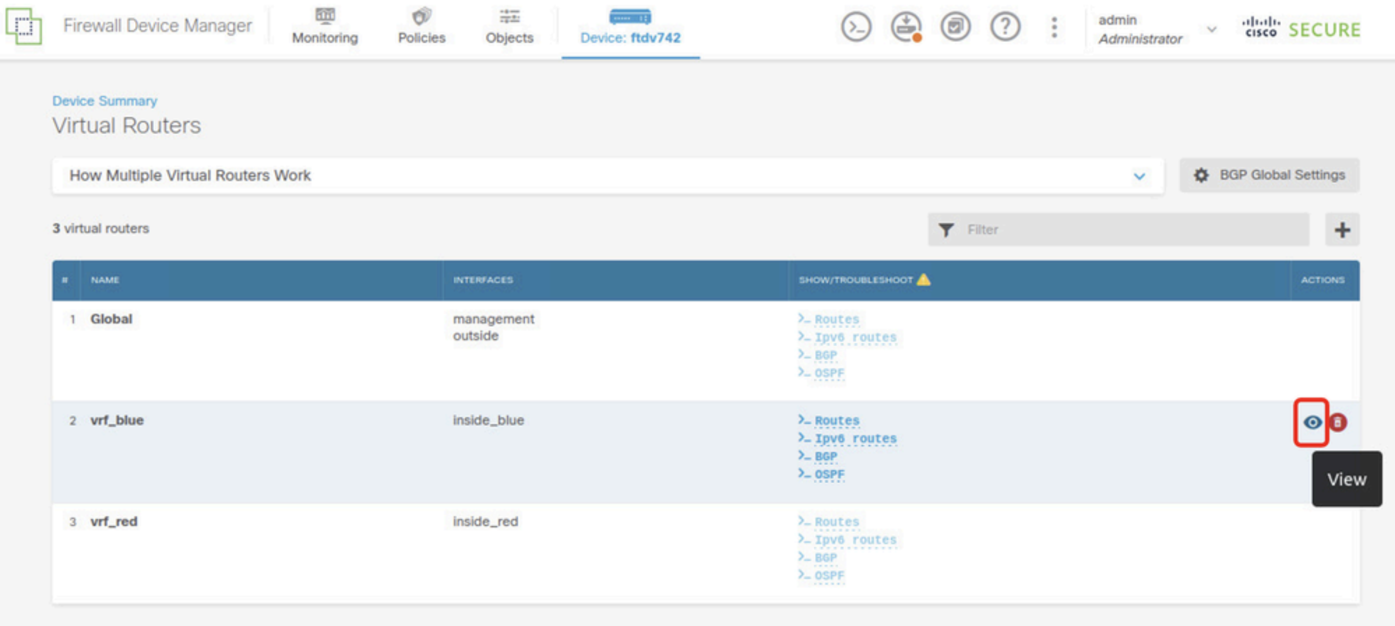
Description

Interfaces: inside_blue (GigabitEthernet0/2)

FTD_Add_Second_Virtual_Router2

Step 5. Create route leak from vrf_blue to Global. This route allows endpoints on the 192.168.20.0/24 network to initiate connections that would traverse the site-to-site VPN tunnel. For this example, the remote endpoint is protecting the 192.168.50.0/24 network.

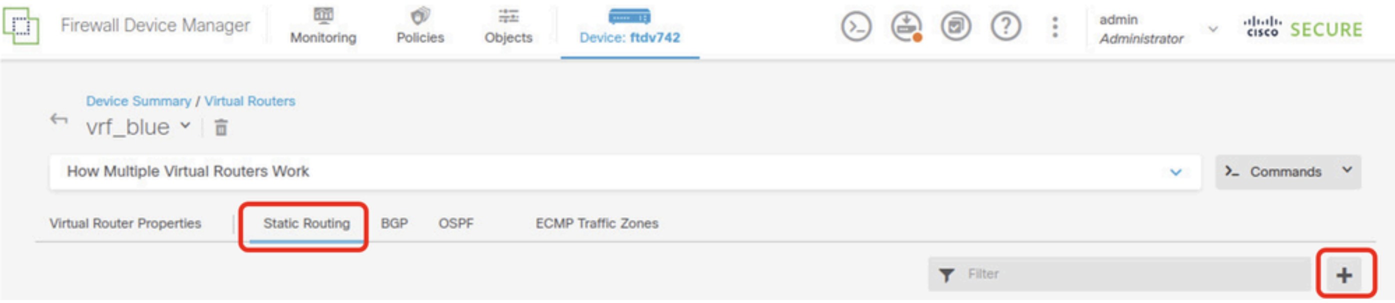
Navigate to **Device > Routing** . Click **View Configuration** . click the **View** icon in the Action cell for the virtual router vrf_blue.



#	NAME	INTERFACES	SHOW/TROUBLESHOOT	ACTIONS
1	Global	management outside	Routes Ipv6 routes BGP OSPF	
2	vrf_blue	inside_blue	Routes Ipv6 routes BGP OSPF	
3	vrf_red	inside_red	Routes Ipv6 routes BGP OSPF	

FTD_View_VRF_Blue

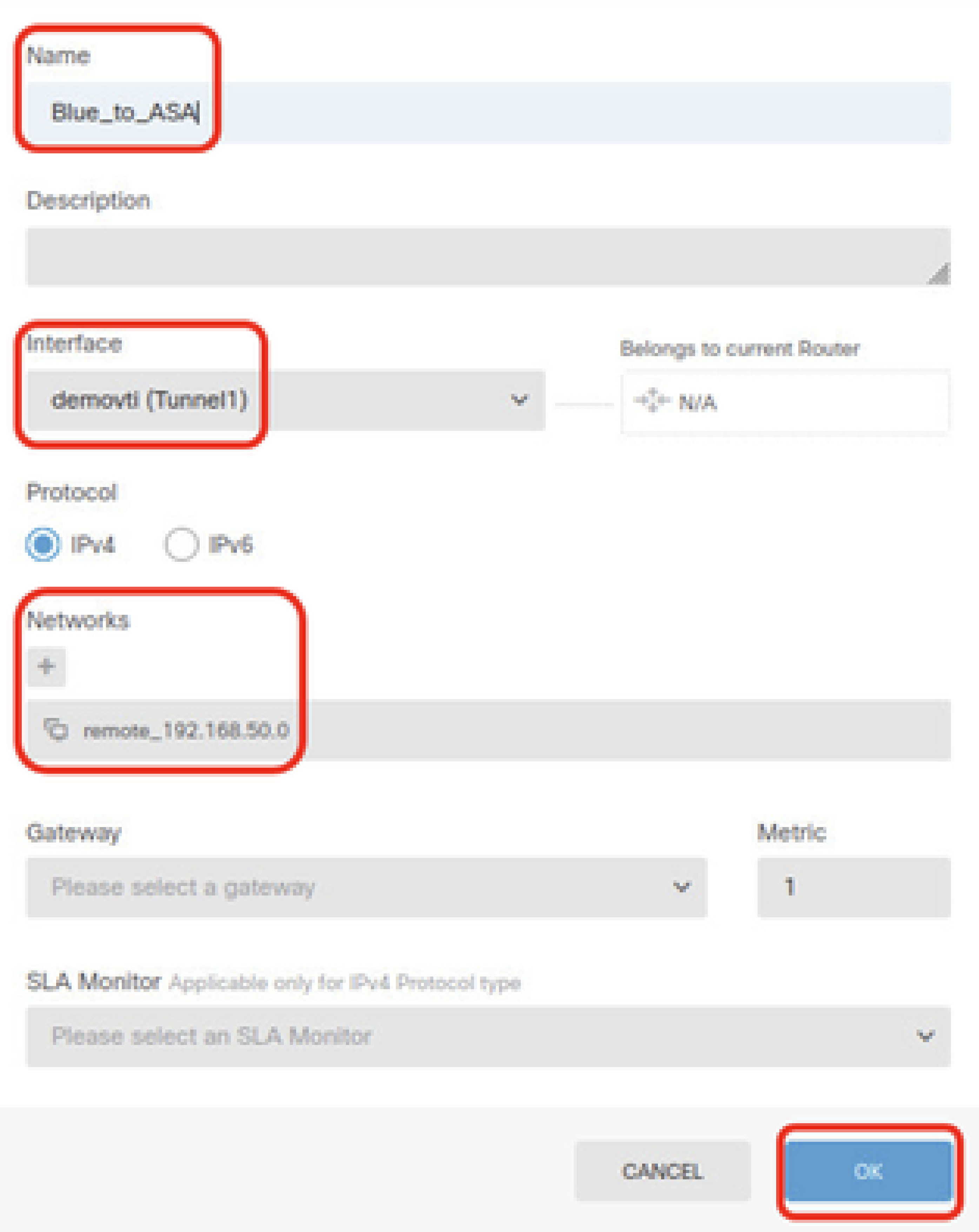
Step 5.1. Click **Static Routing** tab. Click + button.



FTD_Create_Static_Route_VRF_Blue

Step 5.2. Provide necessary information. Click **OK** button.

- Name: Blue_to_ASA
- Interface: demovti (Tunnel1)
- Networks: remote_192.168.50.0
- Gateway: Leave this item blank.



Name: Blue_to_ASA

Description

Interface: demovti (Tunnel1)

Belongs to current Router: N/A

Protocol: ● IPv4 ○ IPv6

Networks: remote_192.168.50.0

Gateway: Please select a gateway

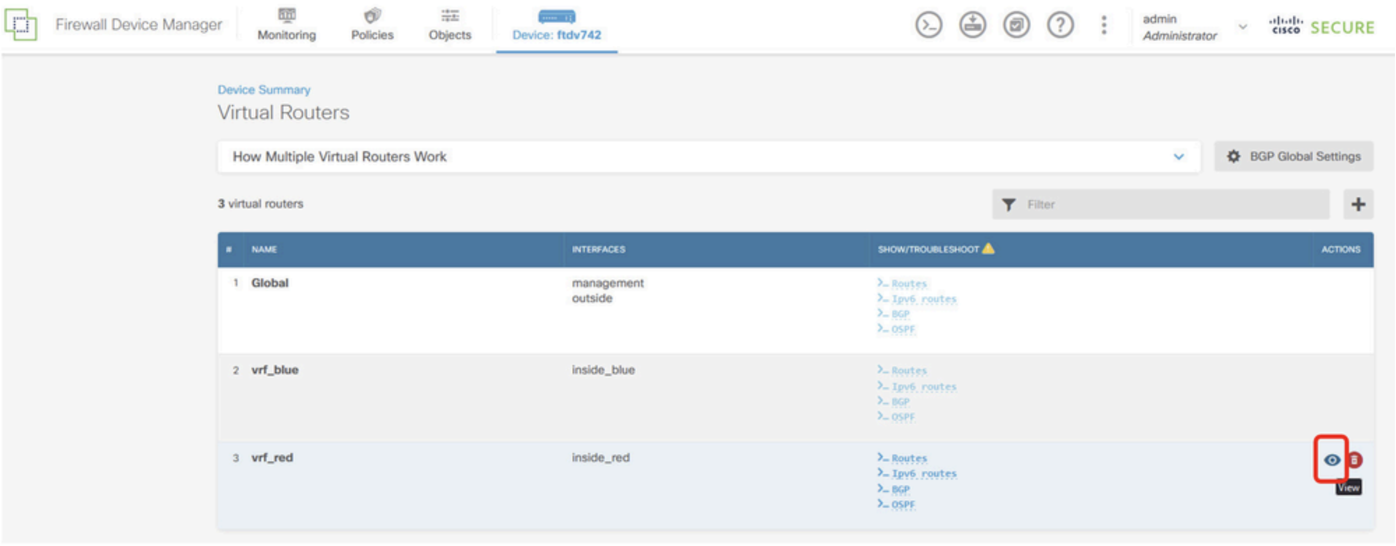
Metric: 1

SLA Monitor Applicable only for IPv4 Protocol type: Please select an SLA Monitor

FTD_Create_Static_Route_VRF_Blue_Details

Step 6. Create route leak from vrf_red to Global. This route allows endpoints on the 192.168.10.0/24 network to initiate connections that would traverse the site-to-site VPN tunnel. For this example, the remote endpoint is protecting the 192.168.50.0/24 network.

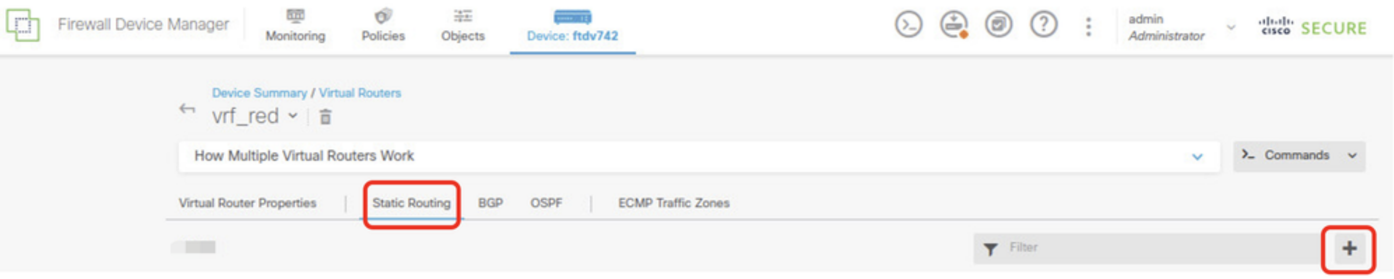
Navigate to **Device > Routing** . Click **View Configuration** . click the **View** icon in the Action cell for the virtual router vrf_red.



#	NAME	INTERFACES	SHOW/TROUBLESHOOT	ACTIONS
1	Global	management outside	>_ Routes >_ Ipv6_routes >_ BGP >_ OSPF	
2	vrf_blue	inside_blue	>_ Routes >_ Ipv6_routes >_ BGP >_ OSPF	
3	vrf_red	inside_red	>_ Routes >_ Ipv6_routes >_ BGP >_ OSPF	

FTD_View_VRF_Red

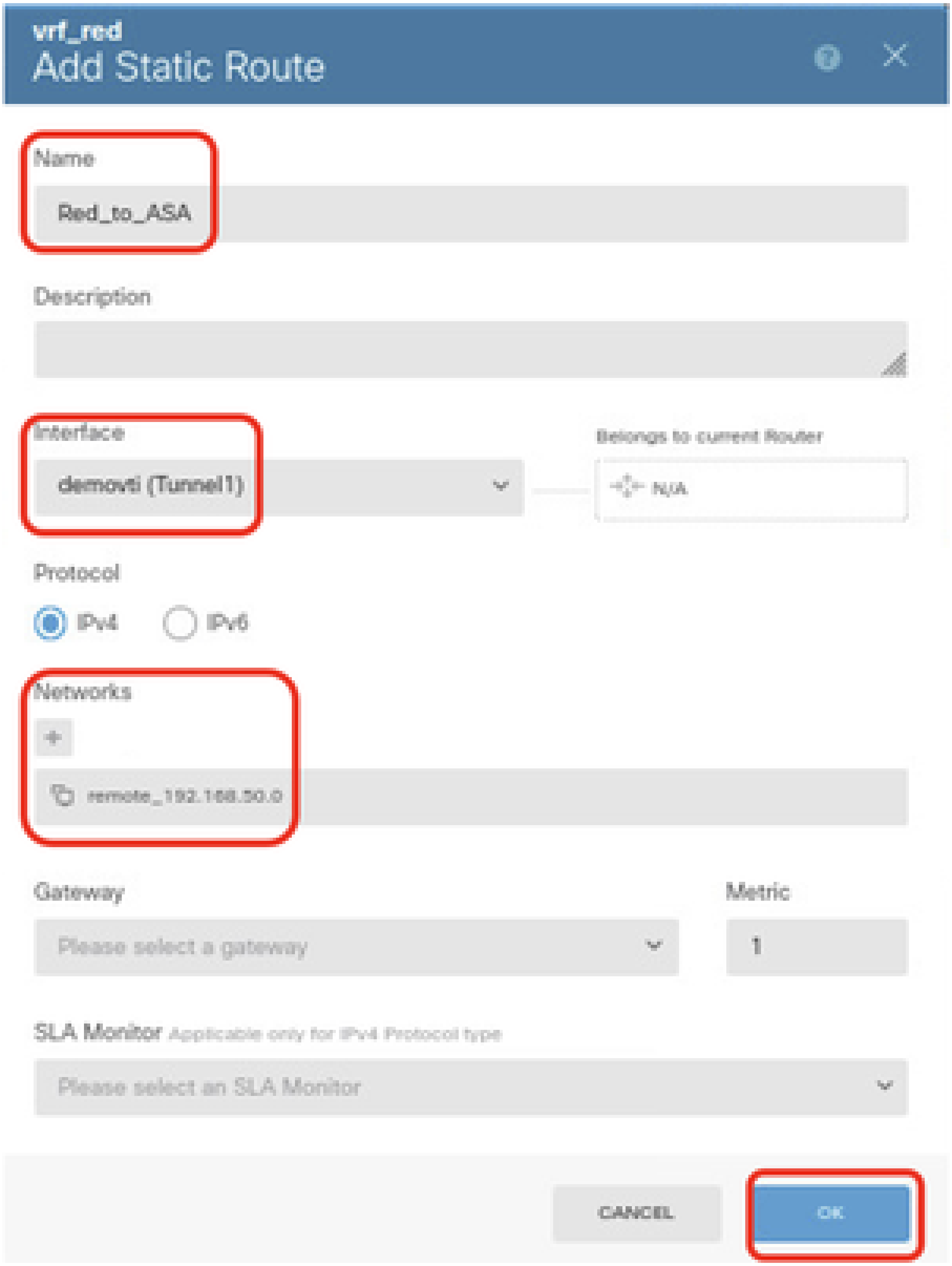
Step 6.1. Click **Static Routing** tab. Click + button.



FTD_Create_Static_Route_VRF_Red

Step 6.2. Provide necessary information. Click **OK** button.

- Name: Red_to_ASA
- Interface: demovti (Tunnel1)
- Networks: remote_192.168.50.0
- Gateway: Leave this item blank.



vrf_red

Add Static Route

Name

Red_to_ASA

Description

Interface

demovti (Tunnel1)

Belongs to current Router

N/A

Protocol

● IPv4 ○ IPv6

Networks

remote_192.168.50.0

Gateway

Please select a gateway

Metric

1

SLA Monitor Applicable only for IPv4 Protocol type

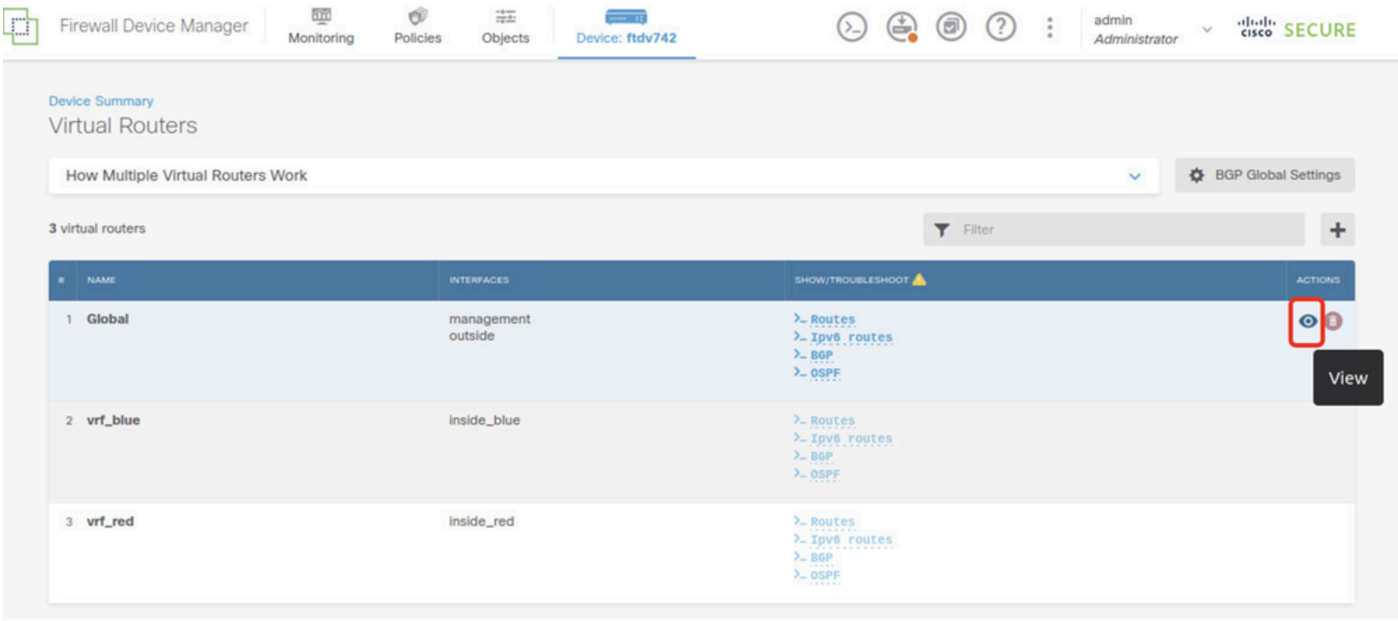
Please select an SLA Monitor

FTD_Create_Static_Route_VRF_Red_Details

Step 7. Create route leak from Global to virtual routers. The routes allows endpoints protected by the remote end of the site-to-site VPN to access the 192.168.10.0/24 network in the vrf_red virtual router and

192.168.20.0/24 network in the vrf_blue virtual router.

Navigate to **Device > Routing** . Click **View Configuration** . click the **View** icon in the Action cell for the Global virtual router.



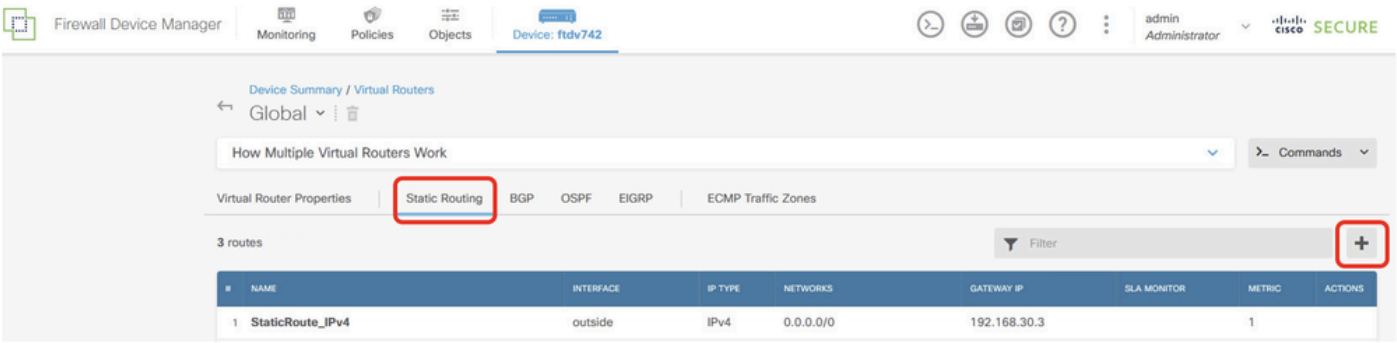
Virtual Routers

3 virtual routers

#	NAME	INTERFACES	SHOW/TROUBLESHOOT ⚠	ACTIONS
1	Global	management outside	>_ Routes >_ Ipv6 routes >_ BGP >_ OSPF	
2	vrf_blue	inside_blue	>_ Routes >_ Ipv6 routes >_ BGP >_ OSPF	
3	vrf_red	inside_red	>_ Routes >_ Ipv6 routes >_ BGP >_ OSPF	

FTD_View_VRF_Global

Step 7.1. Click **Static Routing** tab. Click + button.



Global

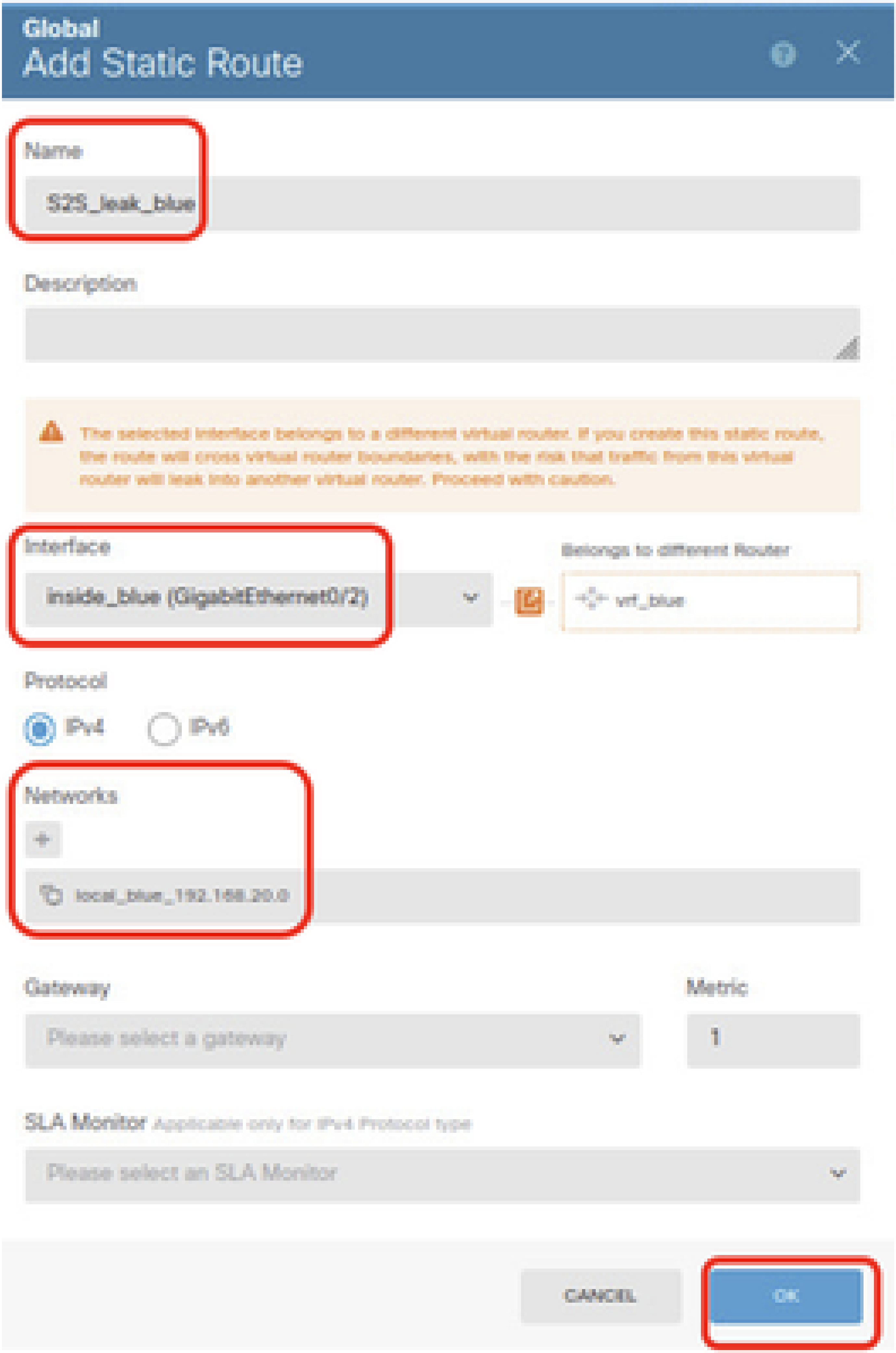
3 routes

#	NAME	INTERFACE	IP TYPE	NETWORKS	GATEWAY IP	SLA MONITOR	METRIC	ACTIONS
1	StaticRoute_IPv4	outside	IPv4	0.0.0.0/0	192.168.30.3		1	

FTD_Create_Static_Route_VRF_Global

Step 7.2. Provide necessary information. Click **OK** button.

- Name: S2S_leak_blue
- Interface: inside_blue (GigabitEthernet0/2)
- Networks: local_blue_192.168.20.0
- Gateway: Leave this item blank.



Global

Add Static Route

Name

S2S_leak_blue

Description

⚠ The selected interface belongs to a different virtual router. If you create this static route, the route will cross virtual router boundaries, with the risk that traffic from this virtual router will leak into another virtual router. Proceed with caution.

Interface

inside_blue (GigabitEthernet0/2)

Belongs to different Router

vrf_blue

Protocol

● IPv4 ○ IPv6

Networks

+

local_blue_192.168.20.0

Gateway

Please select a gateway

Metric

1

SLA Monitor Applicable only for IPv4 Protocol type

Please select an SLA Monitor

```
 encryption aes-256 aes-192 aes
 integrity sha512 sha384 sha256 sha
 group 21 20 16 15 14
 prf sha512 sha384 sha256 sha
 lifetime seconds 86400
```

Step 10. Create an IKEv2 ipsec-proposal that defines the same parameters configured on the FTD.

<#root>

```
crypto ipsec ikev2 ipsec-proposal
```

AES-SHA

```
 protocol esp encryption aes-256 aes-192 aes
 protocol esp integrity sha-512 sha-384 sha-256 sha-1
```

Step 11. Create an ipsec profile, referencing ipsec-proposal created in Step 10.

<#root>

```
crypto ipsec profile
```

demo_ipsec_profile

```
 set ikev2 ipsec-proposal
```

AES-SHA

```
 set security-association lifetime kilobytes 4608000
 set security-association lifetime seconds 28800
```

Step 12. Create a group-policy allowing the IKEv2 protocol.

<#root>

```
group-policy
```

demo_gp_192.168.30.1

```
 internal
group-policy demo_gp_192.168.30.1 attributes
 vpn-tunnel-protocol ikev2
```

Step 13. Create a tunnel group for the peer FTD outside IP address, referencing the group-policy created in Step 12 and configuring the same pre-shared-key with FTD(created in Step 3.7).

<#root>

```
tunnel-group 192.168.30.1 type ipsec-l2l
tunnel-group 192.168.30.1 general-attributes
 default-group-policy

demo_gp_192.168.30.1



tunnel-group 192.168.30.1 ipsec-attributes
 ikev2 remote-authentication pre-shared-key *****
 ikev2 local-authentication pre-shared-key *****
```

Step 14. Enable IKEv2 on the outside interface.

```
crypto ikev2 enable outside
```

Step 15. Create virtual tunnel.

<#root>

```
interface Tunnel1
 nameif demovti_asa
 ip address 169.254.10.2 255.255.255.0
 tunnel source interface outside
 tunnel destination 192.168.30.1
 tunnel mode ipsec ipv4
 tunnel protection ipsec profile

demo_ipsec_profile
```

Step 16. Create static route.

```
route demovti_asa 192.168.10.0 255.255.255.0 169.254.10.1 1
route demovti_asa 192.168.20.0 255.255.255.0 169.254.10.1 1
route outside 0.0.0.0 0.0.0.0 192.168.40.3 1
```

Verify

Use this section in order to confirm that your configuration works properly.

Step 1. Navigate to the CLI of FTD and ASA via console or SSH to verify the VPN status of phase 1 and phase 2 through commands **show crypto ikev2 sa** and **show crypto ipsec sa** .

FTD:

```
> system support diagnostic-cli
```

```
Attaching to Diagnostic CLI ... Press 'Ctrl+a then d' to detach.
Type help or '?' for a list of available commands.

ftdv742#
ftdv742# show crypto ikev2 sa

IKEv2 SAs:

Session-id:4, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                               Remote
 32157565 192.168.30.1/500                                    192.168.40.1/500                        G
      Encr: AES-CBC, keysize: 256, Hash: SHA512, DH Grp:21, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/67986 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: 0x4cf55637/0xa493cc83

ftdv742# show crypto ipsec sa
interface: demovti
    Crypto map tag: __vti-crypto-map-Tunnel1-0-1, seq num: 65280, local addr: 192.168.30.1

      Protected vrf (ivrf): Global
      local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      current_peer: 192.168.40.1


      #pkts encaps: 30, #pkts encrypt: 30, #pkts digest: 30
      #pkts decaps: 30, #pkts decrypt: 30, #pkts verify: 30
      #pkts compressed: 0, #pkts decompressed: 0
      #pkts not compressed: 30, #pkts comp failed: 0, #pkts decomp failed: 0
      #pre-frag successes: 0, #pre-frag failures: 0, #fragments created: 0
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
      #TFC rcvd: 0, #TFC sent: 0
      #Valid ICMP Errors rcvd: 0, #Invalid ICMP Errors rcvd: 0
      #send errors: 0, #recv errors: 0

      local crypto endpt.: 192.168.30.1/500, remote crypto endpt.: 192.168.40.1/500
      path mtu 1500, ipsec overhead 94(44), media mtu 1500
      PMTU time remaining (sec): 0, DF policy: copy-df
      ICMP error validation: disabled, TFC packets: disabled
      current outbound spi: A493CC83
      current inbound spi : 4CF55637

    inbound esp sas:
      spi: 0x4CF55637 (1291146807)
         SA State: active
         transform: esp-aes-256 esp-sha-512-hmac no compression
         in use settings ={L2L, Tunnel, IKEv2, VTI, }
         slot: 0, conn_id: 13, crypto-map: __vti-crypto-map-Tunnel1-0-1
         sa timing: remaining key lifetime (kB/sec): (4055040/16867)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0x00000000 0x00000001
    outbound esp sas:
      spi: 0xA493CC83 (2761149571)
         SA State: active
         transform: esp-aes-256 esp-sha-512-hmac no compression
         in use settings ={L2L, Tunnel, IKEv2, VTI, }
         slot: 0, conn_id: 13, crypto-map: __vti-crypto-map-Tunnel1-0-1
         sa timing: remaining key lifetime (kB/sec): (4285440/16867)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0x00000000 0x00000001
```

ASA:

```
ASA9203# show crypto ikev2 sa

IKEv2 SAs:

Session-id:4, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                               Remote
 26025779 192.168.40.1/500                                    192.168.30.1/500                       G
      Encr: AES-CBC, keysize: 256, Hash: SHA512, DH Grp:21, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/68112 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: 0xa493cc83/0x4cf55637
ASA9203#
ASA9203# show cry
ASA9203# show crypto ipsec sa
interface: demovti_asa
    Crypto map tag: __vti-crypto-map-Tunnel1-0-1, seq num: 65280, local addr: 192.168.40.1

      Protected vrf (ivrf): Global
      local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      remote ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
      current_peer: 192.168.30.1


      #pkts encaps: 30, #pkts encrypt: 30, #pkts digest: 30
      #pkts decaps: 30, #pkts decrypt: 30, #pkts verify: 30
      #pkts compressed: 0, #pkts decompressed: 0
      #pkts not compressed: 30, #pkts comp failed: 0, #pkts decomp failed: 0
      #pre-frag successes: 0, #pre-frag failures: 0, #fragments created: 0
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
      #TFC rcvd: 0, #TFC sent: 0
      #Valid ICMP Errors rcvd: 0, #Invalid ICMP Errors rcvd: 0
      #send errors: 0, #recv errors: 0

      local crypto endpt.: 192.168.40.1/500, remote crypto endpt.: 192.168.30.1/500
      path mtu 1500, ipsec overhead 94(44), media mtu 1500
      PMTU time remaining (sec): 0, DF policy: copy-df
      ICMP error validation: disabled, TFC packets: disabled
      current outbound spi: 4CF55637
      current inbound spi : A493CC83

    inbound esp sas:
      spi: 0xA493CC83 (2761149571)
         SA State: active
         transform: esp-aes-256 esp-sha-512-hmac no compression
         in use settings ={L2L, Tunnel, IKEv2, VTI, }
         slot: 0, conn_id: 4, crypto-map: __vti-crypto-map-Tunnel1-0-1
         sa timing: remaining key lifetime (kB/sec): (4101120/16804)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0x00000000 0x00000001
    outbound esp sas:
      spi: 0x4CF55637 (1291146807)
         SA State: active
         transform: esp-aes-256 esp-sha-512-hmac no compression
         in use settings ={L2L, Tunnel, IKEv2, VTI, }
         slot: 0, conn_id: 4, crypto-map: __vti-crypto-map-Tunnel1-0-1
         sa timing: remaining key lifetime (kB/sec): (4055040/16804)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0x00000000 0x00000001
```

Step 2. Verify the route of VRF and Global on 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
SI       192.168.10.0 255.255.255.0 [1/0] is directly connected, inside_red
SI       192.168.20.0 255.255.255.0 [1/0] is directly connected, inside_blue
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


ftdv742# show route vrf vrf_blue


Routing Table: vrf_blue
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 not set

C        192.168.20.0 255.255.255.0 is directly connected, inside_blue
L        192.168.20.1 255.255.255.255 is directly connected, inside_blue
SI       192.168.50.0 255.255.255.0 [1/0] is directly connected, demovti


ftdv742# show route vrf vrf_red
```

```
Routing Table: vrf_red
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 not set

C        192.168.10.0 255.255.255.0 is directly connected, inside_red
L        192.168.10.1 255.255.255.255 is directly connected, inside_red
SI       192.168.50.0 255.255.255.0 [1/0] is directly connected, demovti
```

Step 3. Verify ping test.

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

In this example, Tunnel1 shows 30 packets for both encapsulation and decapsulation.

```
ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 30, #pkts encrypt: 30, #pkts digest: 30
      #pkts decaps: 30, #pkts decrypt: 30, #pkts verify: 30
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing reassembly: 0
ftdv742#
```

Client1 ping Client3 successfully.

```
Client1#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 = 5/299/620 ms
```

Client2 ping Client3 successfully.

```
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 = 11/297/576 ms
```

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

In this example, Tunnel1 shows 40 packets for both encapsulation and decapsulation after a successful ping. Additionally, both counters increased by 10 packets, matching the 10 ping echo requests, indicating that the ping traffic successfully passed through the IPSec tunnel.

```
ftdv742# show crypto ipsec sa | inc interface:|encap|decap
interface: demovti
      #pkts encaps: 40, #pkts encrypt: 40, #pkts digest: 40
      #pkts decaps: 40, #pkts decrypt: 40, #pkts verify: 40
      #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 those debug commands 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 those debug commands to troubleshoot the route section.

```
debug ip routing
```

Reference

Cisco Secure Firewall Device Manager Configuration Guide, Version 7.4

Cisco Secure Firewall ASA VPN CLI Configuration Guide, 9.20