在FDM管理的FTD上配置VRF感知路由的站点到站点VPN

目录

简介

本文档介绍如何在FDM管理的FTD上配置VRF感知路由的站点到站点VPN。

先决条件

要求

Cisco 建议您了解以下主题：

- 对VPN的基本了解
- 基本了解虚拟路由和转发(VRF)
- 使用FDM的经验

使用的组件

本文档中的信息基于以下软件和硬件版本：

- 思科FTDv版本7.4.2
- 思科FDM版本7.4.2
- 思科ASAv版本9.20.3

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

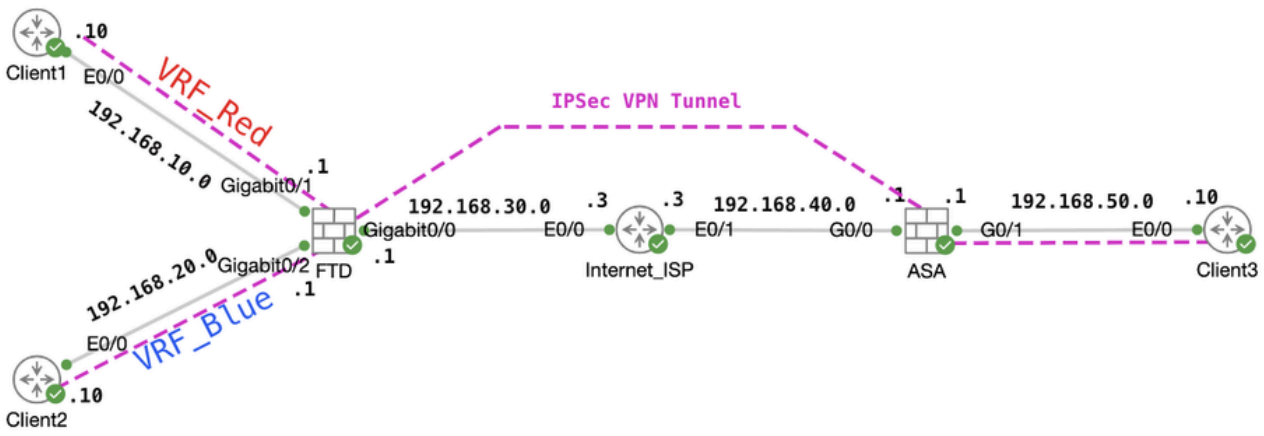
背景信息

通过Firepower设备管理器(FDM)上的虚拟路由和转发(VRF)，您可以在单个Firepower威胁防御(FTD)设备上创建多个隔离路由实例。每个VRF实例都作为单独的虚拟路由器运行，具有自己的路由表，从而实现网络流量的逻辑分离，并提供增强的安全性和流量管理功能。

本文档说明如何使用VTI配置VRF感知IPSec VPN。VRF红色网络和VRF蓝色网络位于FTD之后。VRF红色网络中的Client1和VRF蓝色中的Client2将通过IPSec VPN隧道与ASA后面的客户端3通信。

配置

网络图

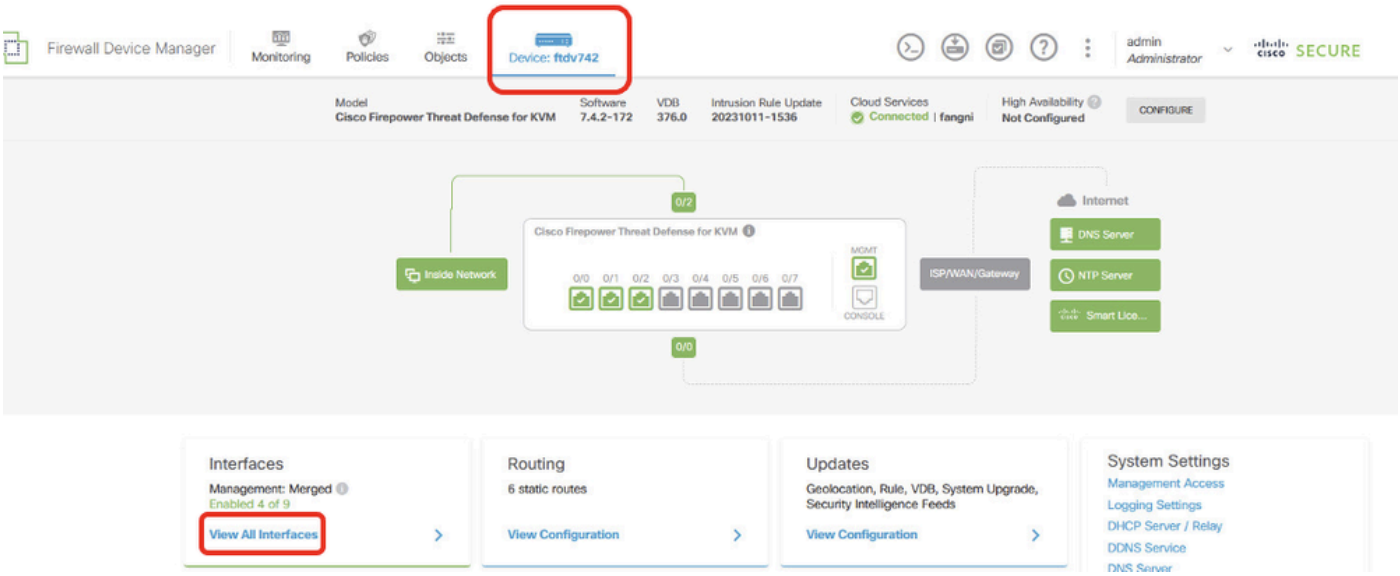


拓扑

配置FTD

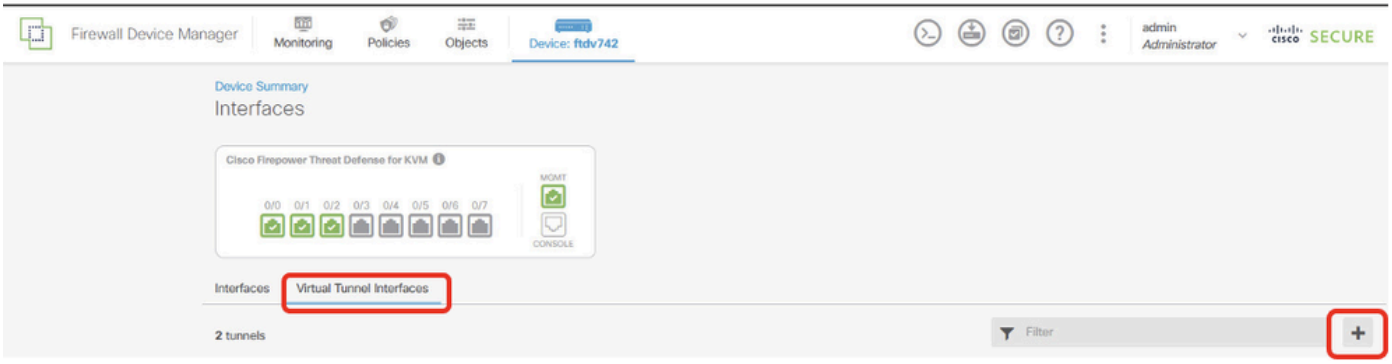
步骤1.必须确保节点间的IP互联初步配置已经适当完成。Client1和Client2使用FTD内部IP地址作为网关。 Client3使用ASA内部IP地址作为网关。

步骤2.创建虚拟隧道接口。登录FTD的FDM GUI。导航到设备>接口。单击View All Interfaces 。



FTD_View_Interfaces

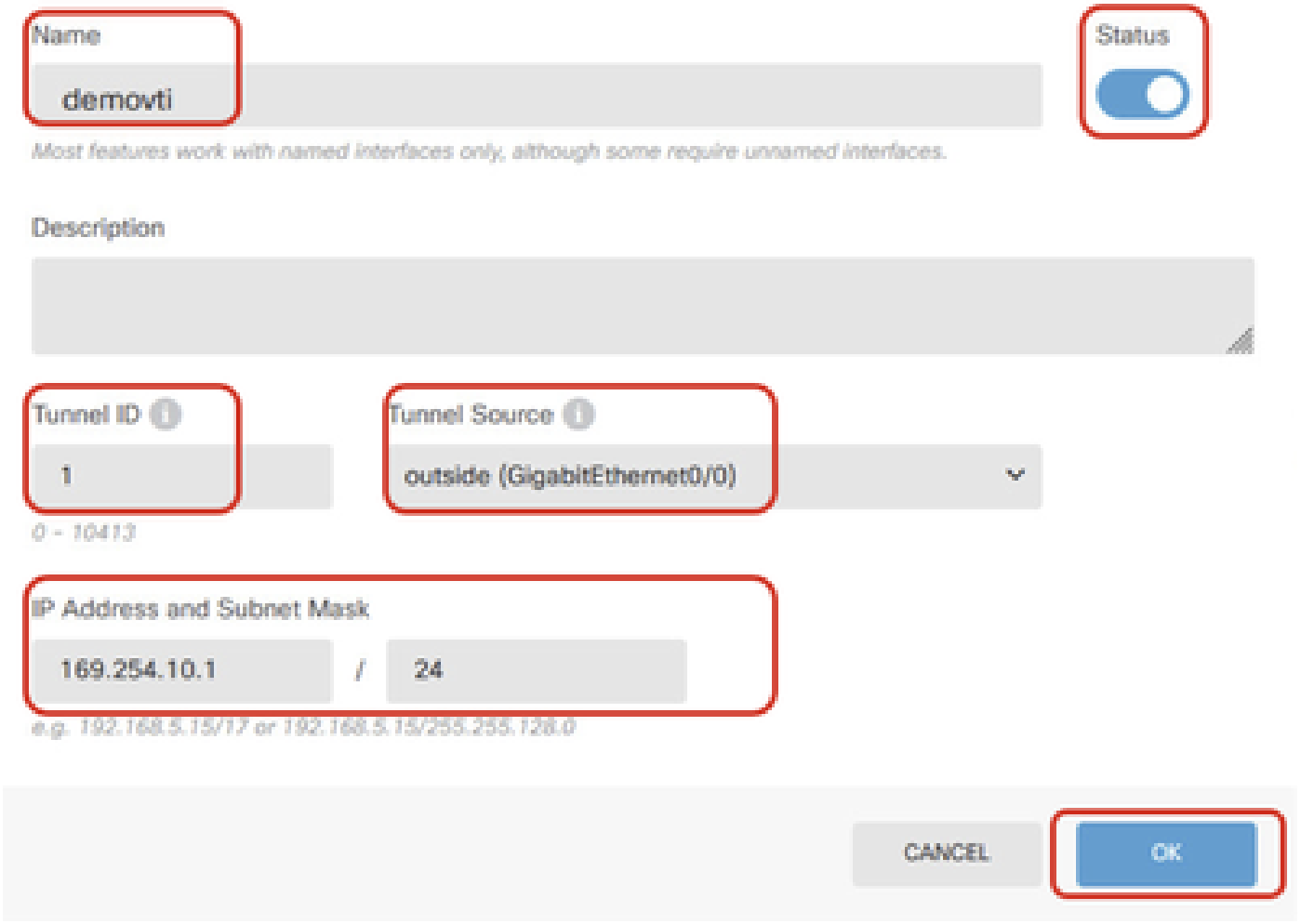
步骤2.1.单击Virtual Tunnel Interfaces选项卡。单击+按钮。



FTD_Create_VTI

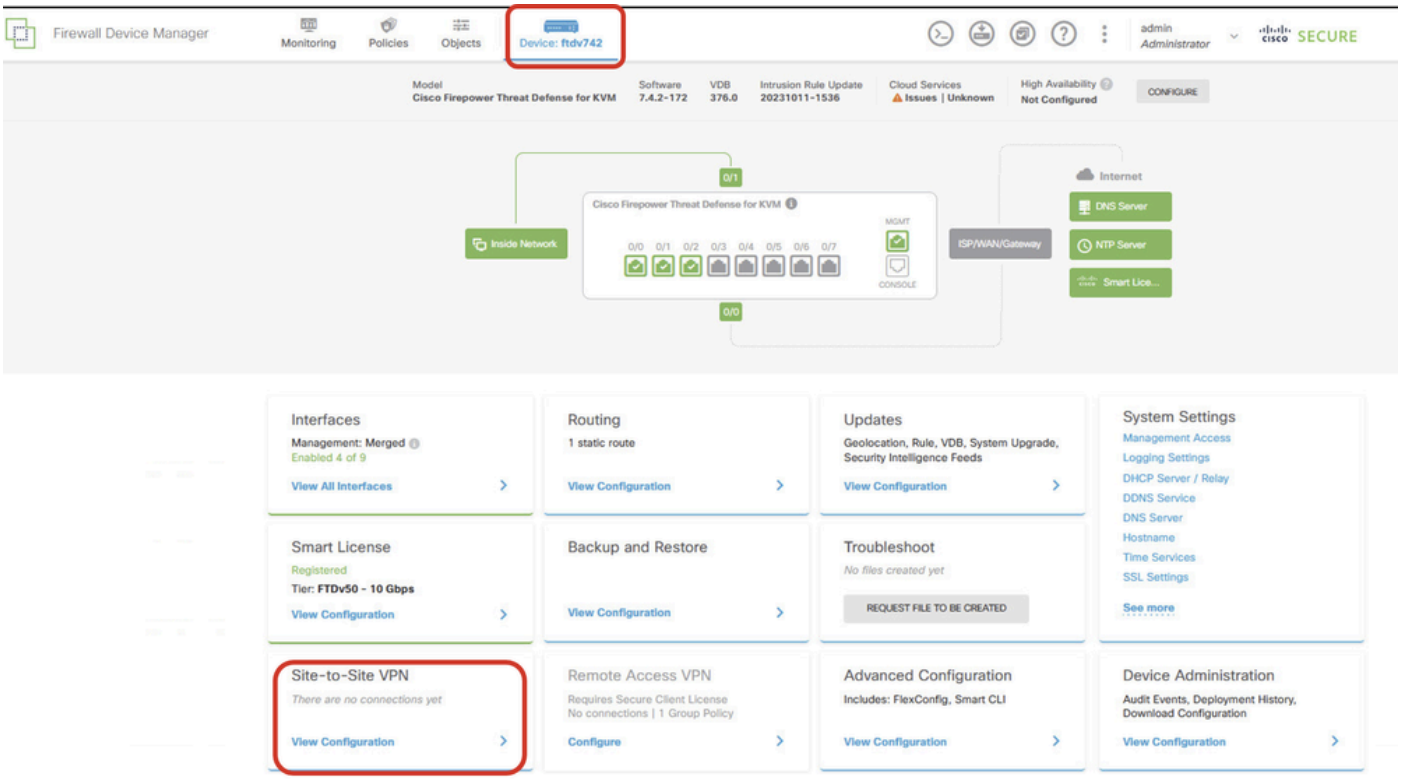
步骤2.2.提供必要信息。单击OK按钮。

- 名称：demovti
- 隧道ID:1
- 通道来源:外部(GigabitEthernet0/0)
- IP 地址和子网掩码:169.254.10.1/24
- 状态:单击滑块到“已启用”位置



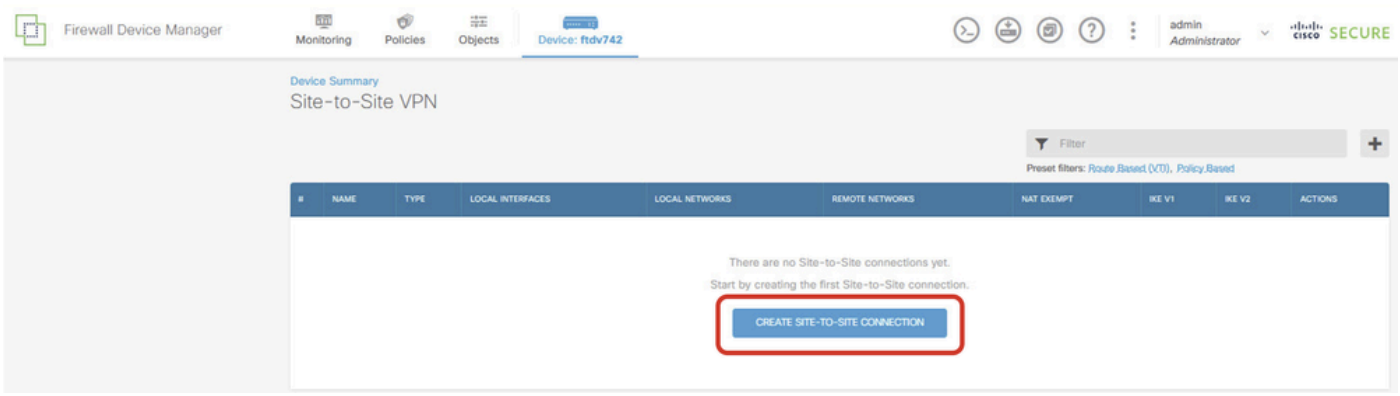
FTD_Create_VTI_Details

步骤3.导航到Device > Site-to-Site VPN。单击View Configuration按钮。



FTD_站点到站点_VPN_View_Configurations

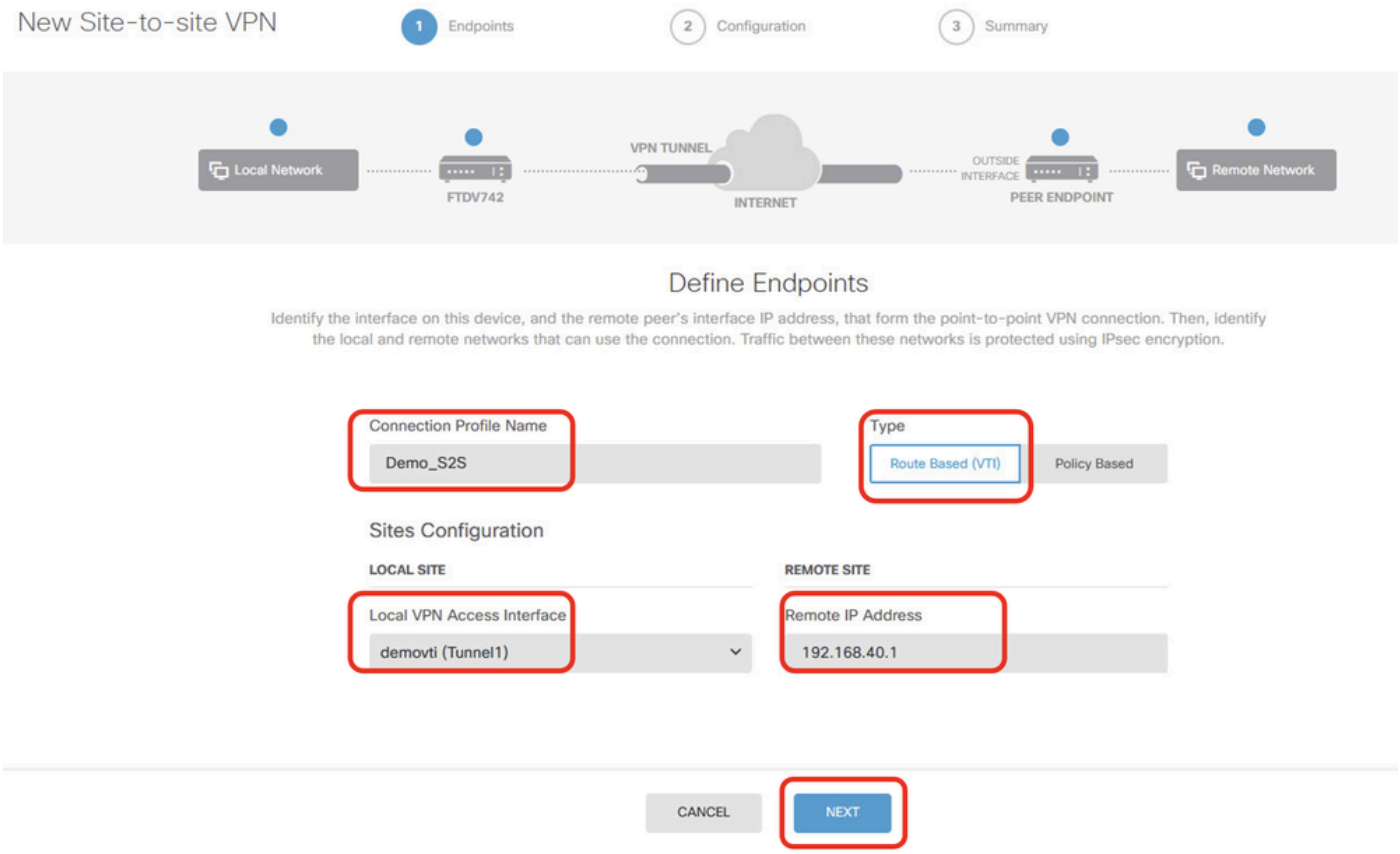
步骤3.1.开始创建新的站点到站点VPN。单击CREATE SITE-TO-SITE CONNECTION 按钮。或点击+按钮。



FTD_Create_Site2Site_Connection

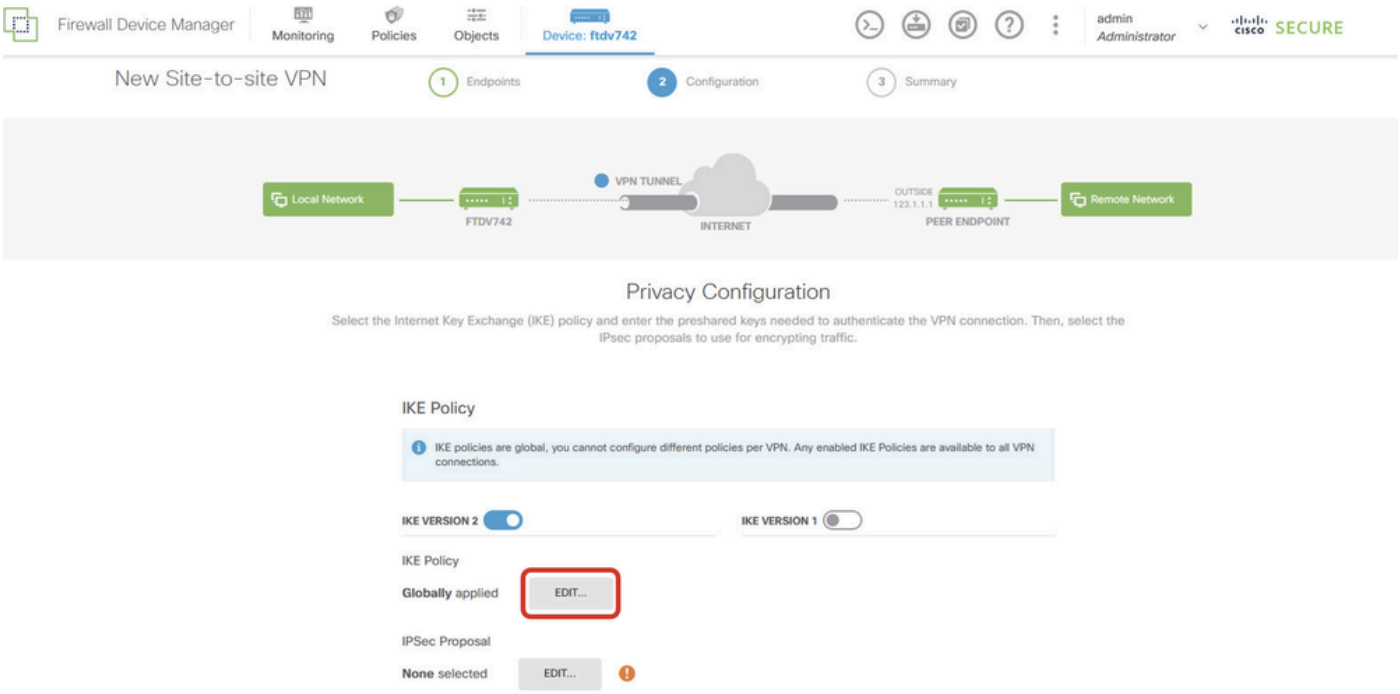
第 3.2 步： 提供 必要信息。单击NEXT按钮。

- 连接配置文件名称：Demo_S2S
- type：基于路由(VTI)
- 本地VPN访问接口：demovti（在第2步中创建）
- 远程 IP 地址:192.168.40.1（这是外部IP地址的对等ASA）



FTD_站点到站点_VPN_终端

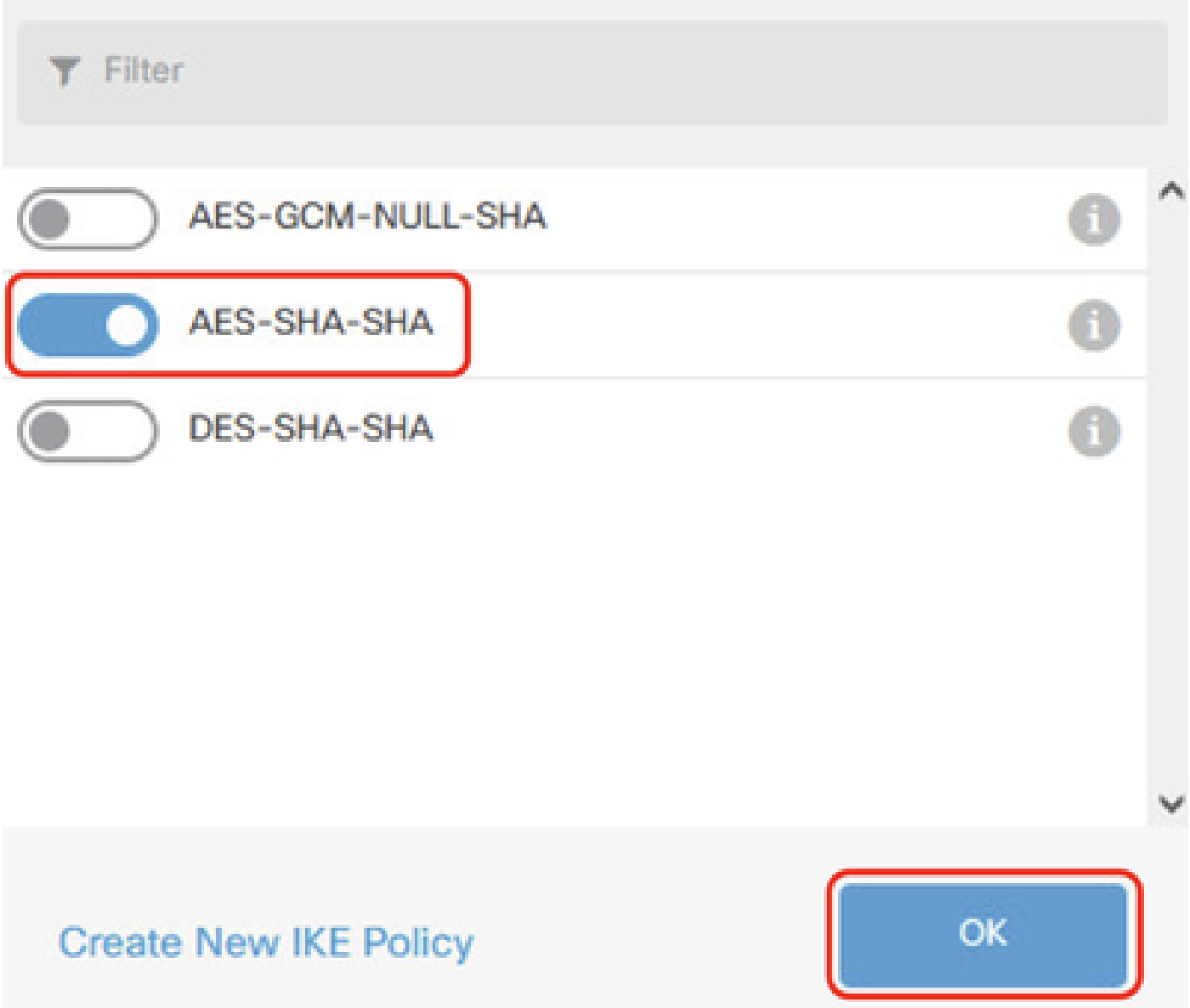
第3.3步：导航到IKE Policy。单击EDIT按钮。



FTD_Edit_IKE_Policy

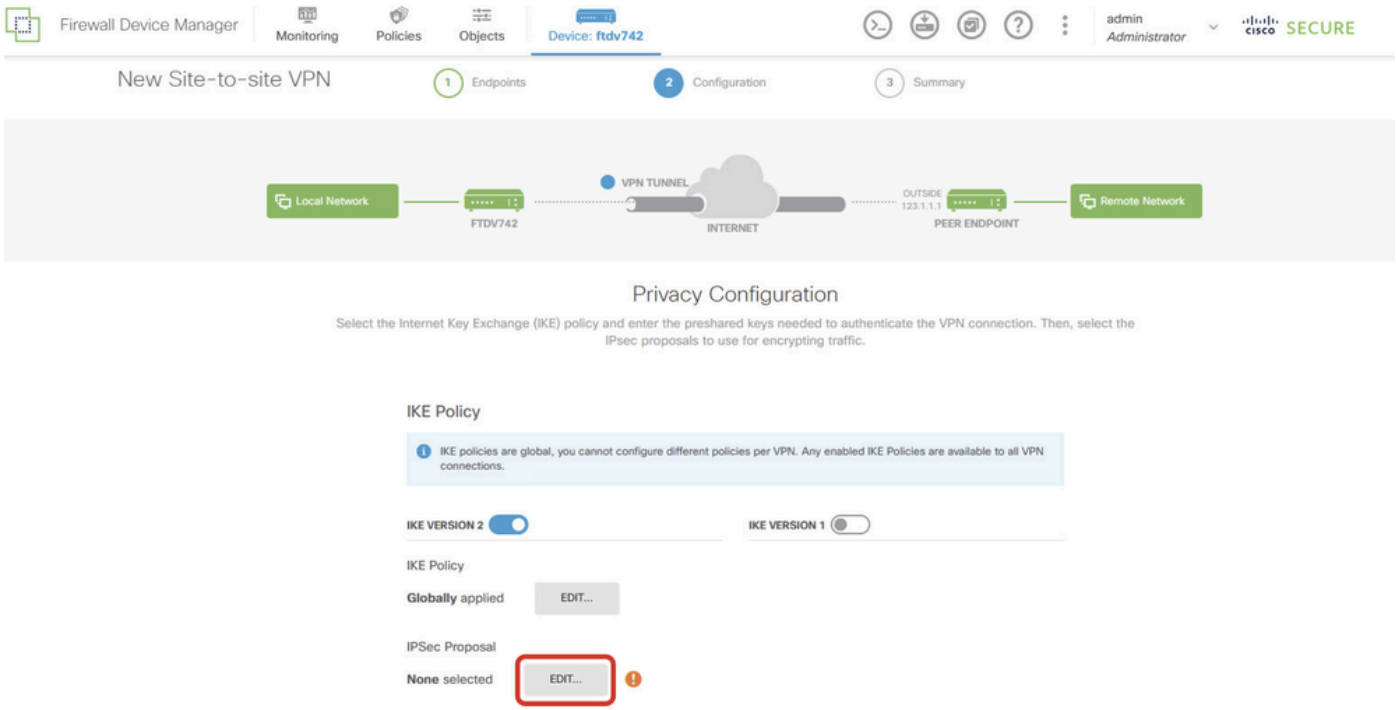
第 3.4 步： 对于IKE策略，可以使用预定义，也可以通过单击创建一个新策略 创建新的IKE策略 .

在本示例中，切换现有IKE策略名称AES-SHA-SHA。单击OK按钮保存。



FTD_Enable_IKE_Policy

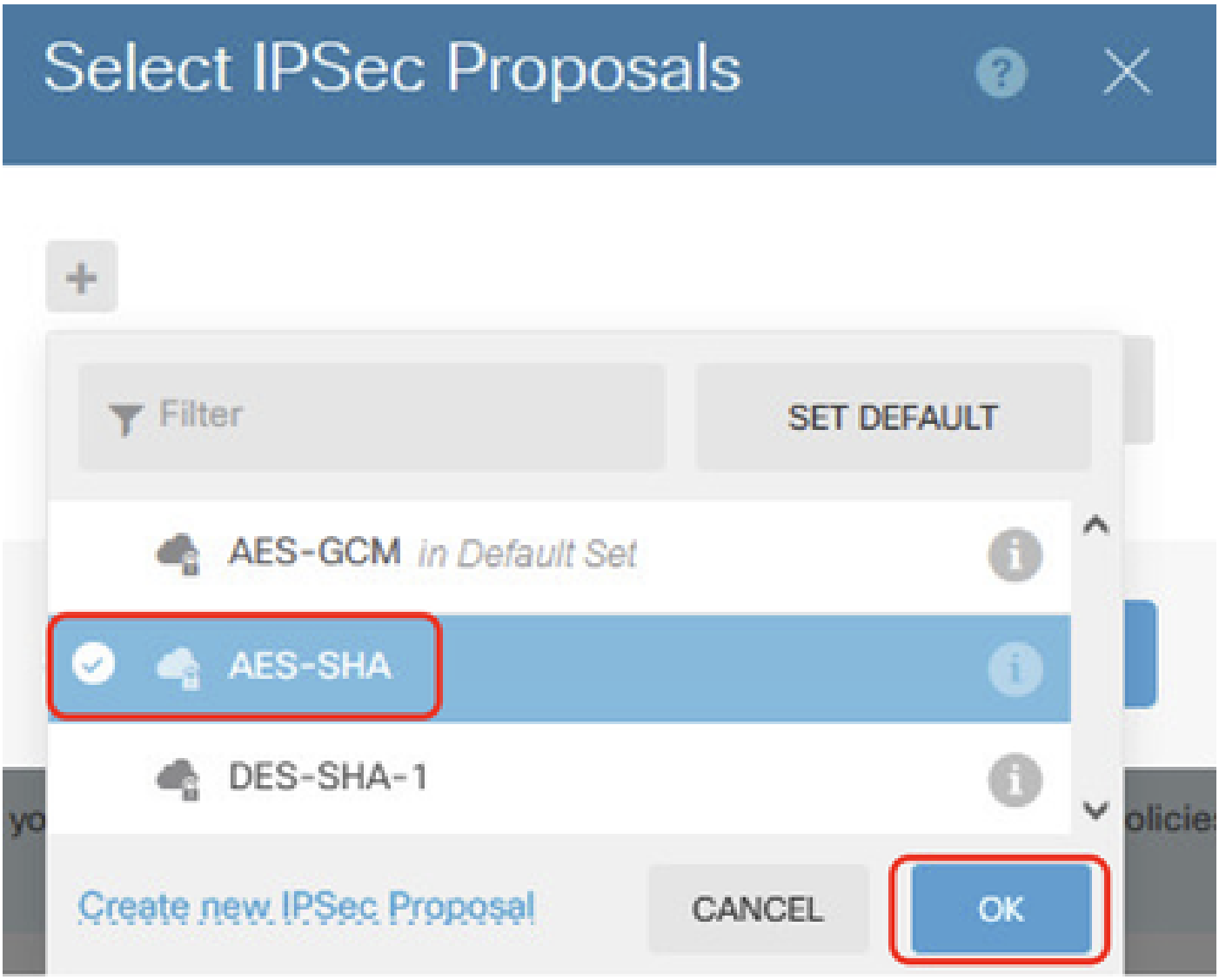
步骤3.5.导航至IPSec建议书。单击EDIT按钮。



FTD_Edit_IPSec_Proposal

第3.6步：对于IPSec提议，您可以使用预定义，也可以通过点击创建新IPSec提议来创建一个新IPSec提议。

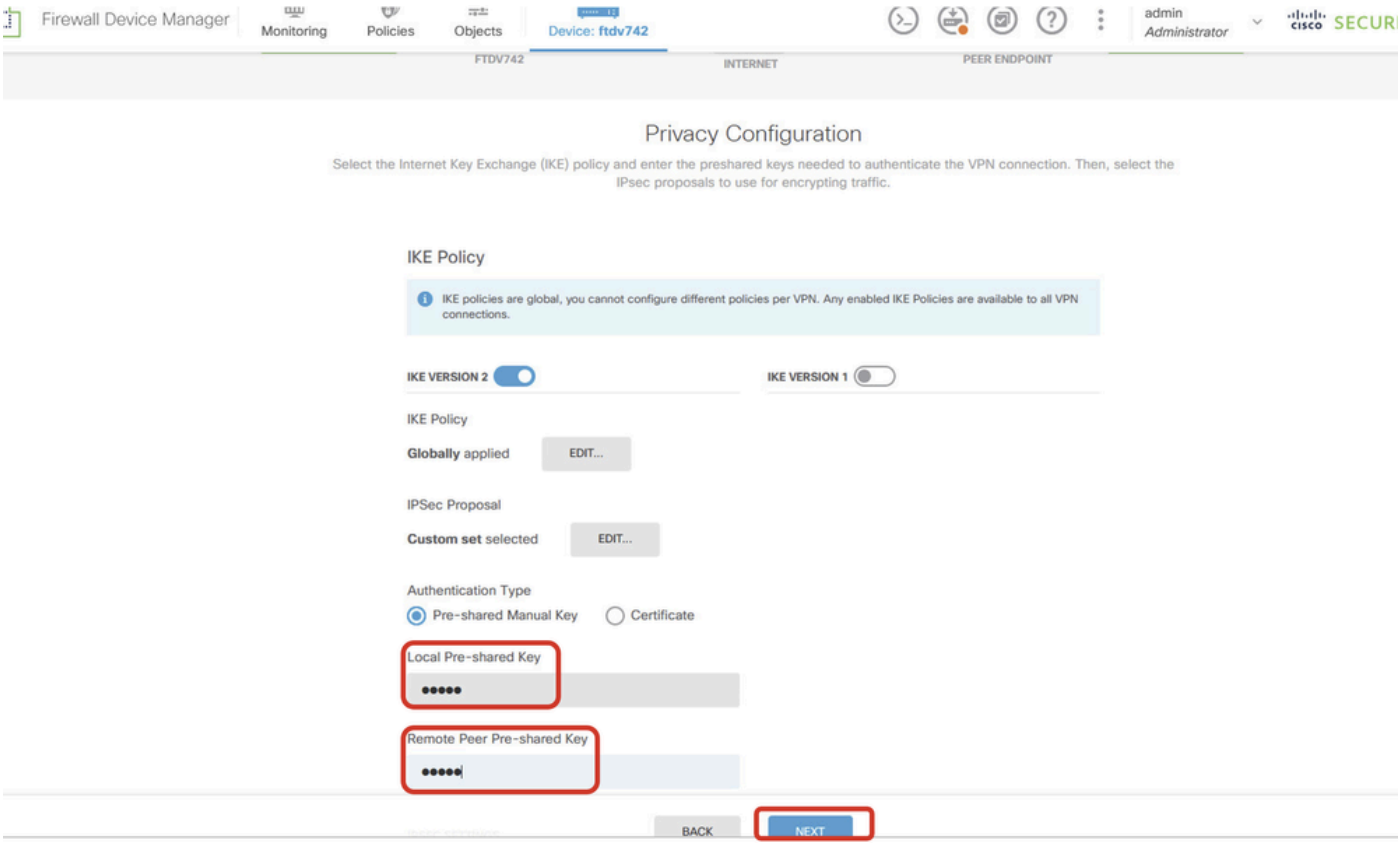
在本示例中，切换现有IPSec建议名称AES-SHA。点击 确定 按钮进行保存。



FTD_Enable_IPSec_Proposal

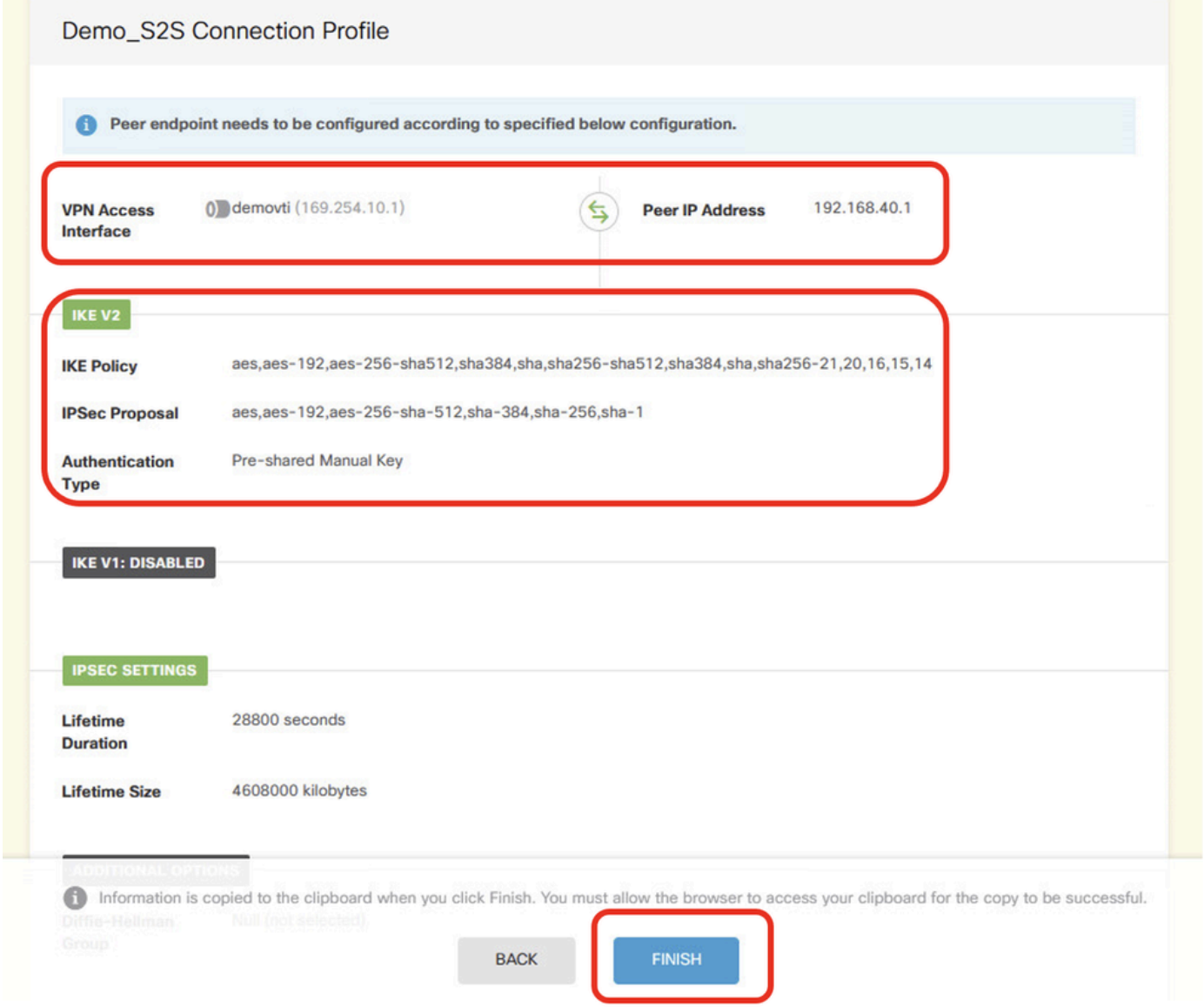
步骤3.7.向下滚动页面并配置预共享密钥。单击NEXT按钮。

请记下此预共享密钥，稍后在ASA上配置它。



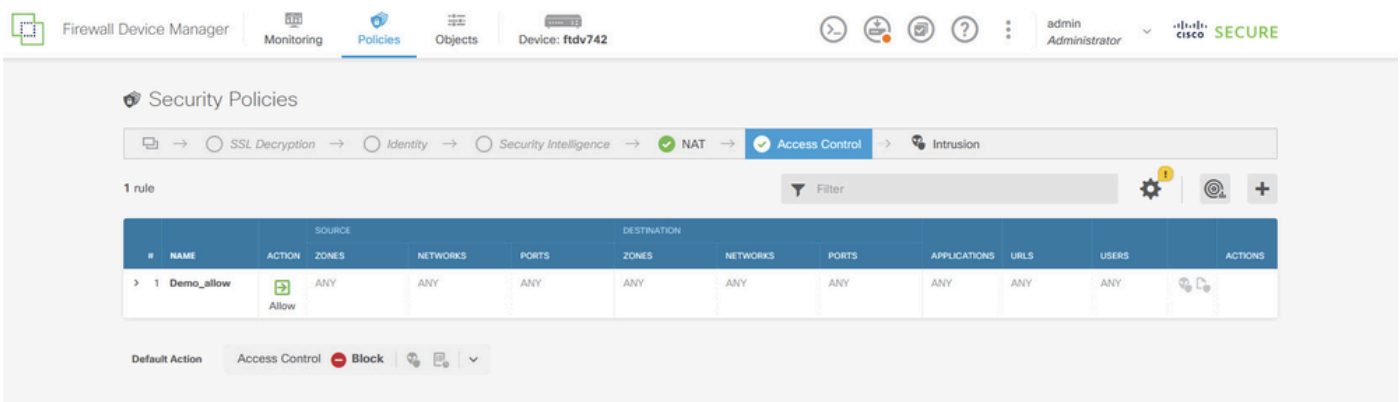
FTD_Configure_Pre_Shared_Key

步骤3.8.检查VPN配置。如果需要修改任何内容，请单击BACK按钮。如果一切正常，请单击FINISH按钮。



FTD_Review_VPN_Configuration

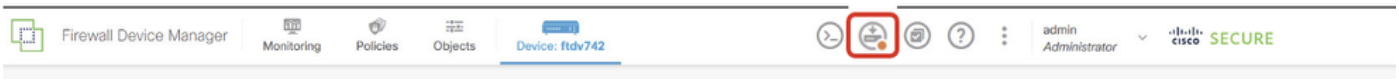
步骤3.9.创建访问控制规则以允许流量通过FTD。在本示例中，允许所有内容用于演示目的。请根据您的实际需求修改您的策略。



FTD_ACP_示例

第3.10步。（可选）如果为客户端访问互联网配置了动态NAT，请为FTD上的客户端流量配置NAT豁免规则。在本示例中，无需配置NAT免除规则，因为FTD上未配置动态NAT。

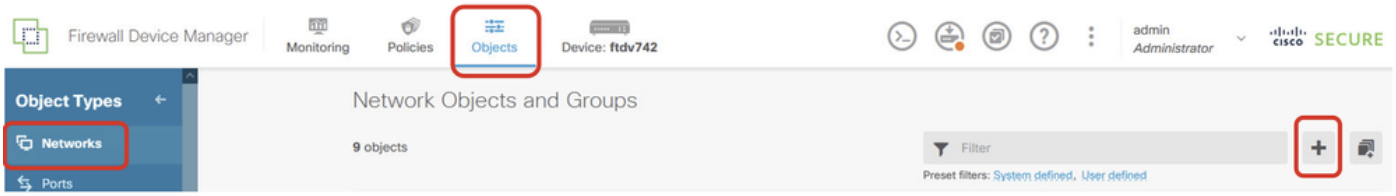
步骤3.11.部署配置更改。



FTD_Deployment_Changes

步骤4.配置虚拟路由器。

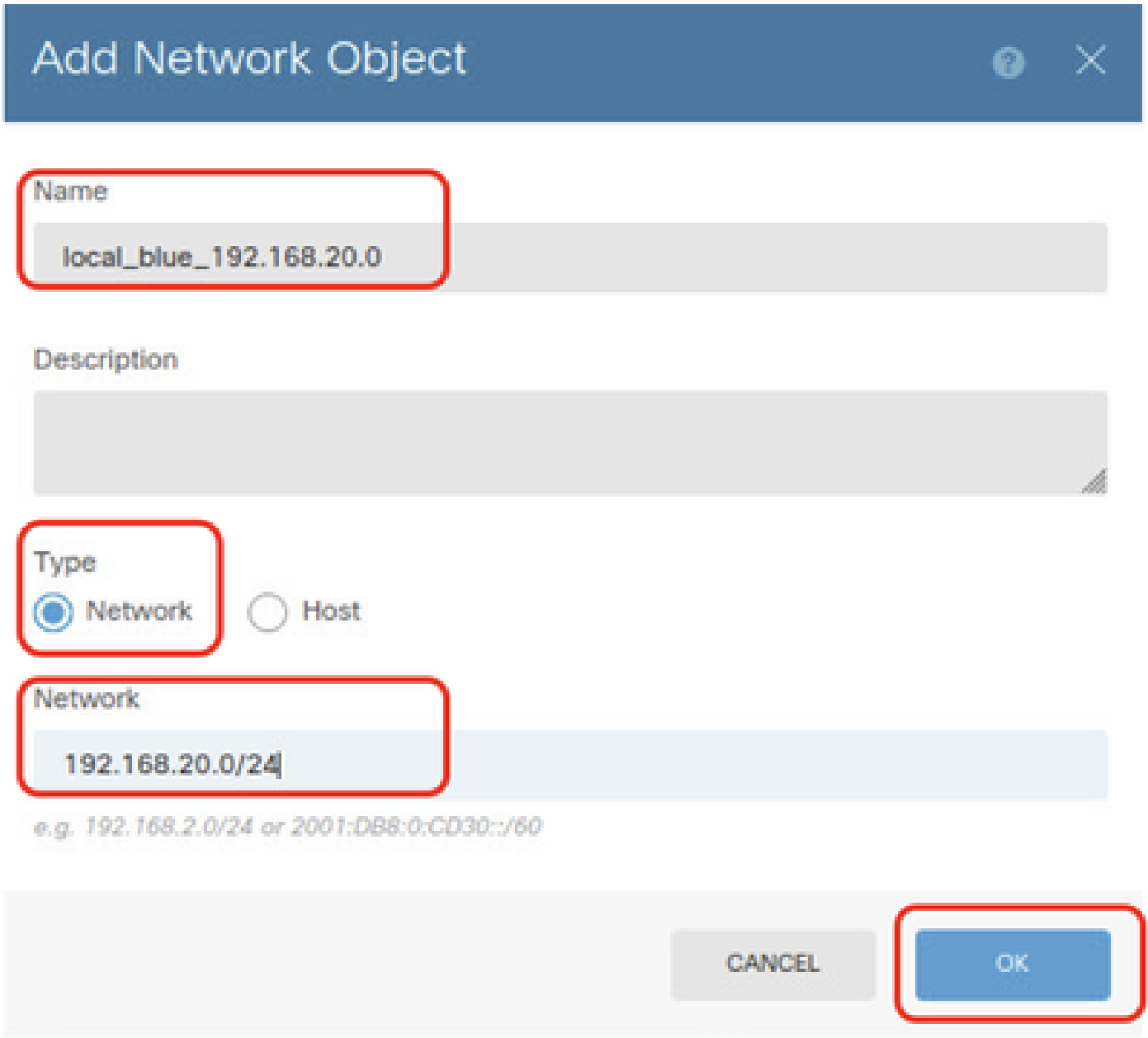
步骤4.1.为静态路由创建网络对象。导航到对象>网络，单击+按钮。



FTD_Create_NetObjects

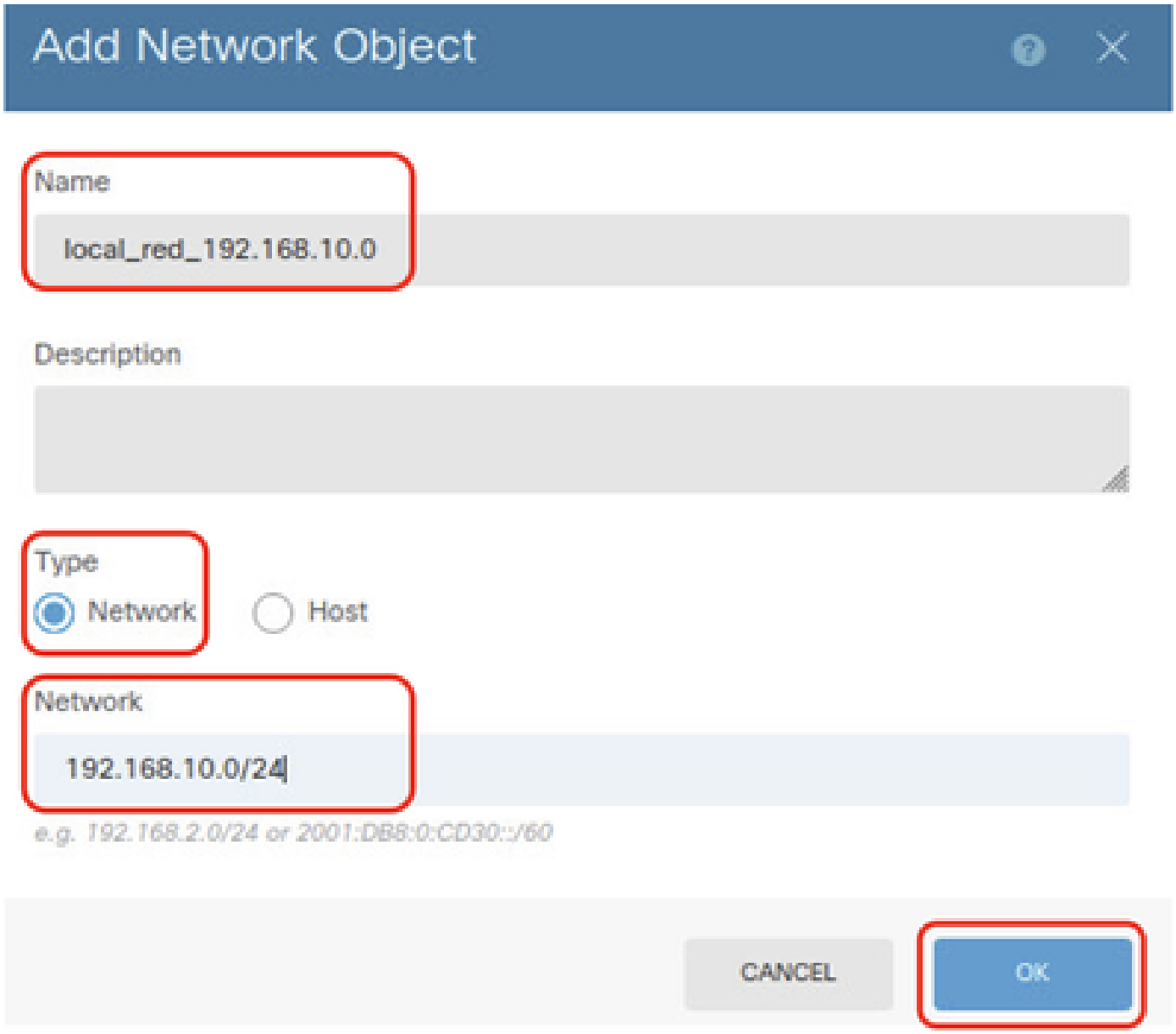
步骤4.2.提供每个网络对象的必要信息。单击OK按钮。

- 名称：local_blue_192.168.20.0
- type：网络
- 网络:192.168.20.0/24



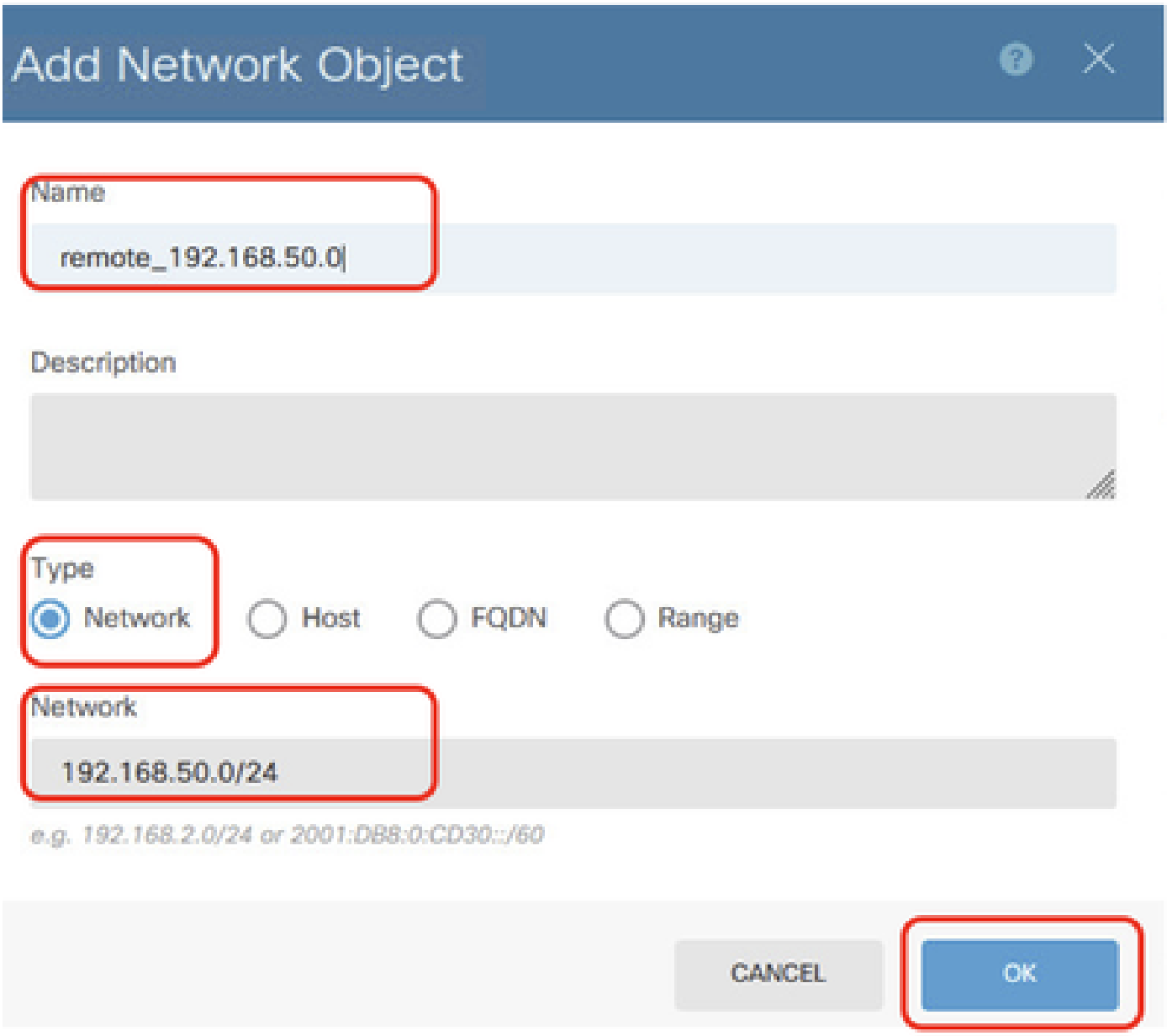
FTD_VRF_Blue_Network

- 名称：local_red_192.168.10.0
- type：网络
- 网络:192.168.10.0/24



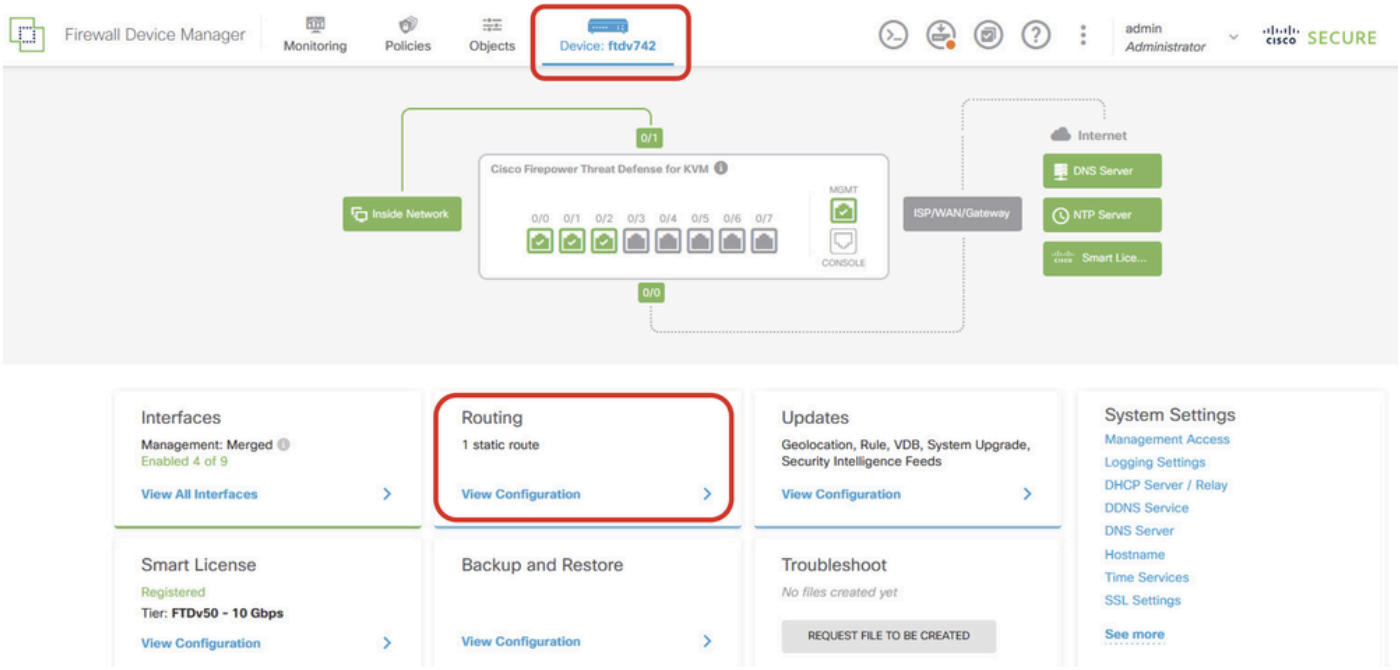
FTD_VRF_Red_Network

- 名称：remote_192.168.50.0
- type：网络
- 网络:192.168.50.0/24



FTD_Remote_Network

步骤4.3.创建第一个虚拟路由器。导航到设备>路由。单击View Configuration。



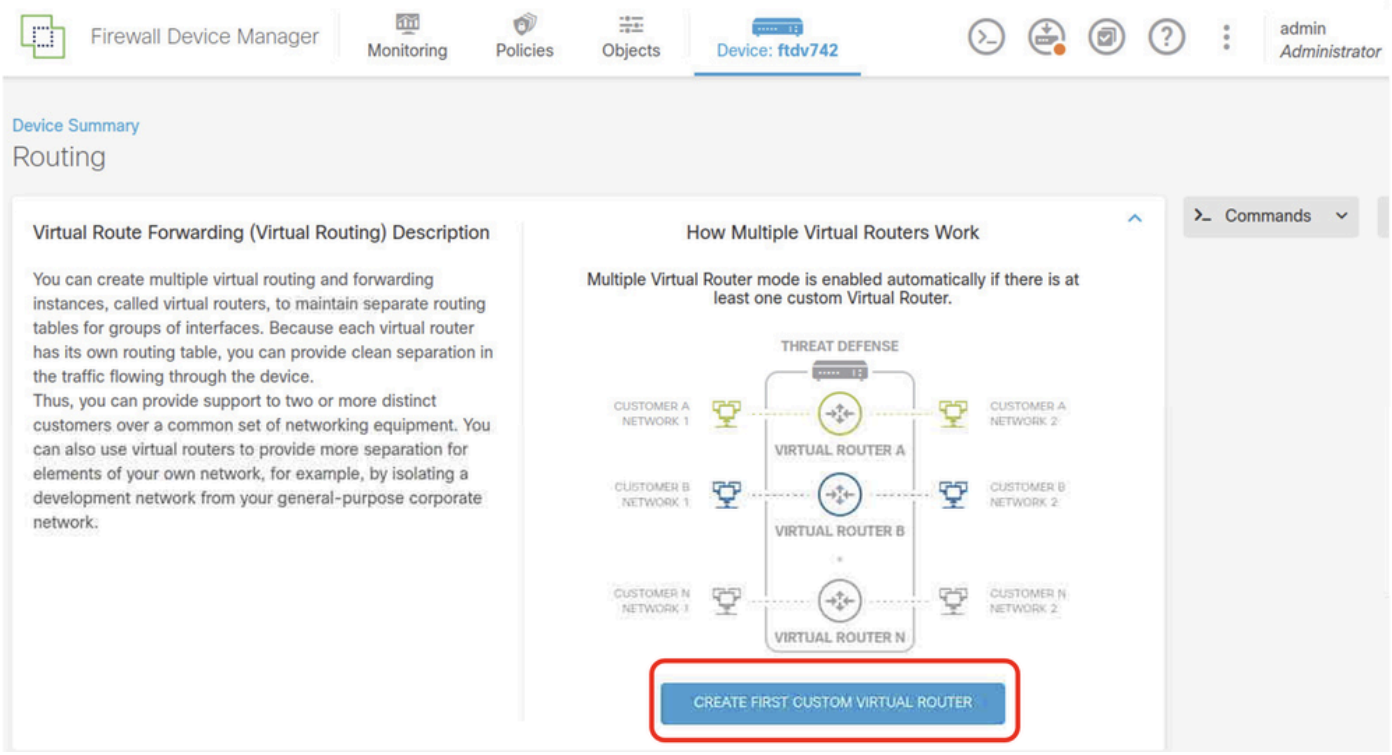
FTD_View_Routing_Configuration

步骤4.4.单击添加多个虚拟路由器。

注意：在FDM初始化期间，已配置通过外部接口的静态路由。如果您没有此功能，请手动配置。

FTD_Add_First_Virtual_Router1

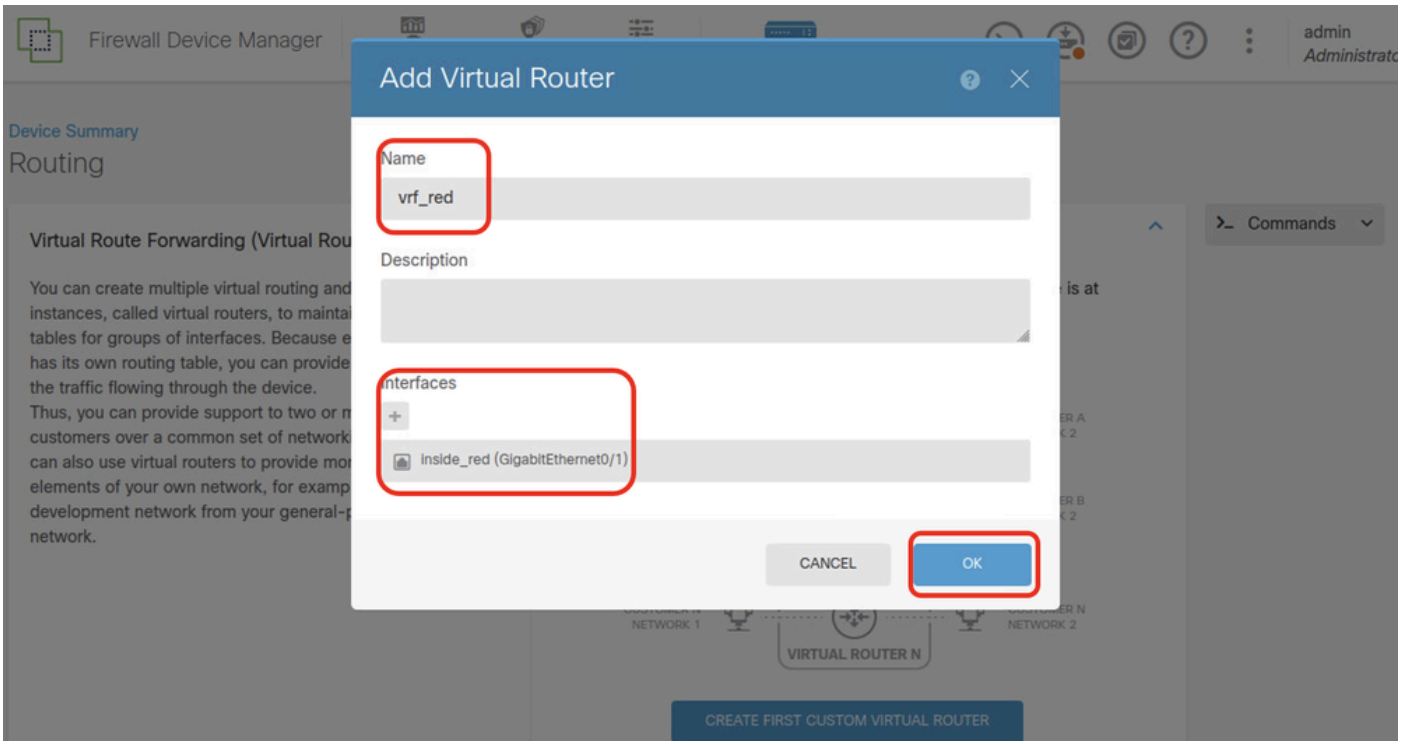
步骤4.5.单击CREATE FIRST CUSTOM VIRTUAL ROUTER。



FTD_Add_First_Virtual_Router2

步骤4.6.提供第一台虚拟路由器的必要信息。单击OK按钮。首次创建虚拟路由器后，将自动显示vrf名称Global。

- 名称：vrf_red
- 接口:inside_red(GigabitEthernet0/1)



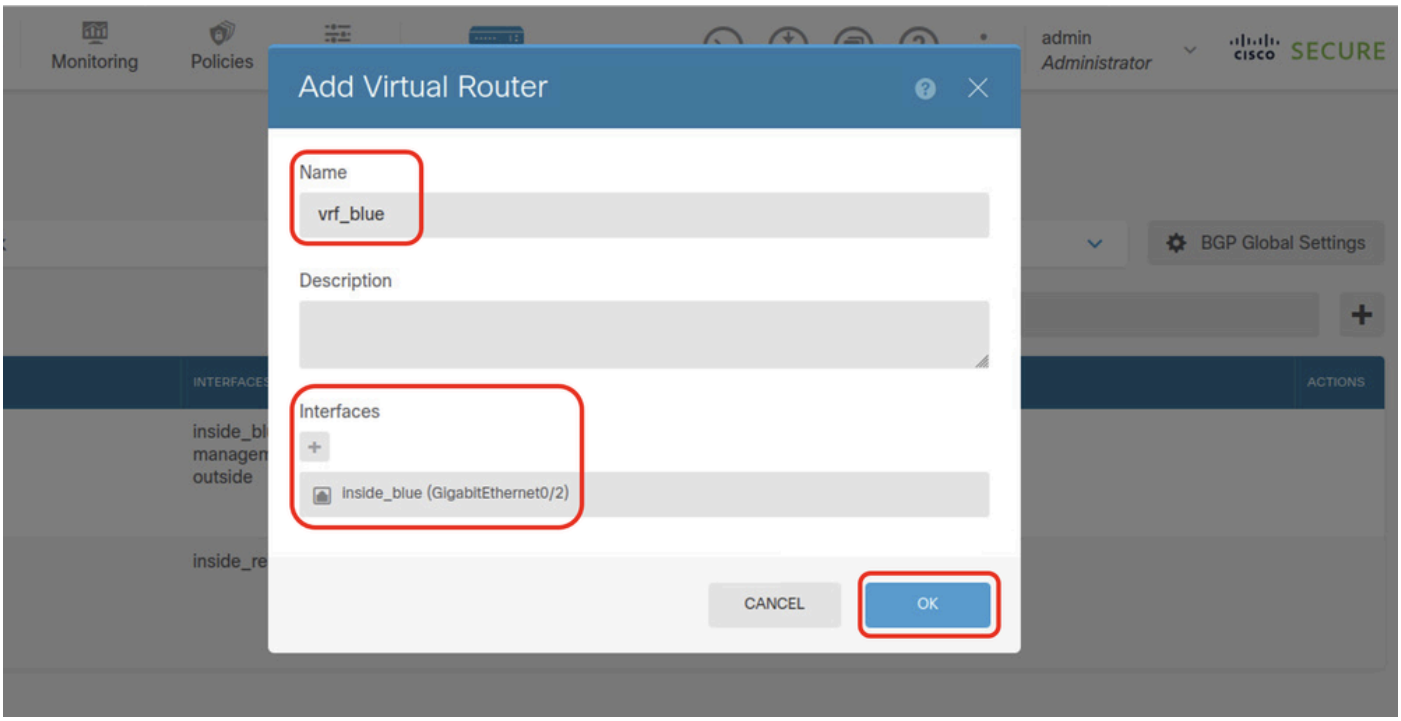
FTD_Add_First_Virtual_Router3

步骤4.7.创建第二个虚拟路由器。导航到设备>路由。单击View Configuration。单击+按钮。

FTD_Add_Second_Virtual_Router

步骤4.8.提供第二台虚拟路由器的必要信息。单击OK按钮

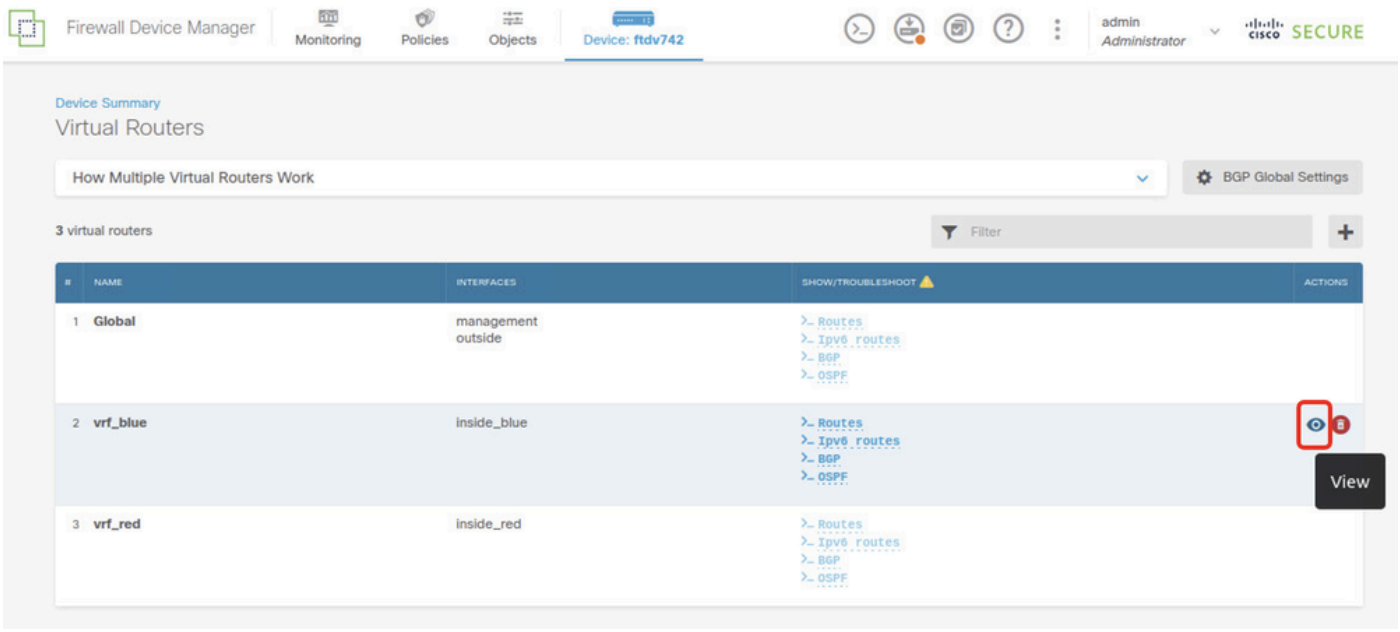
- 名称：vrf_blue
- 接口:inside_blue(GigabitEthernet0/2)



FTD_Add_Second_Virtual_Router2

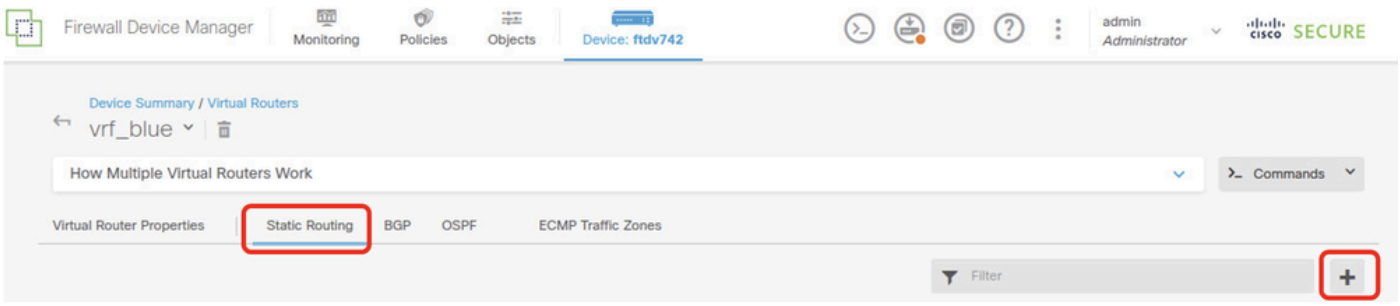
步骤5.创建从vrf_blue到Global的路由泄漏。此路由允许192.168.20.0/24网络上的终端发起将穿过站点到站点VPN隧道的连接。在本示例中，远程终端正在保护192.168.50.0/24网络。

导航到设备>路由。单击查看配置，然后单击查看图标 虚拟路由器vrf_blue的Action单元格中。



FTD_View_VRF_Blue

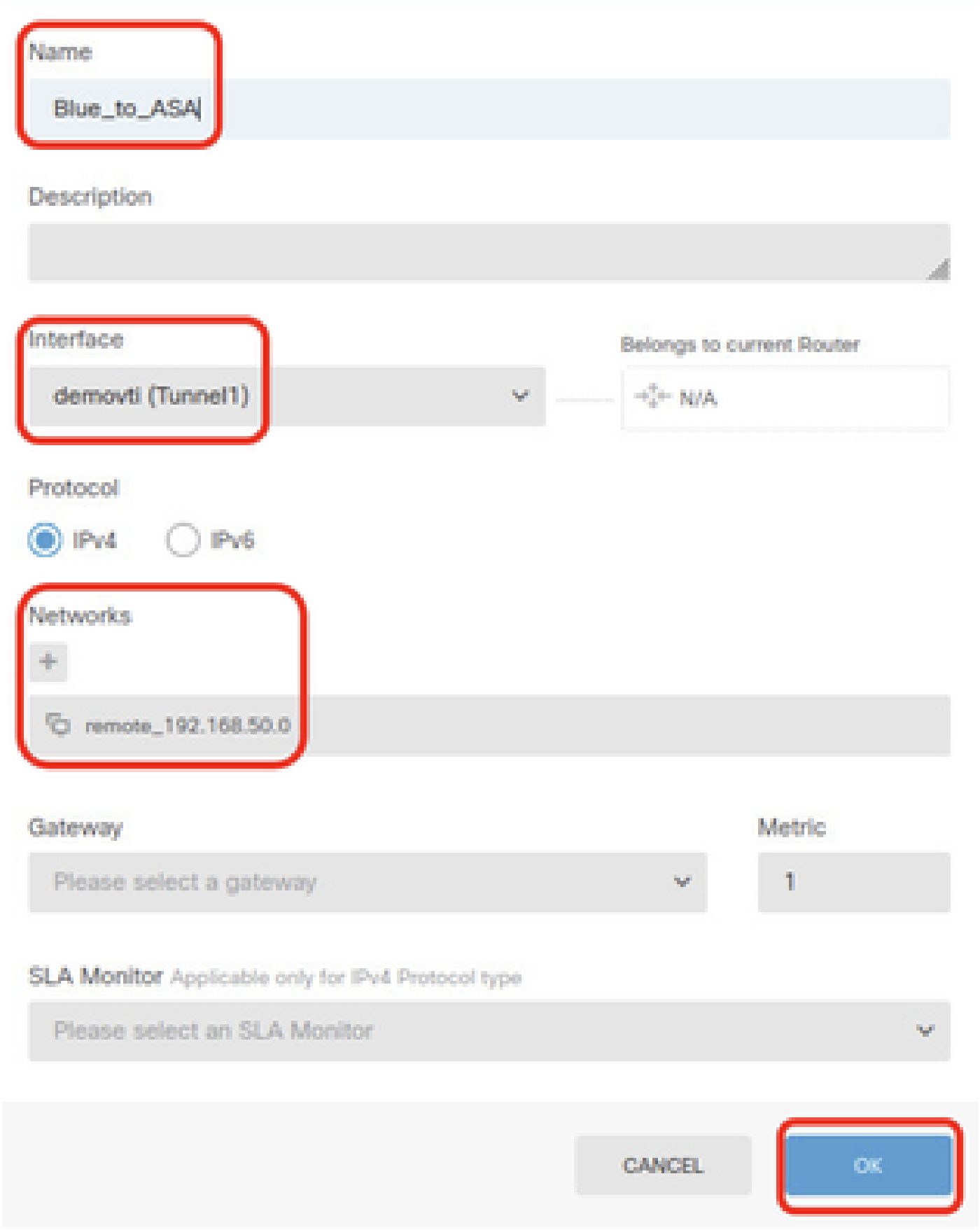
步骤5.1.单击静态路由选项卡。单击+按钮。



FTD_Create_Static_Route_VRF_Blue

步骤5.2.提供必要信息。单击OK按钮。

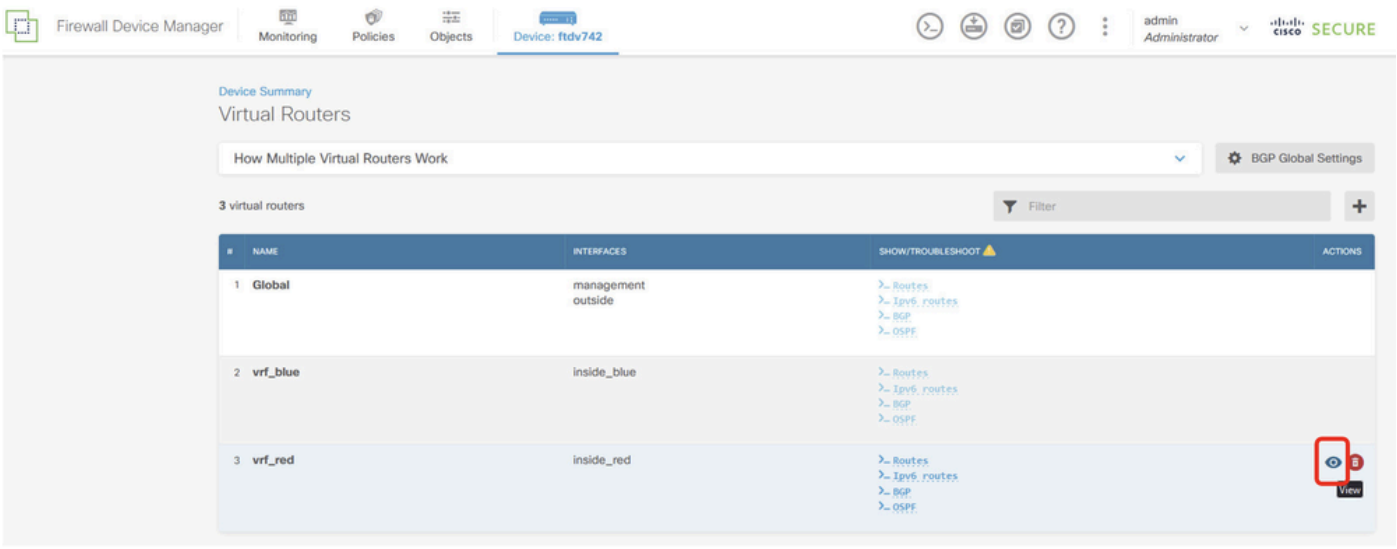
- 名称：Blue_to_ASA
- 接口:demovti(Tunnel1)
- 网络：remote_192.168.50.0
- 网关：将此项目留空。



FTD_Create_Static_Route_VRF_Blue_Details

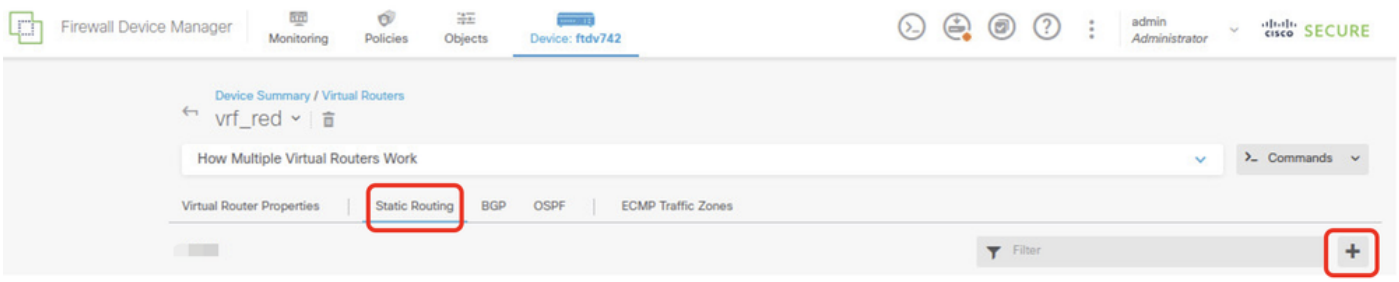
步骤6.创建从vrf_red到Global的路由泄漏。此路由允许192.168.10.0/24网络上的终端发起将穿过站点到站点VPN隧道的连接。在本示例中，远程终端正在保护192.168.50.0/24网络。

导航到设备>路由。单击查看配置，然后单击查看图标 虚拟路由器vrf_red的操作单元格中。



FTD_View_VRF_Red

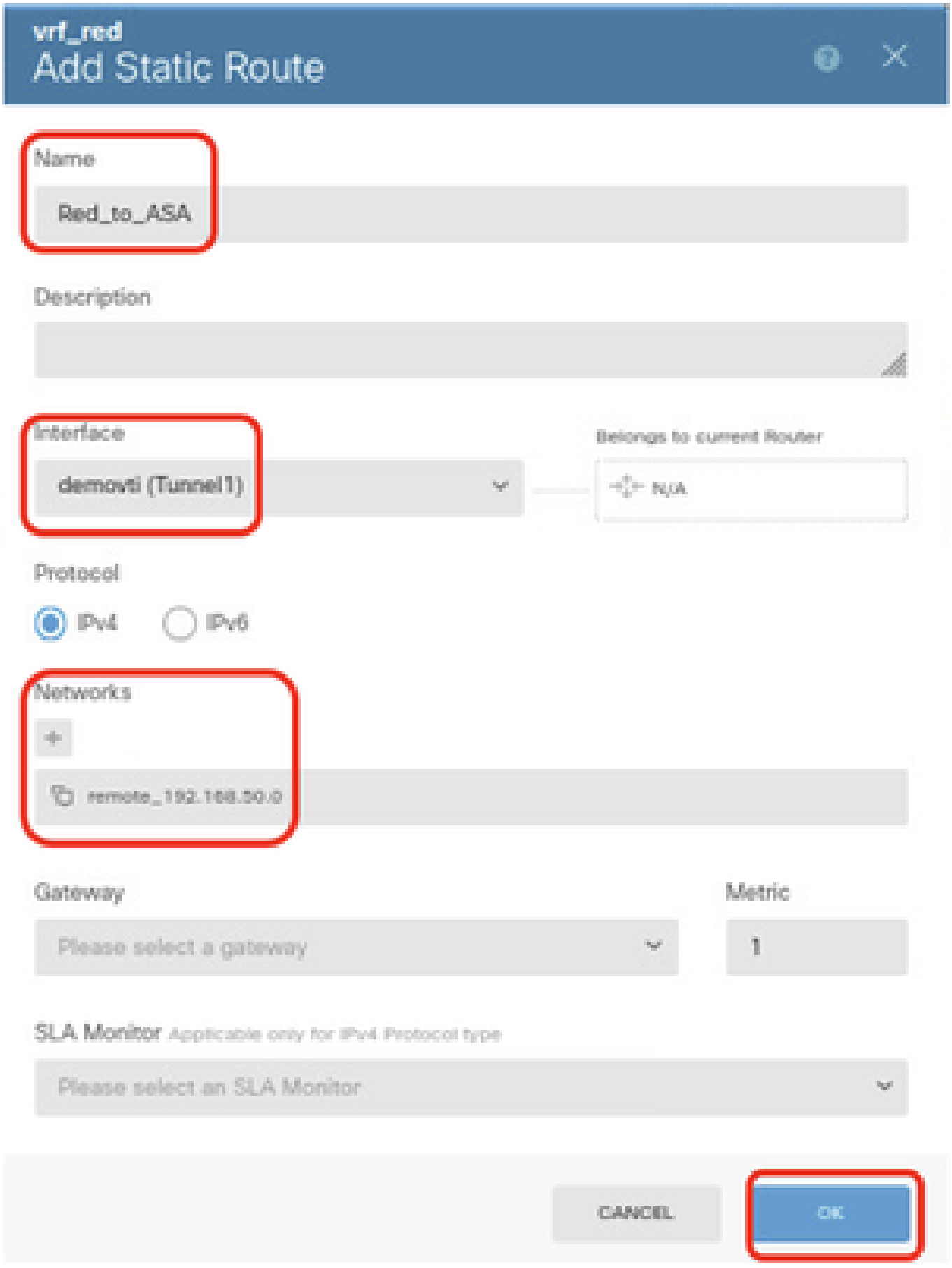
步骤6.1.单击静态路由选项卡。单击+按钮。



FTD_Create_Static_Route_VRF_Red

步骤6.2.提供必要信息。单击OK按钮。

- 名称：Red_to_ASA
- 接口:demovti(Tunnel1)
- 网络：remote_192.168.50.0
- 网关：将此项目留空。

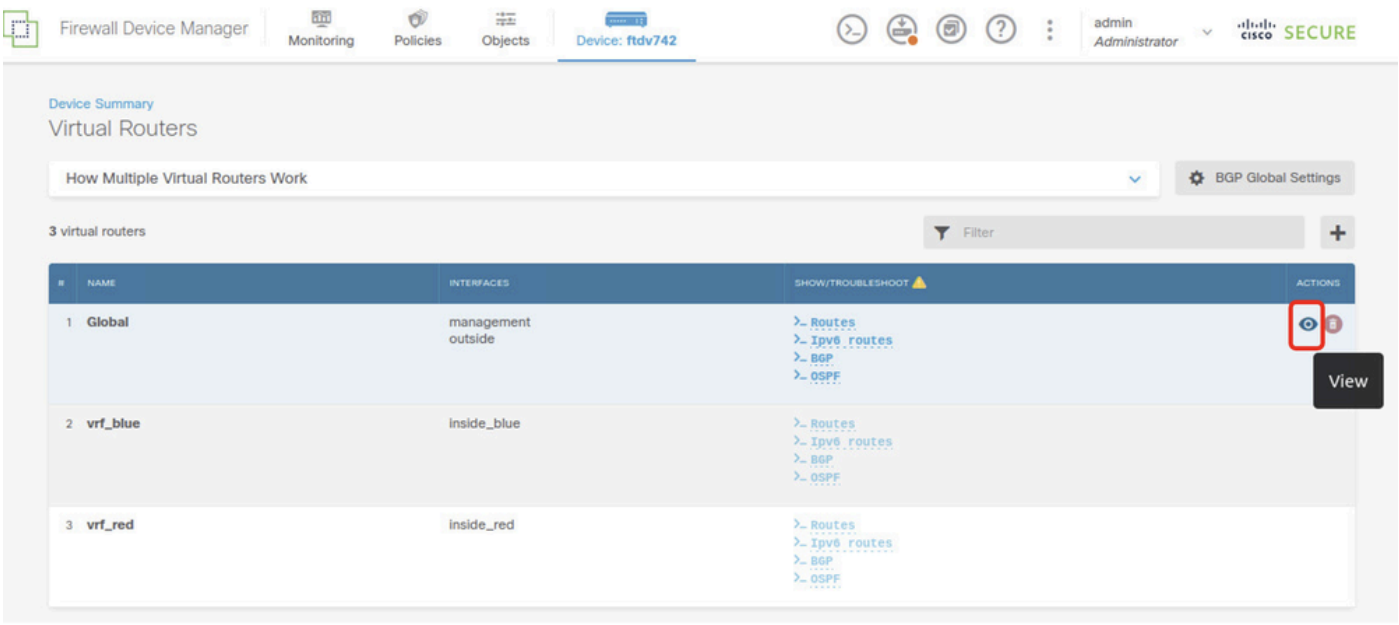


FTD_Create_Static_Route_VRF_Red_Details

步骤7.创建从全局到虚拟路由器的路由泄漏。这些路由允许受站点到站点VPN的远程终端保护的终端访问vrf_red虚拟路由器中的192.168.10.0/24网络和vrf_blue虚拟路由器中的192.168.20.0/24网络

。

导航到设备>路由。单击View Configuration，然后单击Global虚拟路由器的Action单元格中的View图标。



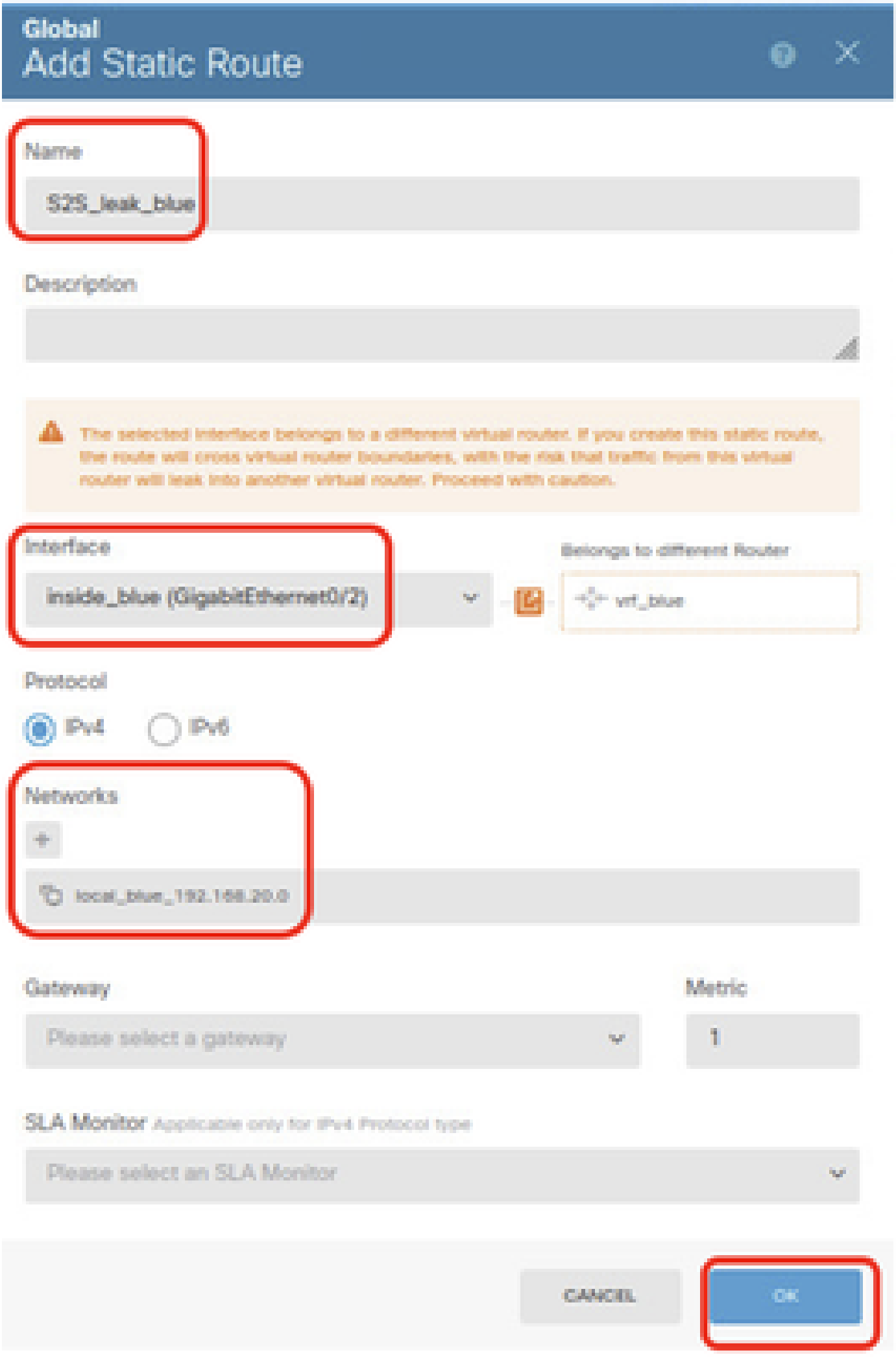
FTD_View_VRF_Global

步骤7.1.单击静态路由选项卡。单击+按钮。

FTD_Create_Static_Route_VRF_Global

步骤7.2.提供必要信息。单击OK按钮。

- 名称：S2S_leak_blue
- 接口：inside_blue(GigabitEthernet0/2)
- 网络：local_blue_192.168.20.0
- Gateway：将此项目留空。


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
CANCEL
OK

```
 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
```

步骤10.创建定义在FTD上配置的相同参数的IKEv2 ipsec-proposal。

```
<#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
```

步骤11.创建 ipsec配置文件，引用 第10步中创建的IPSec提议。

```
<#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
```

步骤12.创建允许IKEv2协议的组策略。

```
<#root>

group-policy

demo_gp_192.168.30.1

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

步骤13.参考步骤12中创建的组策略，为对等FTD外部IP地址创建隧道组，然后 使用FTD配置相同的预共享密钥（在步骤3.7中创建）。

<#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 *****
```

步骤14.在外部接口上启用IKEv2。

```
crypto ikev2 enable outside
```

步骤15.创建虚拟隧道。

<#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

步骤16.创建静态路由。

```
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
```

验证

使用本部分可确认配置能否正常运行。

第1步：通过控制台或SSH导航到FTD和ASA的CLI，通过命令show crypto ikev2 sa和show crypto ipsec sa验证第1阶段和第2阶段的VPN状态。

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
```

步骤2.检验FTD上VRF和全局的路由。

```
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
```

步骤3.检验ping测试。

在ping之前，请检查show crypto ipsec sa的计数器 | inc接口：|encap|decap on FTD。

在本示例中，Tunnel1显示封装和解封的30个数据包。

```
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成功ping Client3。

```
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成功ping Client3。

```
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
```

检查的计数器 show crypto ipsec sa | inc interface:|encap|decap 在FTD上，ping成功。

在本例中，Tunnel1在成功ping后显示封装和解封的40个数据包。此外，两个计数器增加10个数据包，匹配10个ping回应请求，表示ping流量成功通过IPSec隧道。

```
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
```

故障排除

本部分提供了可用于对配置进行故障排除的信息。

可以使用这些debug命令对VPN部分进行故障排除。

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

您可以使用这些debug命令对路由部分进行故障排除。

```
debug ip routing
```

参考

思科安全防火墙设备管理器配置指南，版本7.4

思科安全防火墙ASA VPN CLI配置指南，9.20

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