在FDM管理的FTD上使用PBR配置雙活動路由型站點到站點VPN

目錄

簡介

本文說明如何在FDM管理的FTD上使用PBR配置雙活動路由型站點到站點VPN。

必要條件

需求

思科建議您瞭解以下主題：

- 對VPN有基礎認識
- 對原則型路由(PBR)的基本瞭解
- 對網際網路通訊協定服務等級協定(IP SLA)有基礎認識
- 使用FDM的經驗

採用元件

本文中的資訊係根據以下軟體和硬體版本：

- Cisco FTDv 7.4.2版
- Cisco FDM版本7.4.2

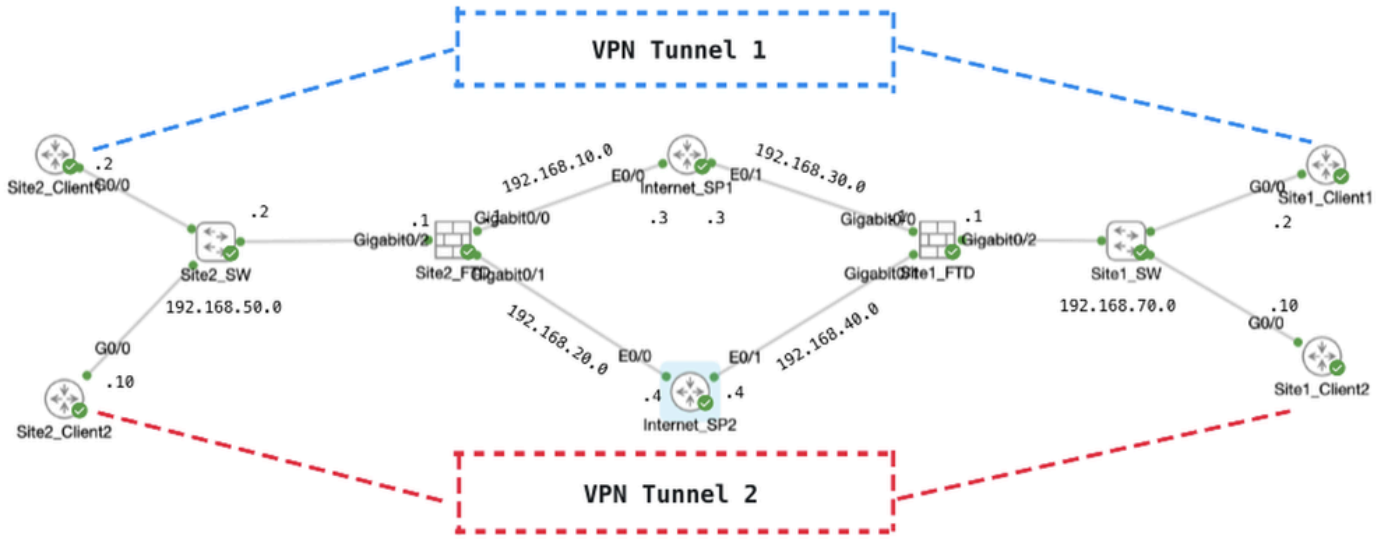
本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

背景資訊

本檔案將說明如何在FTD上設定雙作用中路由型站對站VPN。在本例中，站點1和站點2的FTD都有兩個活動ISP連線，可同時與兩個ISP建立站點到站點VPN。預設情況下，VPN流量通過ISP1隧道1（藍線）。 對於特定主機，流量通過ISP2隧道2（紅線）。 如果ISP1遇到中斷，則流量會切換到ISP2作為備份。相反，如果ISP2遇到中斷，則流量會切換到ISP1作為備份。本範例中使用原則型路由(PBR)和網際網路通訊協定服務等級協定(IP SLA)來滿足這些要求。

設定

網路圖表



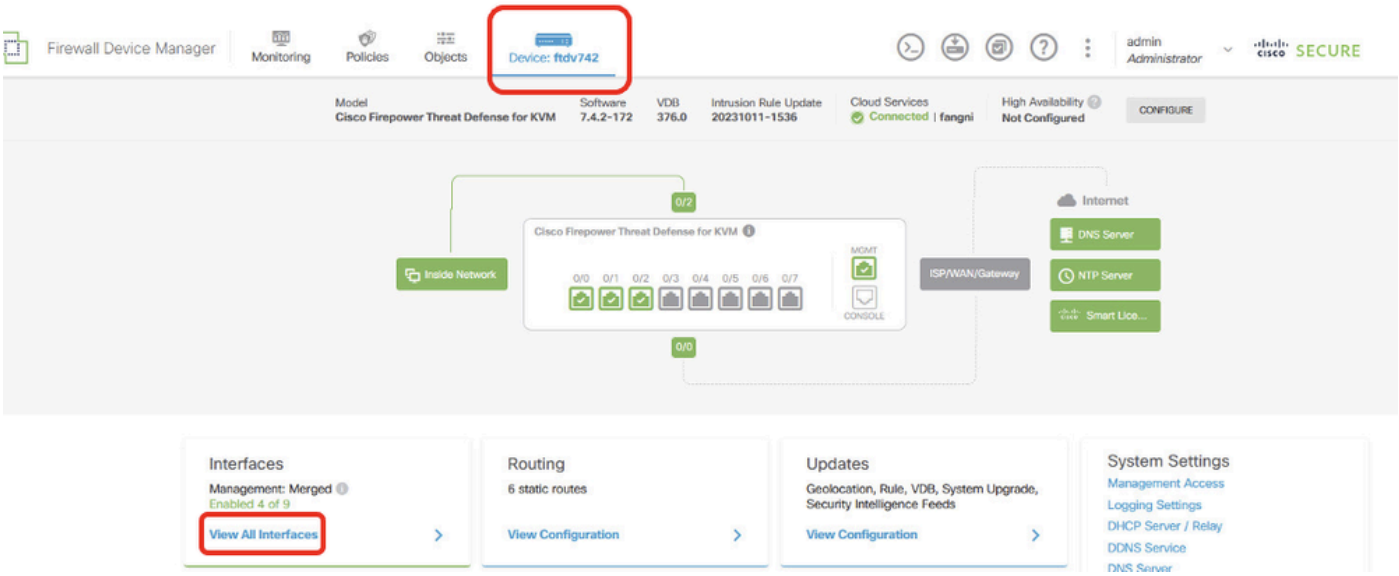
拓撲

VPN上的配置

必須確保在節點之間正確完成IP互連的初步配置。Site1和Site2中的客戶端都將FTD內部IP地址用作網關。

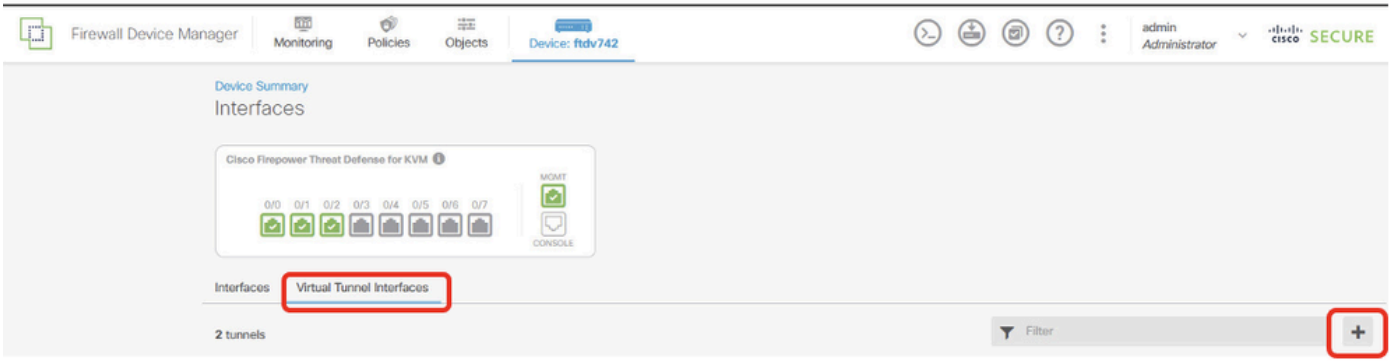
站點1 FTD VPN配置

步驟1.為ISP1和ISP2建立虛擬隧道介面。登入Site1 FTD的FDM GUI。導覽至Device > Interfaces。按一下「View All Interfaces」。



Site1FTD_View_All_Interfaces

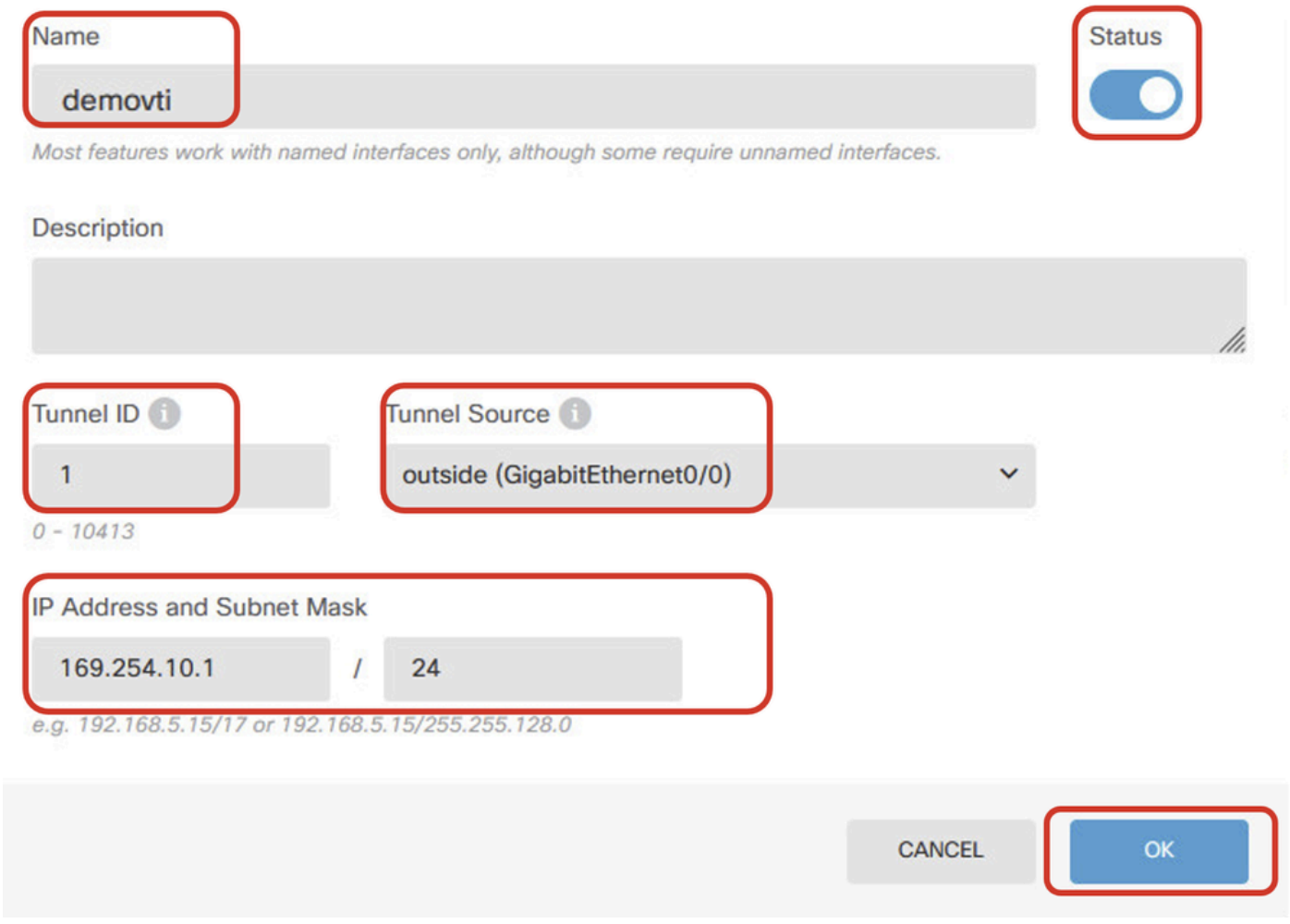
步驟2.按一下Virtual Tunnel Interfaces頁籤，然後按一下+按鈕。



Site1FTD_Create_VTI

步驟3.提供VTI詳細資訊的必要資訊。按一下「OK」按鈕。

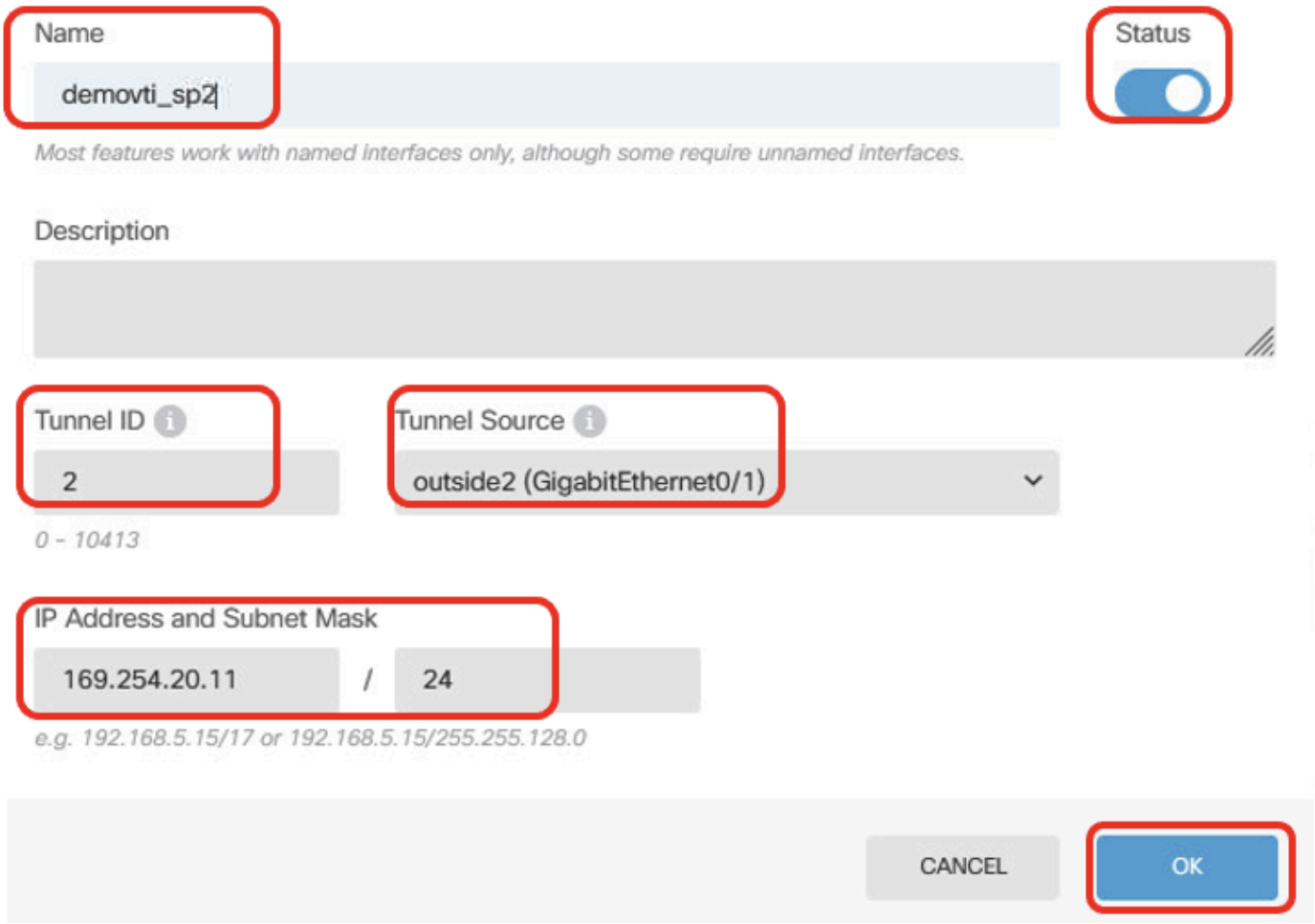
- 名稱:demovti
- 通道ID:1
- 通道來源：outside(GigabitEthernet0/0)
- IP地址和子網掩碼：169.254.10.1/24
- 狀態:按一下滑塊到「已啟用」位置



Site1FTD_VTI_Details_Tunnel1_ISP1

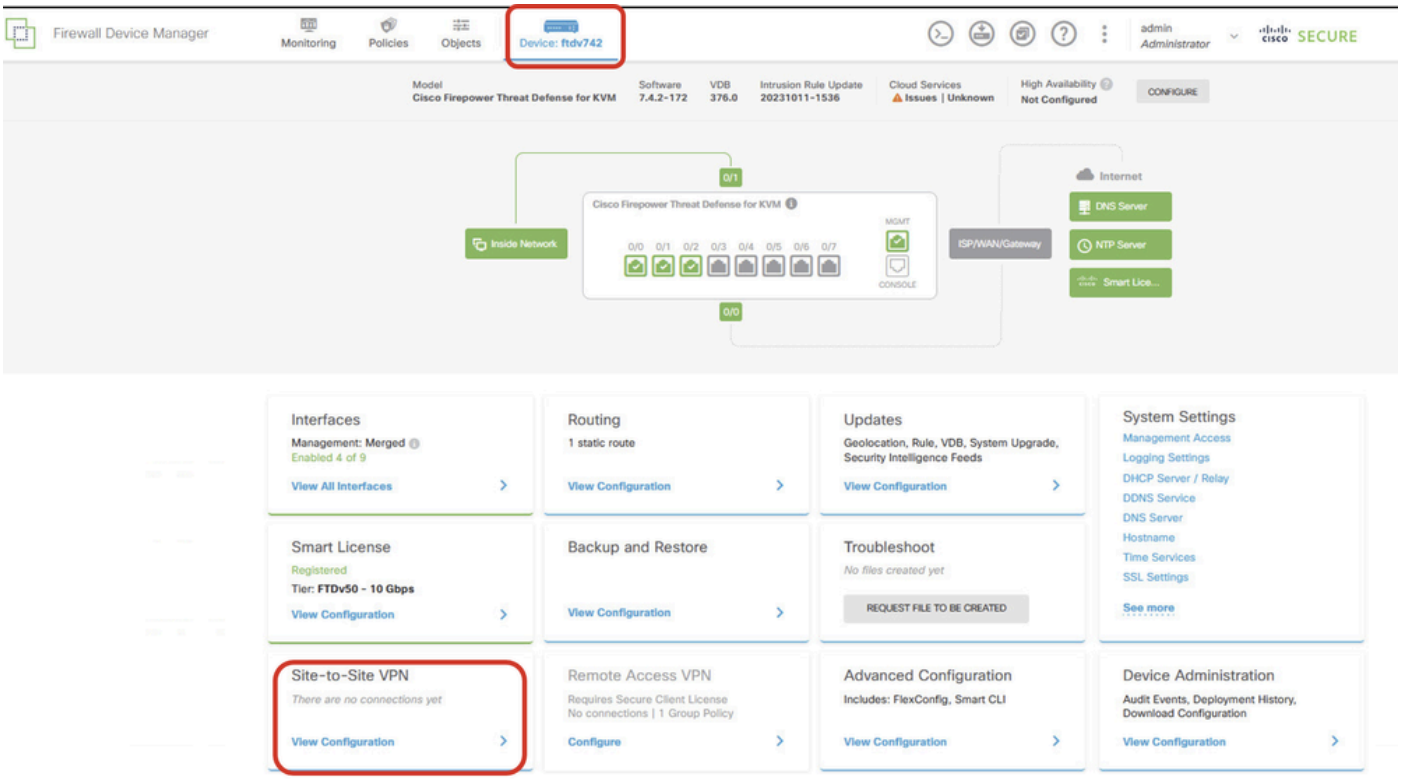
- 名稱:demovti_sp2
- 通道ID:2

- 通道來源：outside2(GigabitEthernet0/1)
- IP地址和子網掩碼：169.254.20.11/24
- 狀態:按一下滑塊到「已啟用」位置



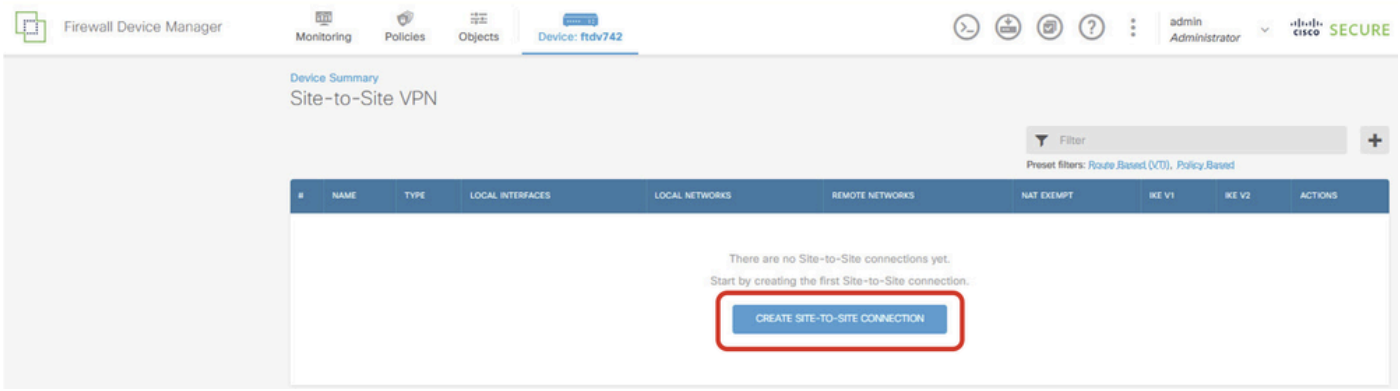
Site1FTD_VTI_Details_Tunnel2_ISP2

步驟4.導覽至Device > Site-to-Site VPN。按一下「View Configuration」按鈕。



Site1FTD_View_Site2Site_VPN

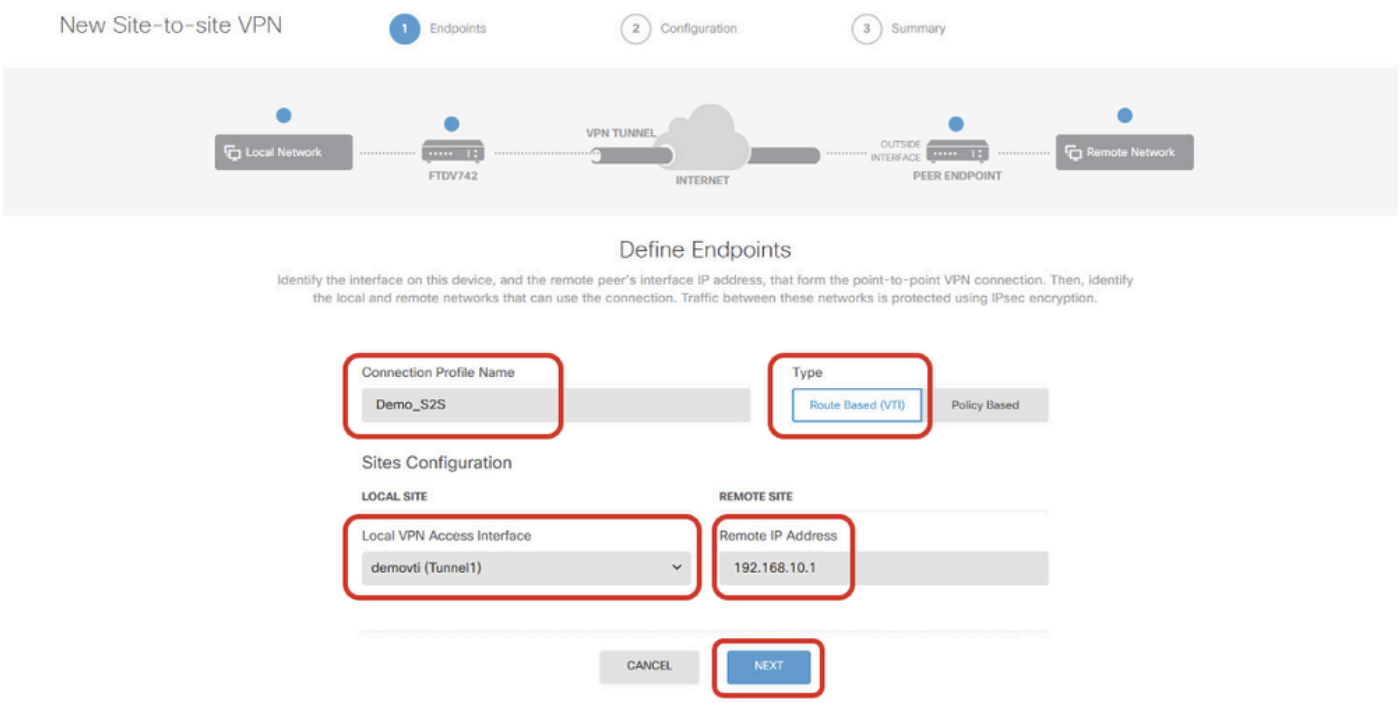
步驟5.開始通過ISP1建立新的站點到站點VPN。按一下CREATE SITE-TO-SITE CONNECTION按鈕，或按一下+按鈕。



Site1FTD_Create_Site-to-Site_Connection

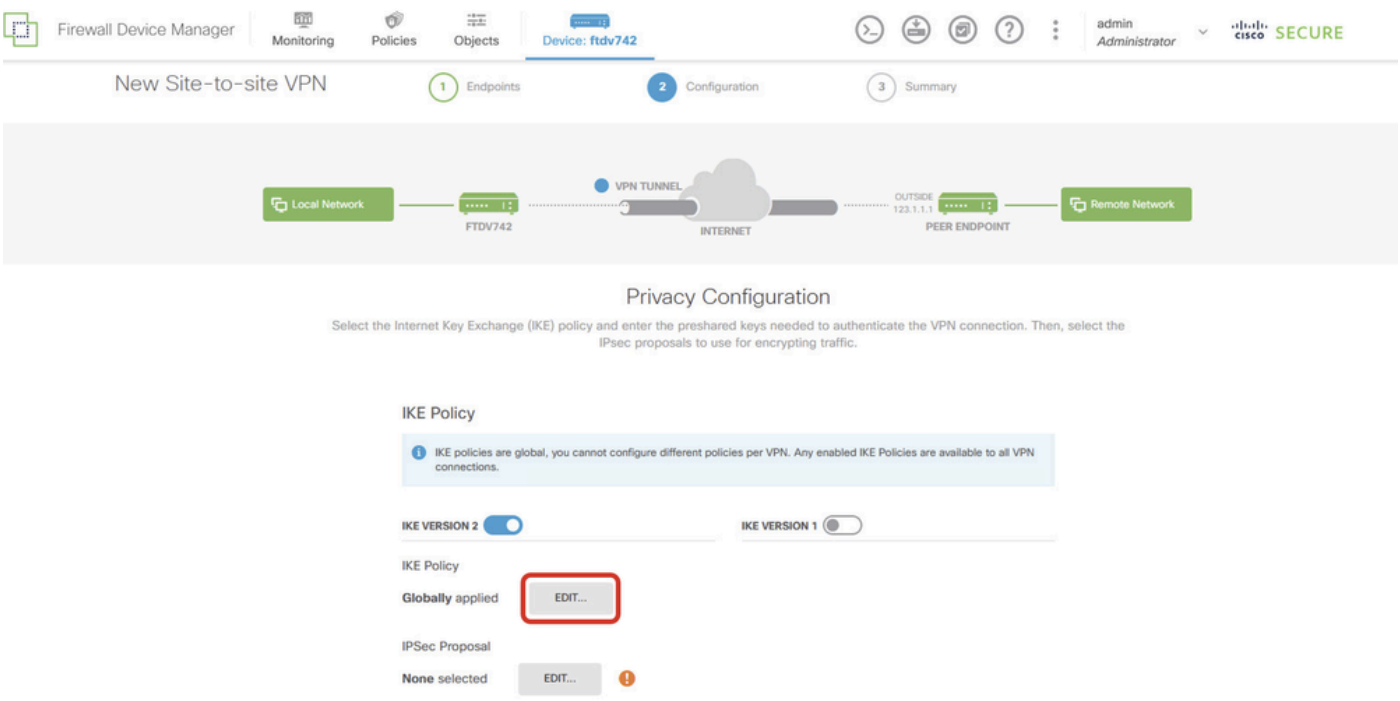
步驟5.1. 提供端點的必要資訊。按一下NEXT按鈕。

- 連線配置檔名稱：演示_S2
- Type:路由型(VTI)
- 本地VPN訪問介面：演示（在步驟3中建立。）
- 遠端IP地址：192.168.10.1（這是Site2 FTD ISP1 IP地址）



Site1FTD_ISP1_Site-to-Site_VPN_Define_Endpoints

步驟5.2.導覽至IKE Policy。按一下EDIT按鈕。

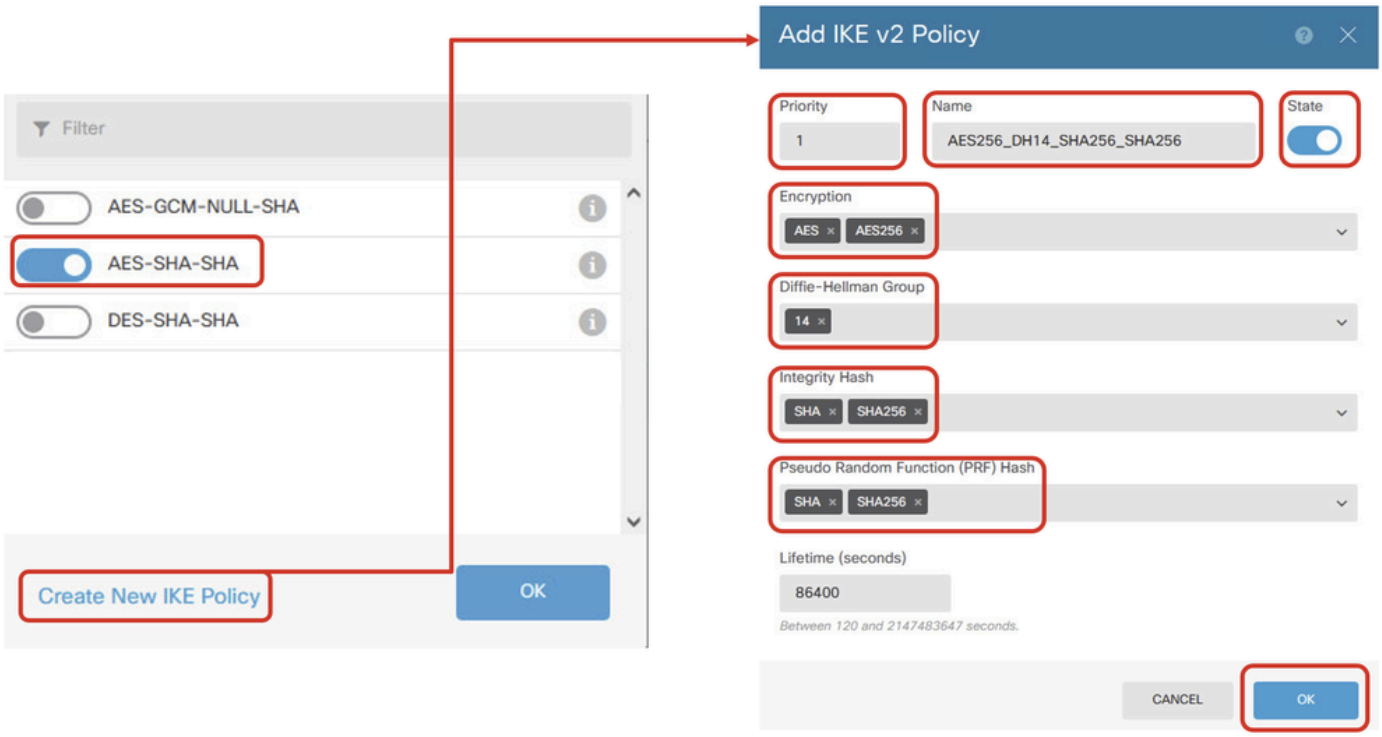


Site1FTD_Edit_IKE_Policy

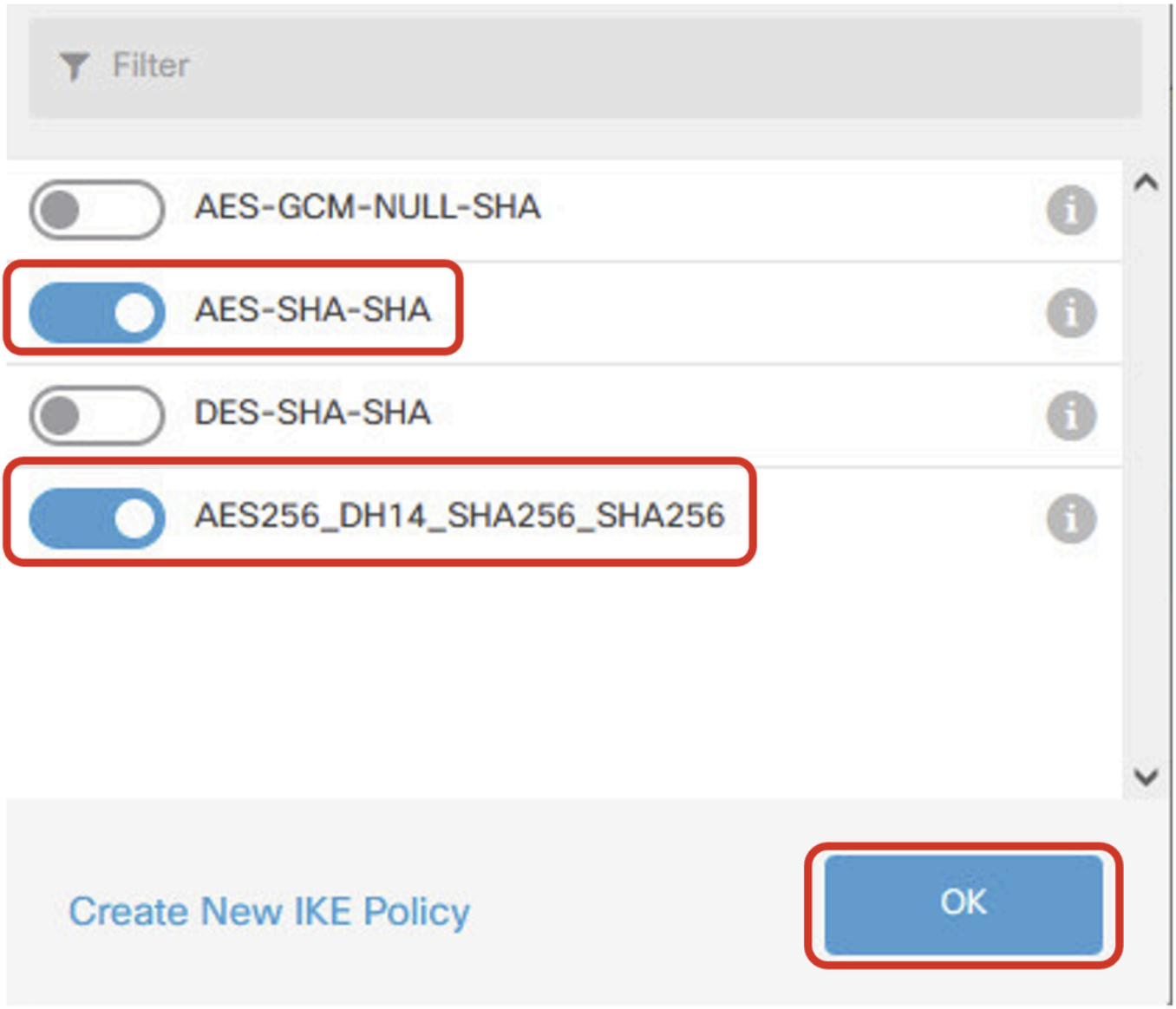
步驟5.3.對於IKE策略，您可以使用預定義，也可以通過按一下「新建IKE策略」來創建新的IKE策略。

在本示例中，切換現有IKE策略AES-SHA-SHA，並建立一個新策略用於演示。按一下OK按鈕以進行儲存。

- 名稱:AES256_DH14_SHA256_SHA256
- 加密:AES、AES256
- DH組：14
- 完整性雜湊：SHA256
- PRF雜湊：SHA256
- Lifetime:86400（預設）

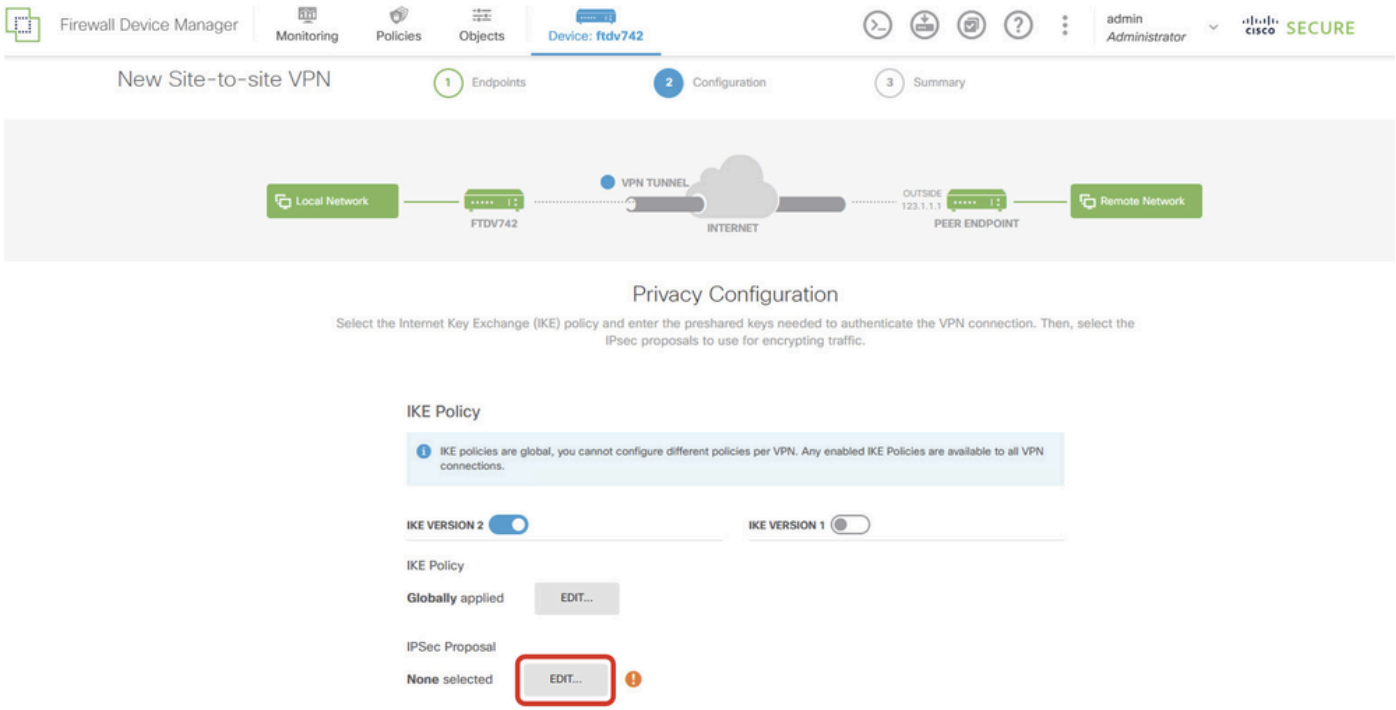


Site1FTD_Add_New_IKE_Policy



Site1FTD_Enable_New_IKE_Policy

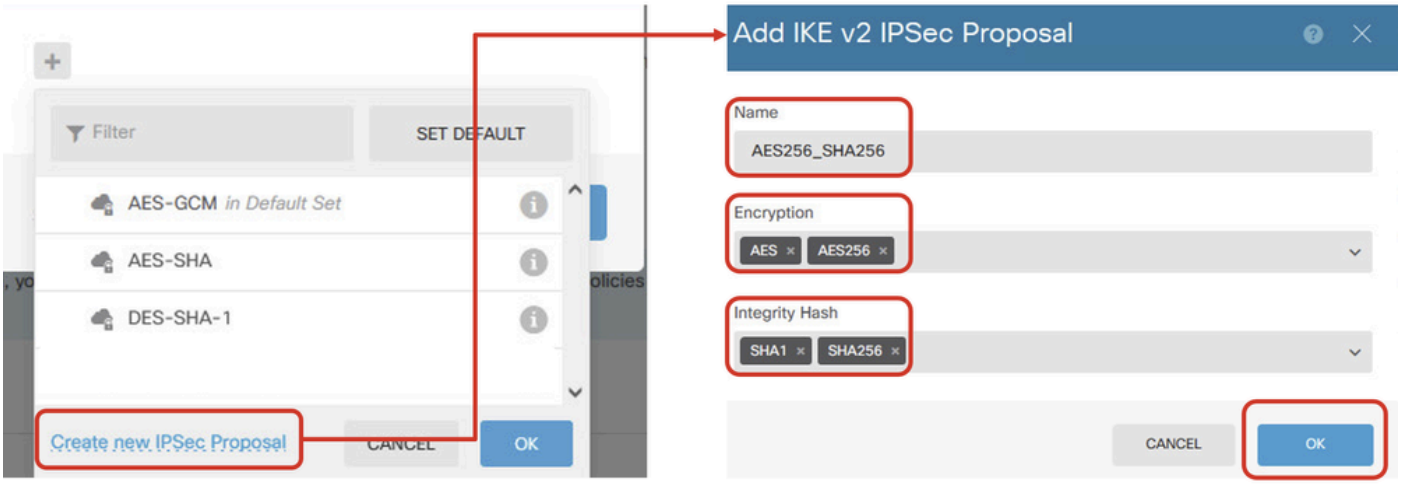
步驟5.4.導覽至IPSec建議書。按一下EDIT按鈕。



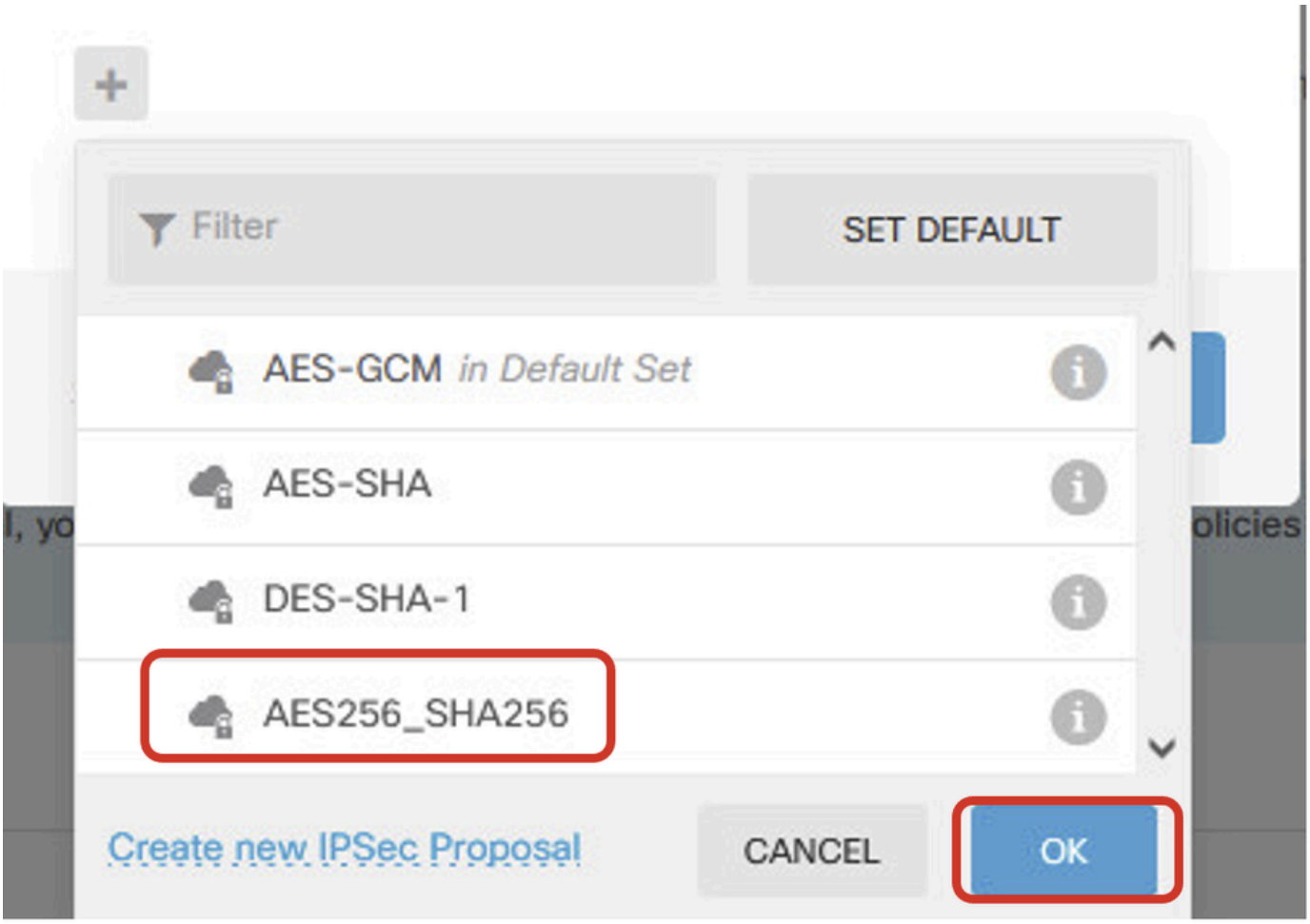
Site1FTD_Edit_IKE_Proposal

步驟5.5.對於IPSec建議，您可以使用預定義的建議或按一下建立新的IPSec建議創建新的IPSec建議。在本示例中，建立一個用於演示的新示例。按一下OK按鈕以進行儲存。

- 名稱:AES256_SHA256
- 加密:AES、AES256
- 完整性雜湊：SHA1、SHA256



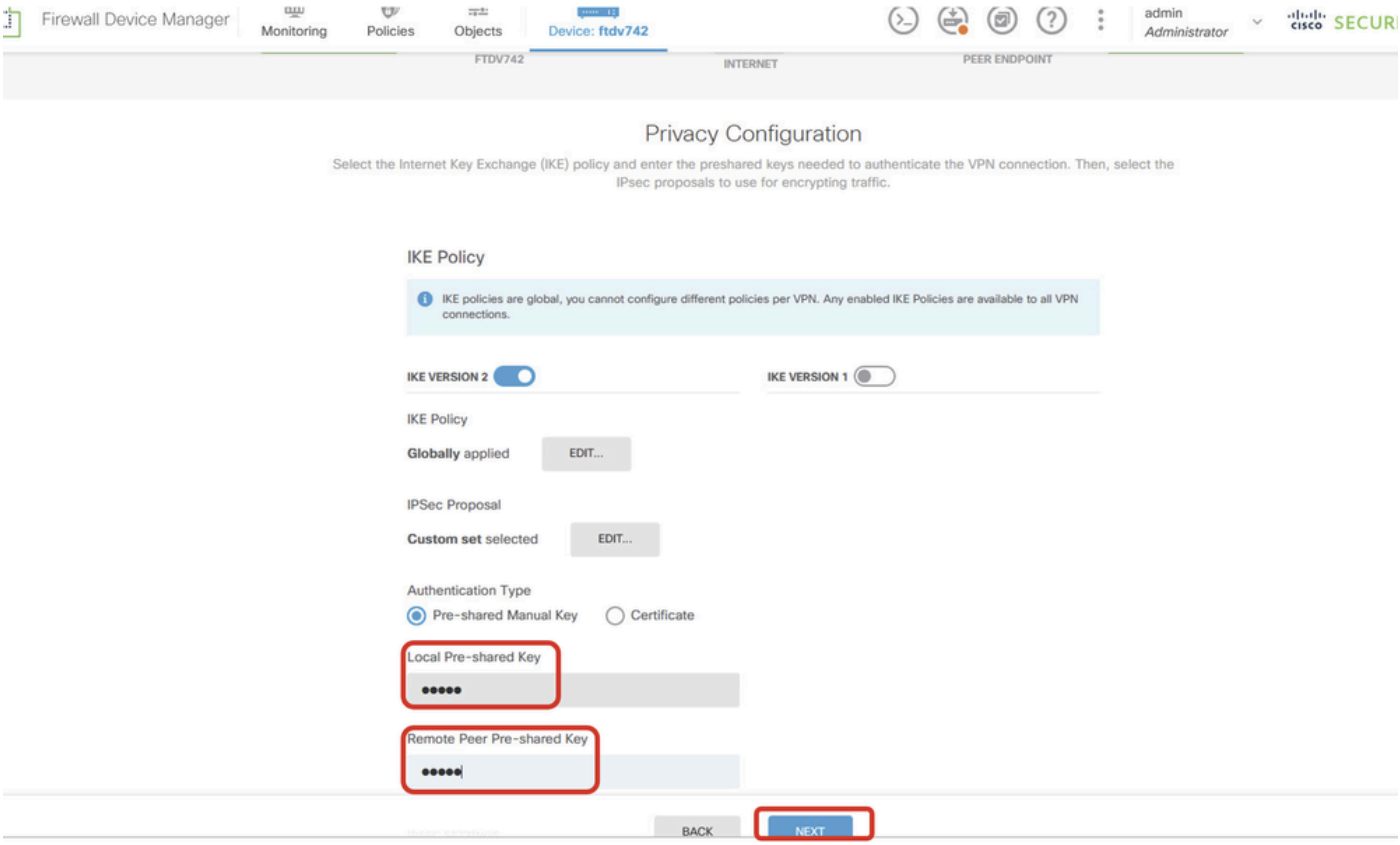
Site1FTD_Add_New_IKE_Proposal



Site1FTD_Enable_New_IKE_Proposal

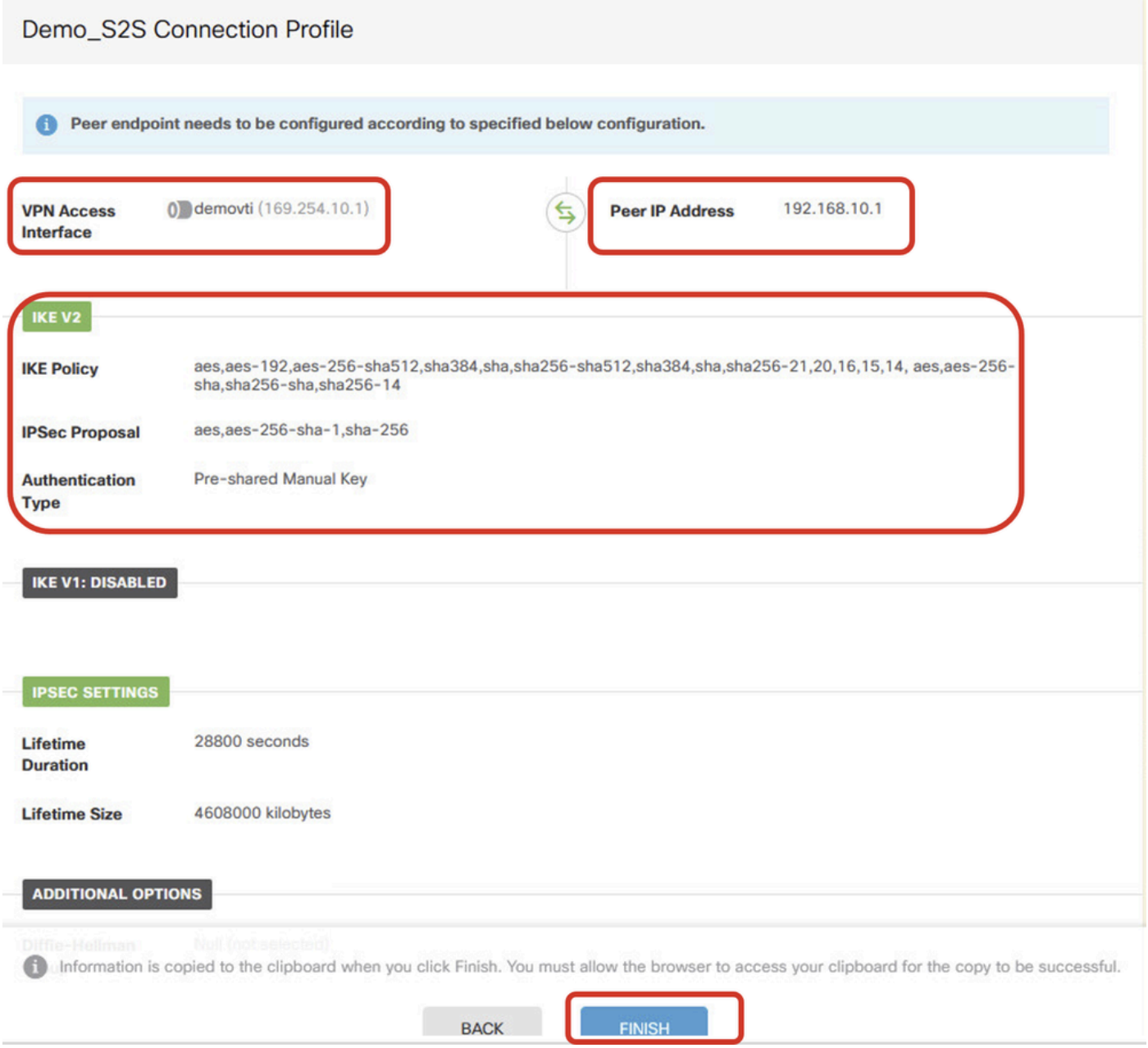
步驟5.6.向下滾動頁面並配置預共用金鑰。按一下「下一步」按鈕。

記下此預共用金鑰，稍後在Site2 FTD上配置它。



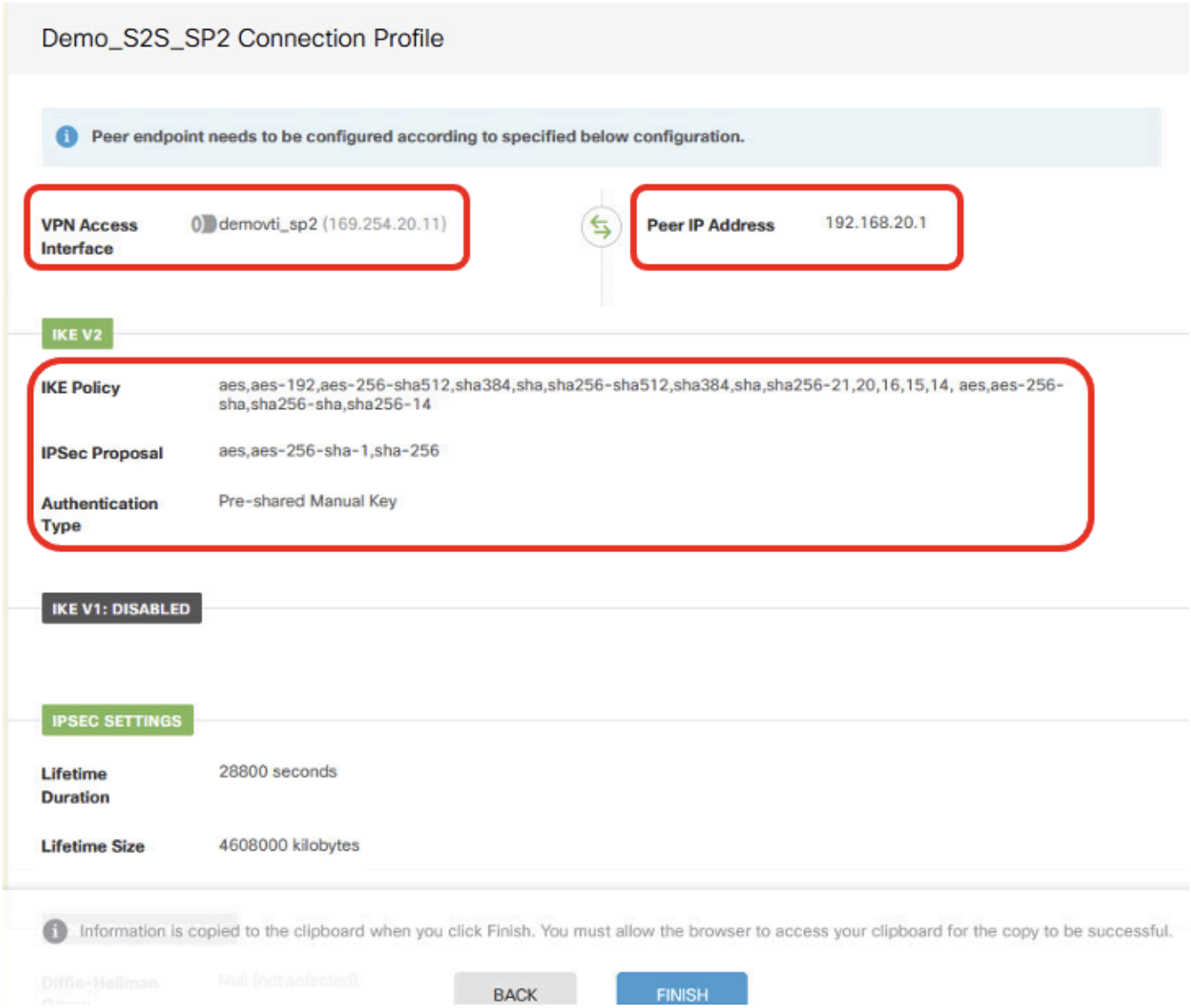
Site1FTD_Configure_Pre_Shared_Key

步驟5.7.檢查VPN配置。如果需要修改任何內容，請按一下BACK按鈕。如果一切正常，請按一下FINISH按鈕。



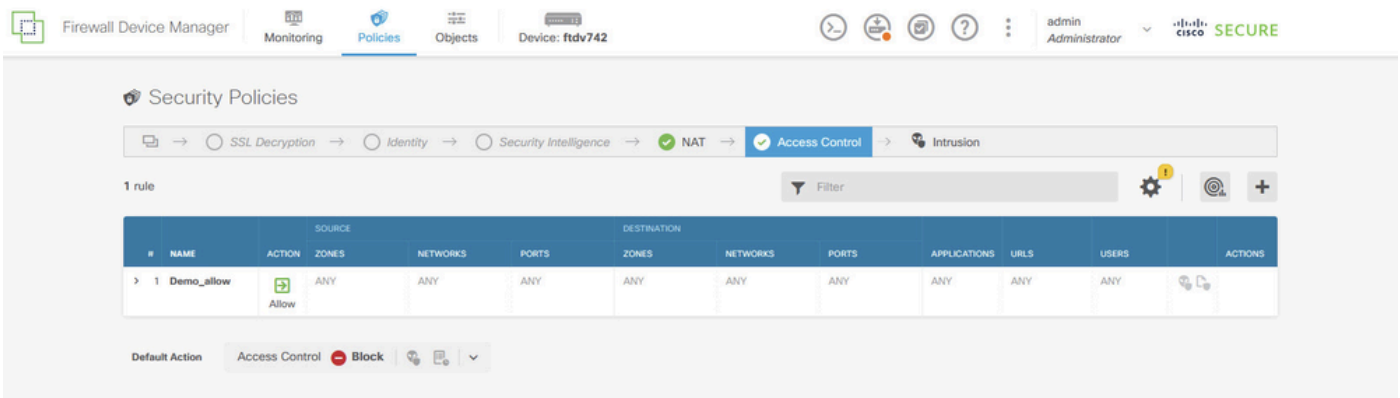
Site1FTD_ISP1_Review_VPN_Config_Summary

步驟6.重復步驟5.以便通過ISP2建立新的站點到站點VPN。



Site1FTD_ISP2_Review_VPN_Config_Summary

步驟7.建立存取控制規則，以允許流量通過FTD。在本例中，允許所有用於演示。根據您的實際需要修改您的策略。



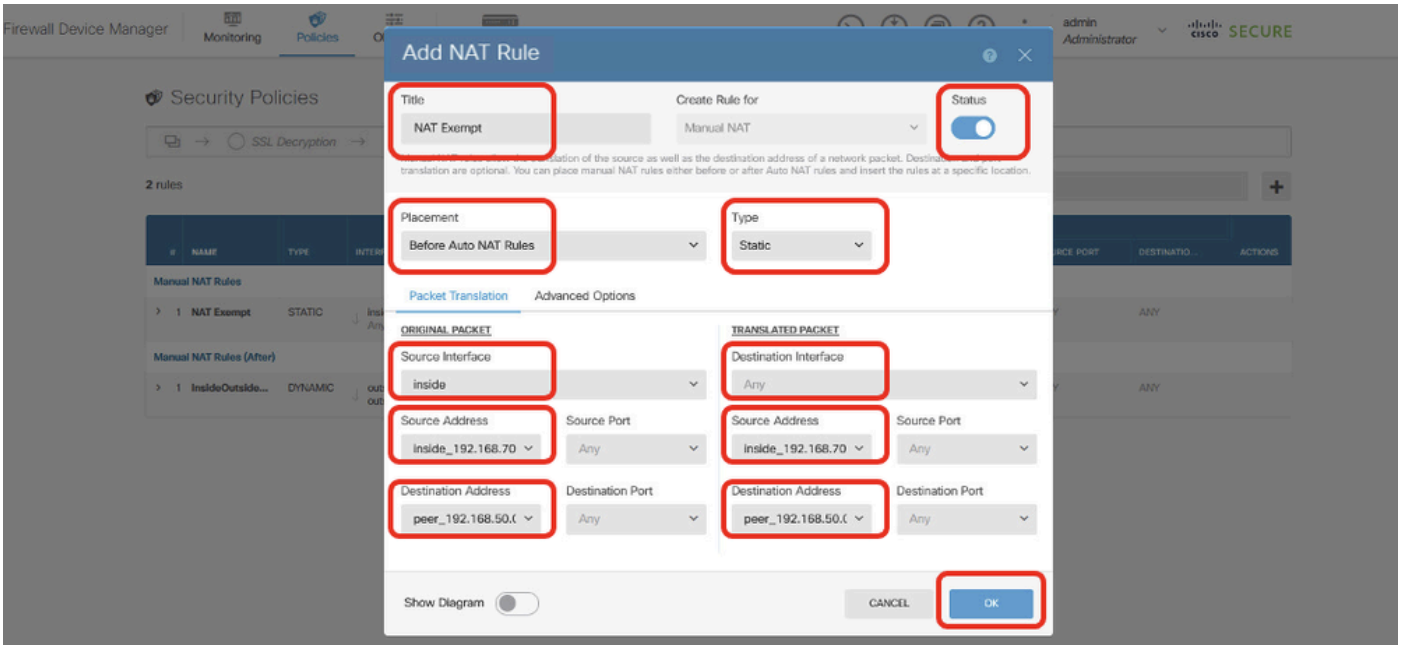
Site1FTD_Allow_Access_Control_Rule_Example

步驟8.(可選)如果為客戶端配置了動態NAT以訪問網際網路，請為FTD上的客戶端流量配置NAT豁免規則。

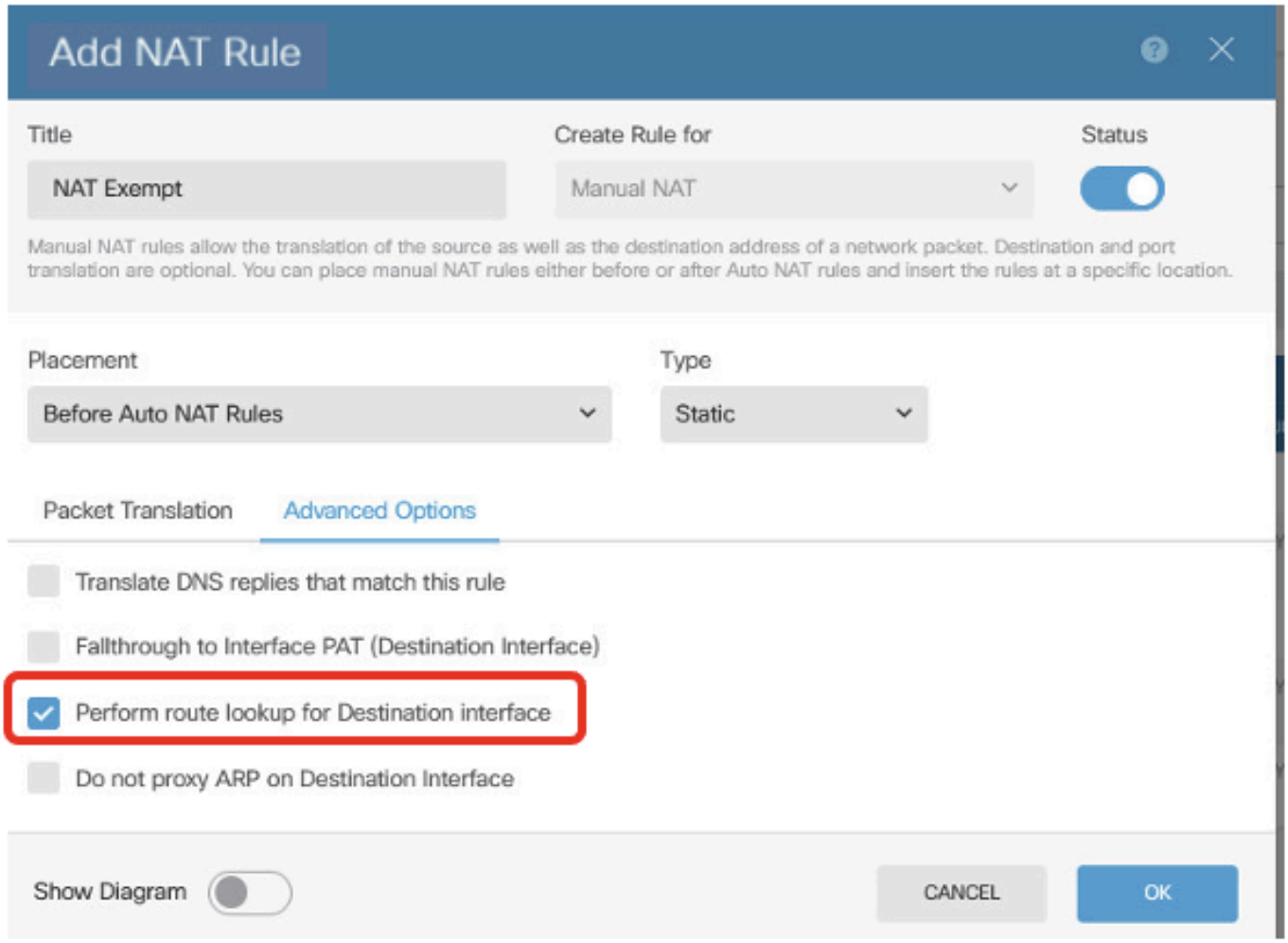
出於演示目的，本示例中為客戶端配置了動態NAT以訪問網際網路。因此需要NAT豁免規則。

導航到Policies > NAT。按一下+按鈕。提供詳細資訊，然後按一下「OK」。

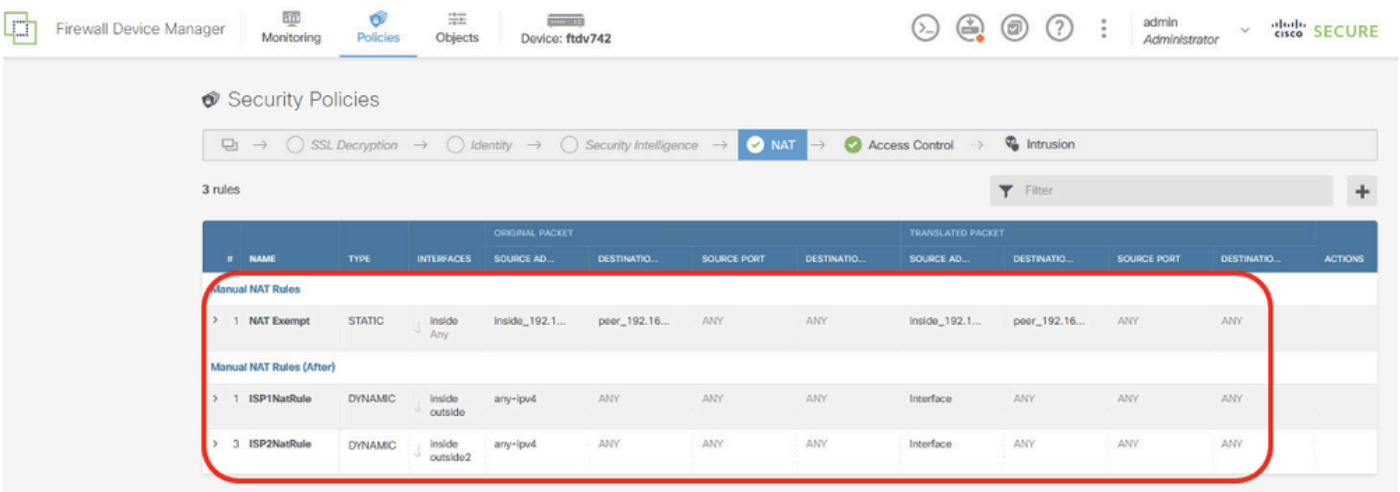
- Title:NAT免除
- 位置：自動NAT規則之前
- Type:靜態
- 源介面：INSIDE
- 目標：任意
- 原始源地址：192.168.70.0/24
- 轉換後的源地址：192.168.70.0/24
- 原始目標地址：192.168.50.0/24
- 轉換的目標地址：192.168.50.0/24
- 啟用Route-Lookup



Site1FTD_Nat_Exempt_Rule



Site1FTD_Nat_Exempt_Rule_2



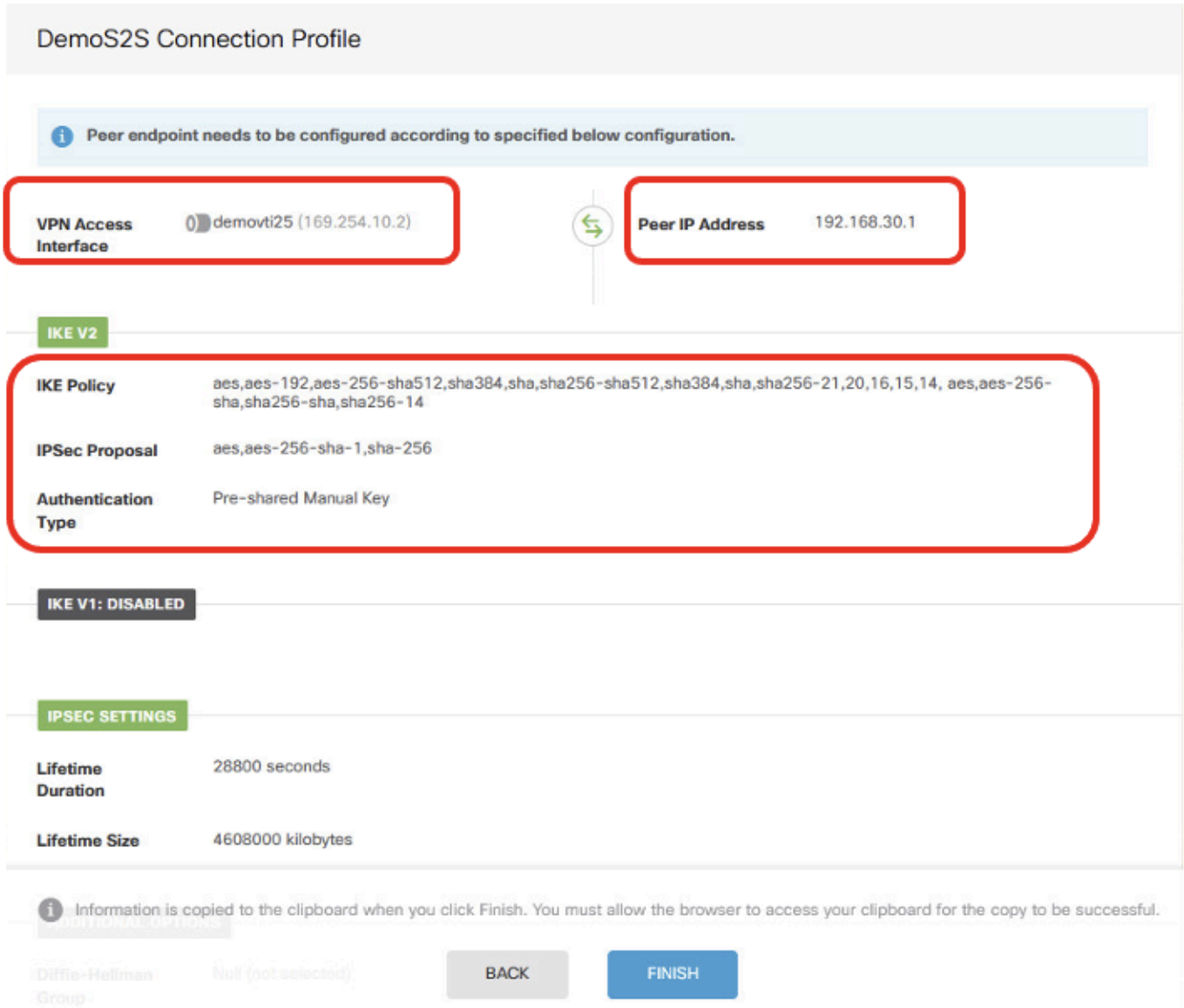
Site1FTD_Nat_Rule_Overview

步驟9.部署配置更改。

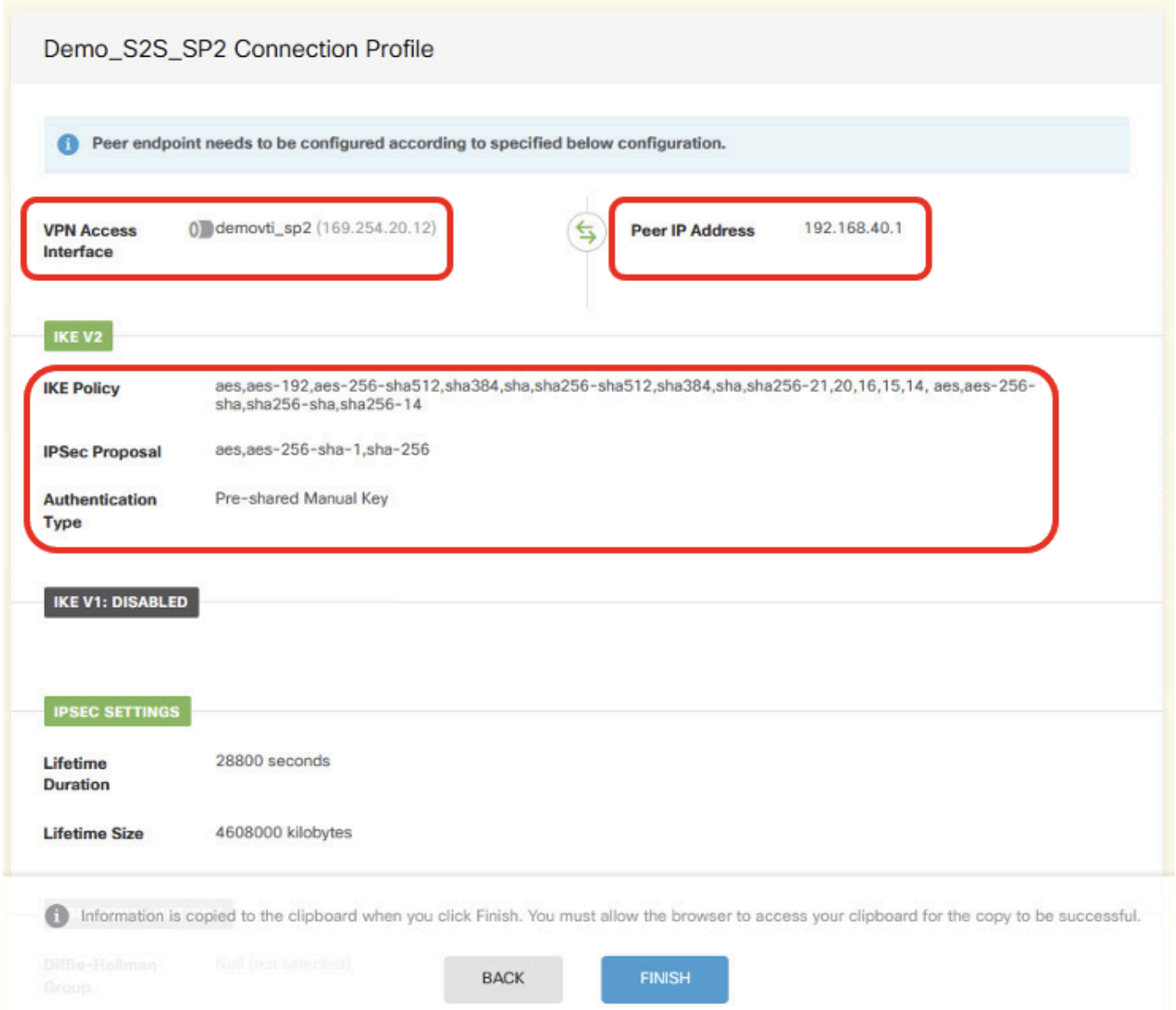
Site1FTD_Deployment_Changes

站點2 FTD VPN配置

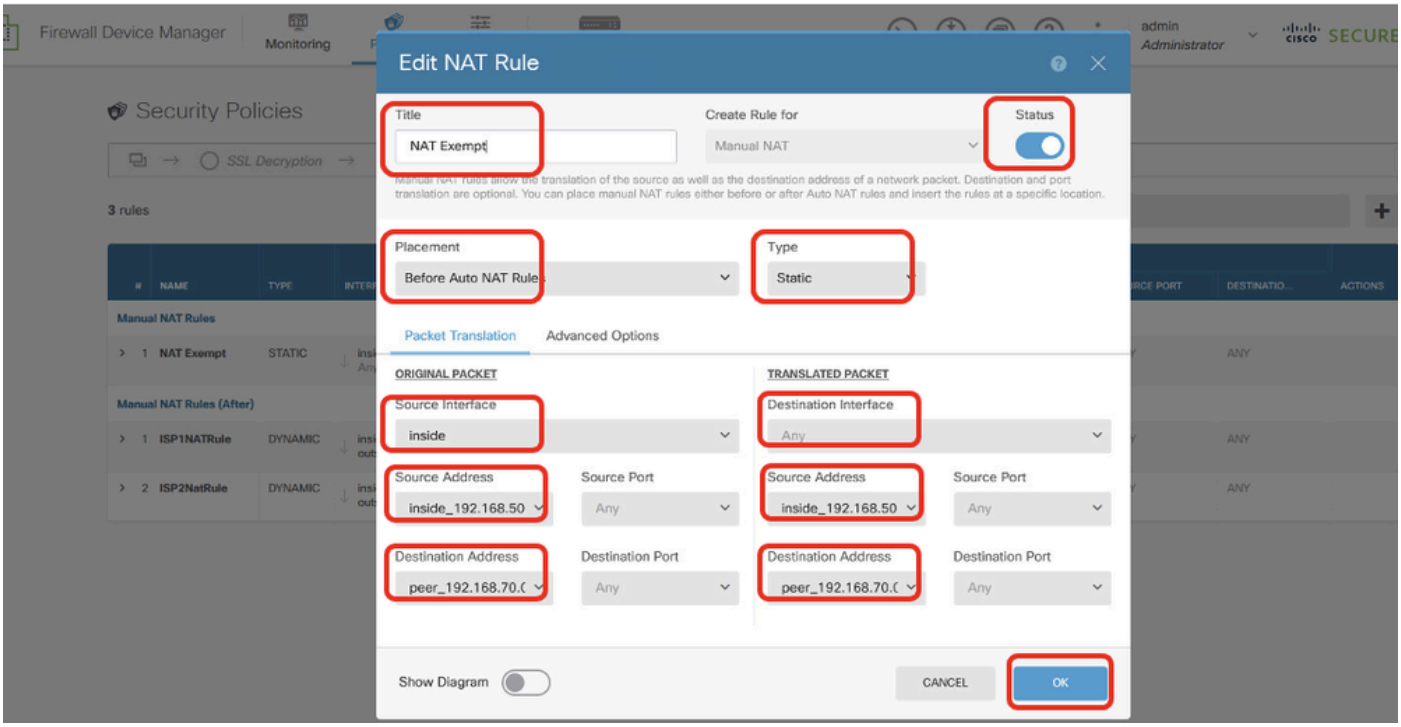
步驟10.使用站點2 FTD的相應引數重複步驟1到步驟9。



Site2FTD_ISP1_Review_VPN_Config_Summary



Site2FTD_ISP2_Review_VPN_Config_Summary

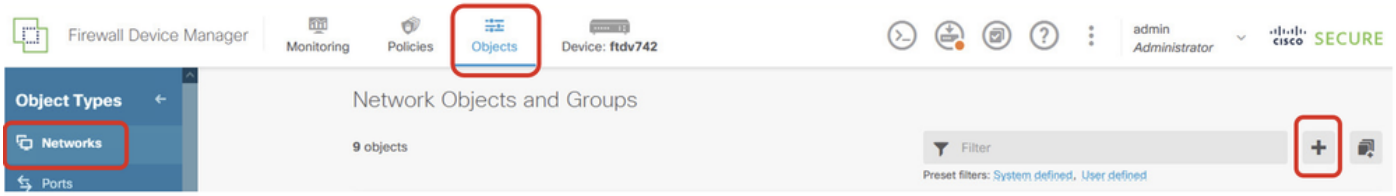


Site2FTD_Nat_Exempt_Rule

PBR上的配置

站點1 FTD PBR配置

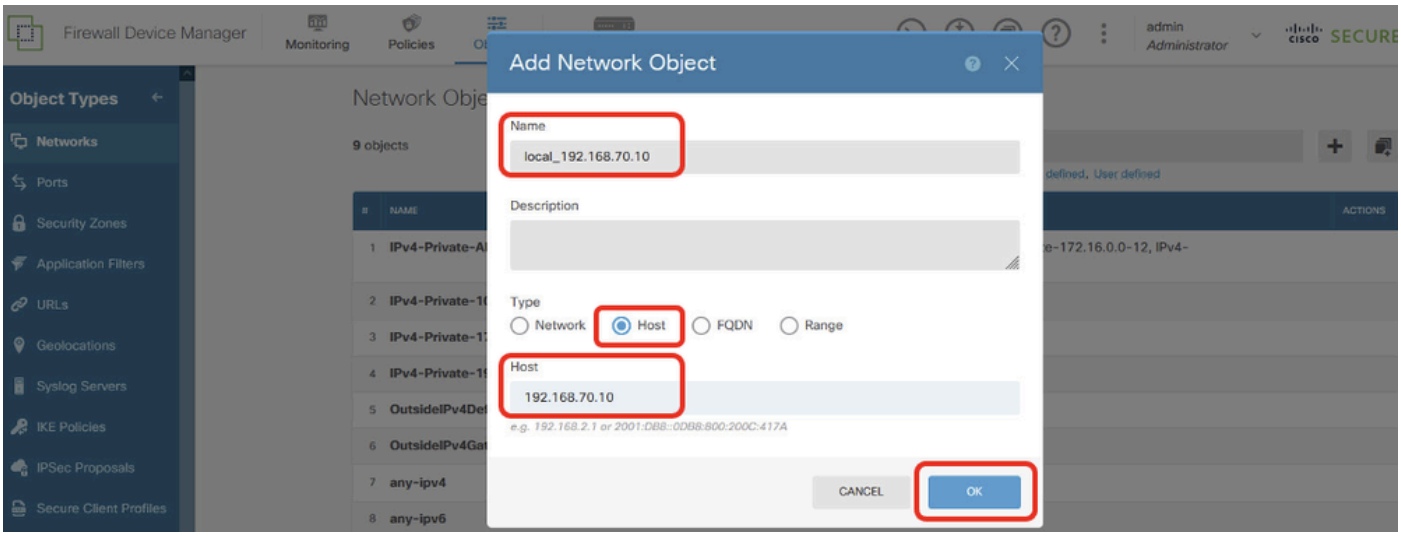
步驟11.為Site1 FTD建立要由PBR訪問清單使用的新網路對象。導航到對象>網路，然後按一下+按鈕。



Site1FTD_Create_Network_Object

步驟 11.1. 建立Site1 Client2 IP地址的對象。提供必要資訊。按一下OK按鈕。

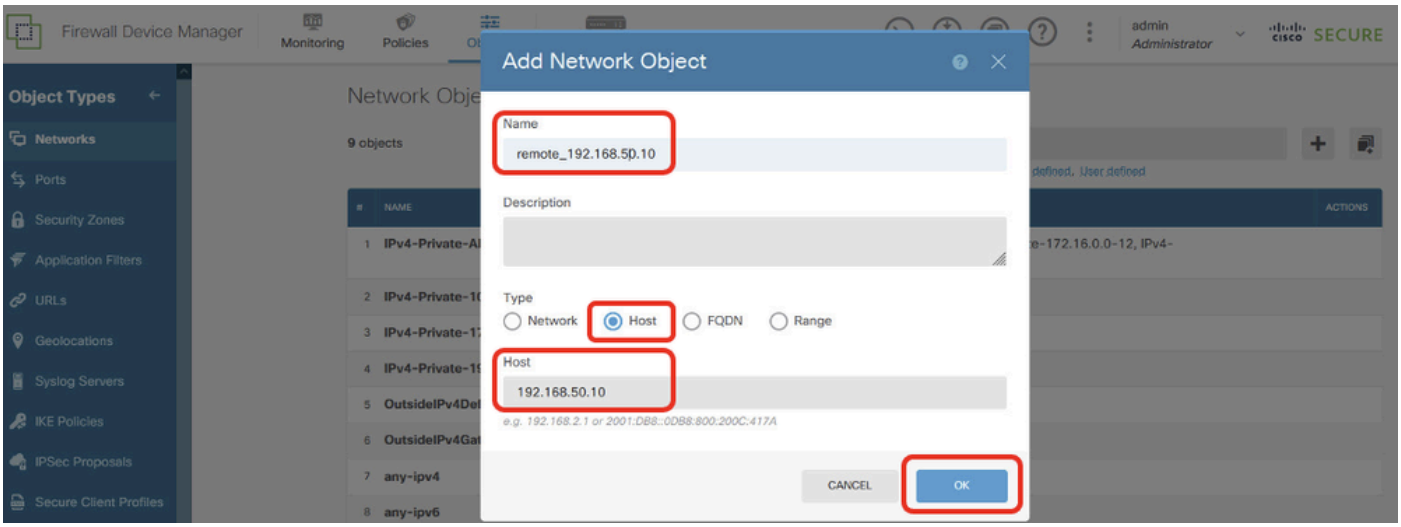
- 名稱:local_192.168.70.10
- Type:主機
- 主機：192.168.70.10



Site1FTD_Site1FTD_PBR_LocalObject

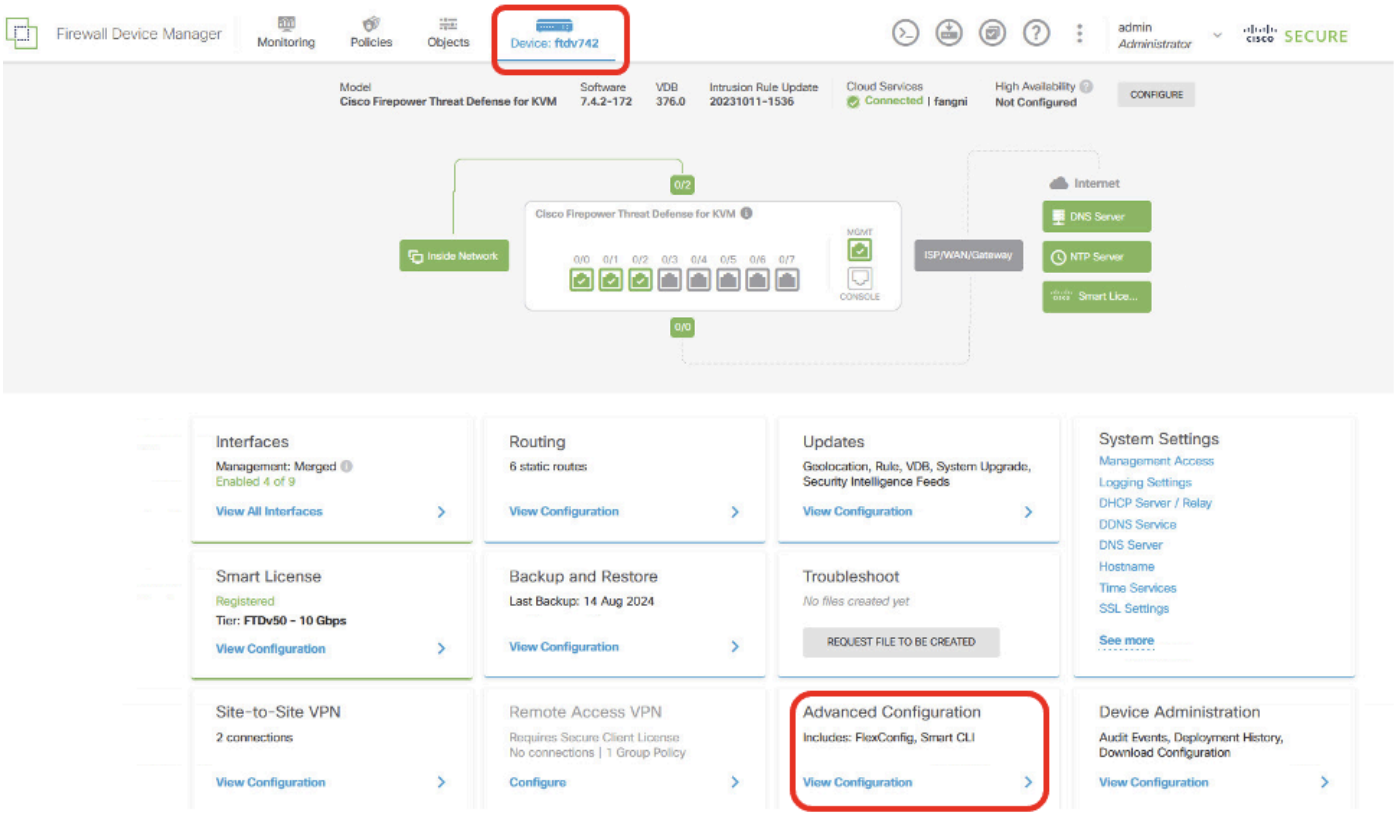
步驟11.2.建立Site2 Client2 IP地址的對象。提供必要資訊。按一下「OK」按鈕。

- 名稱:remote_192.168.50.10
- Type:主機
- 主機：192.168.50.10



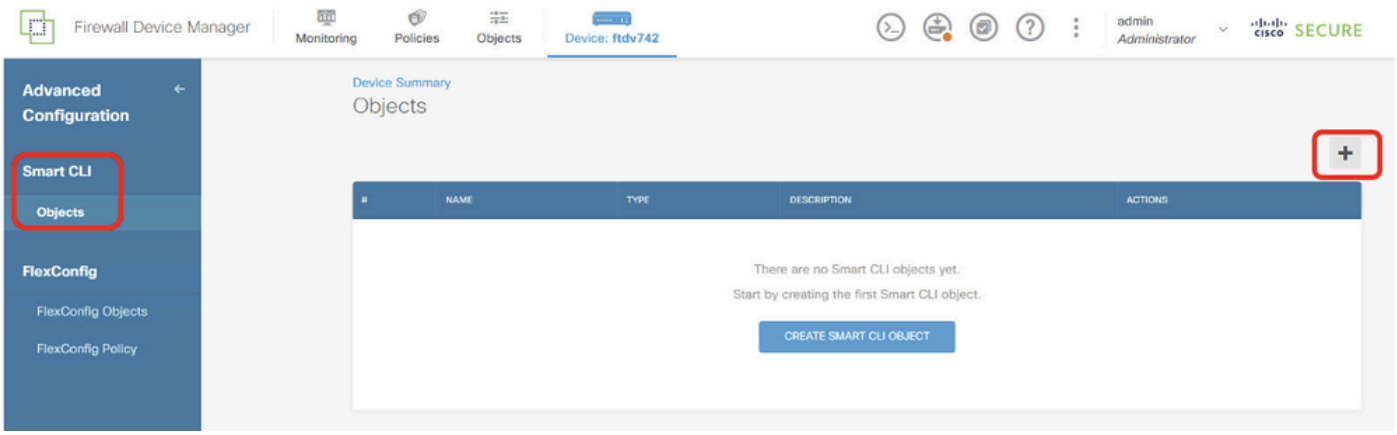
Site1FTD_PBR_RemoteObject

步驟12.為PBR建立擴展訪問清單。導覽至Device > Advanced Configuration。按一下「View Configuration」。



Site1FTD_View_Advanced_Configuration

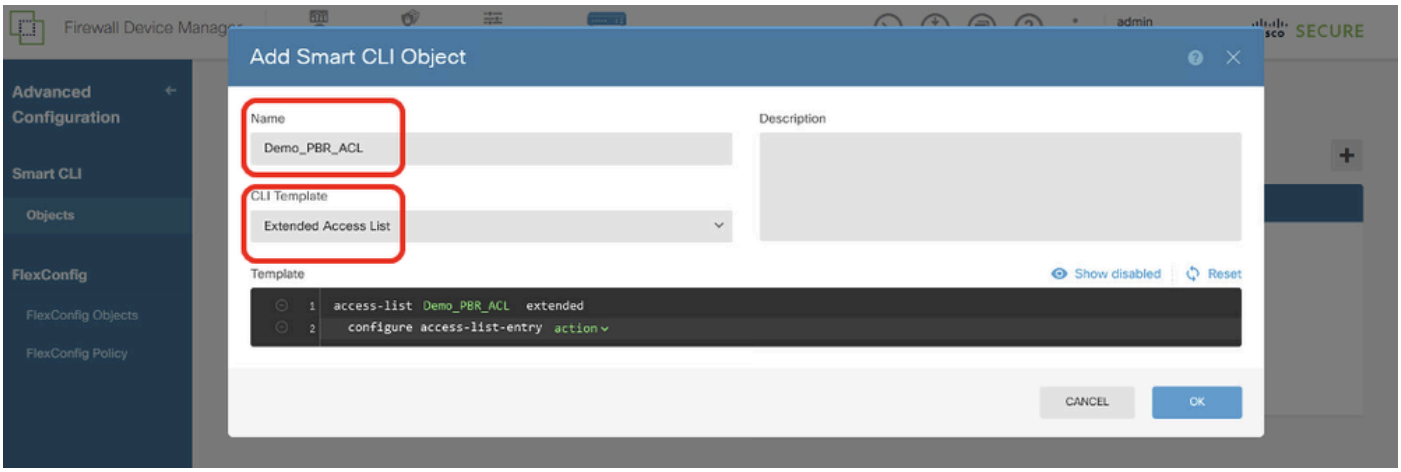
步驟12.1.導航到Smart CLI > Objects。按一下+按鈕。



Site1FTD_Add_SmartCLI_Object

步驟12.2.輸入對象的名稱，然後選擇CLI模板。

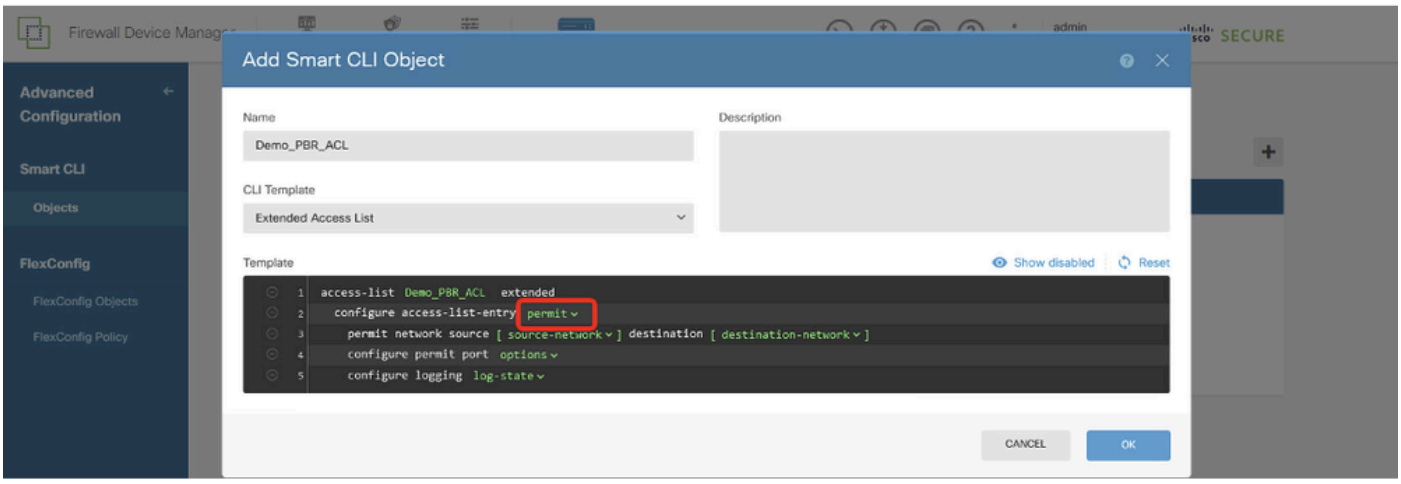
- 名稱:Demo_PBR_ACL
- CLI模板：擴展訪問清單



Site1FTD_Create_PBR_ACL_1

步驟12.3.導覽至Template並進行設定。按一下OK按鈕以進行儲存。

第2行，按一下action。選擇permit。

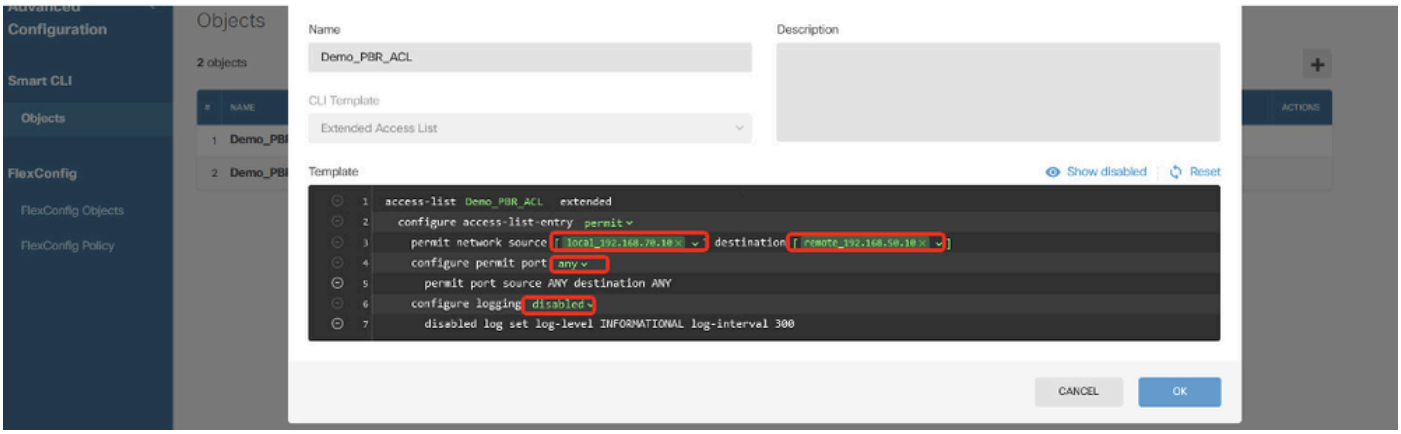


Site1FTD_Create_PBR_ACL_2

第3行，按一下source-network。選擇local_192.168.70.10。按一下destination-network。選擇remote_192.168.50.10。

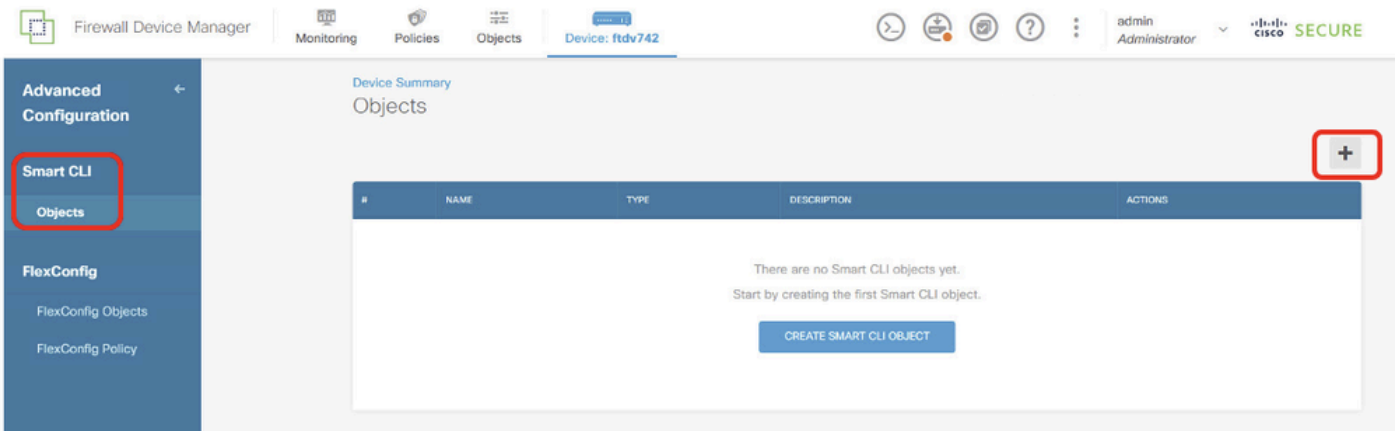
第4行，按一下options並選擇any。

第6行，按一下log-state 並選擇disabled。



Site1FTD_Create_PBR_ACL_3

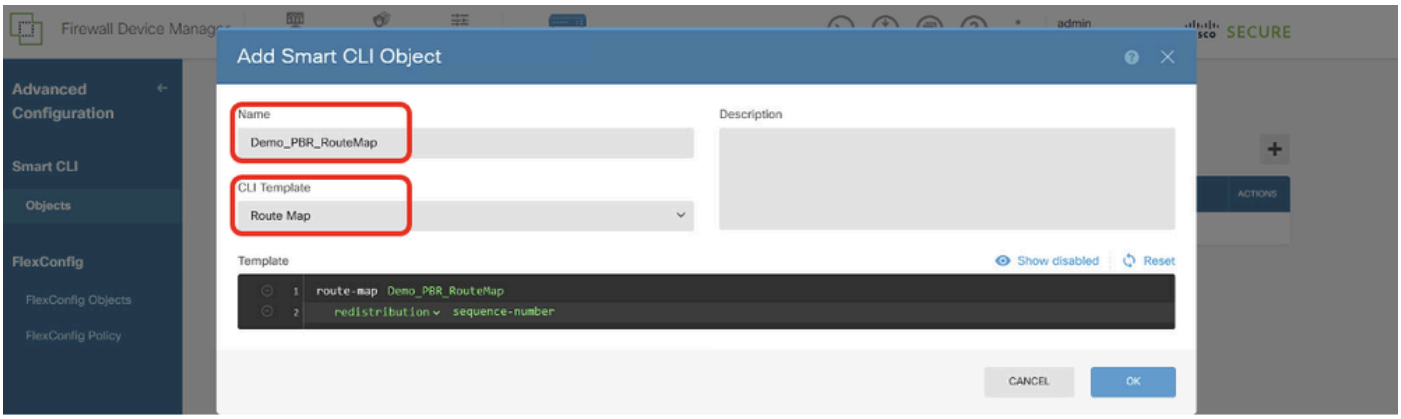
步驟13.為PBR建立路由對映。導航到Device > Advanced Configuration > Smart CLI > Objects。按一下+按鈕。



Site1FTD_Add_SmartCLI_Object

步驟13.1.輸入對象的名稱，然後選擇CLI模板。

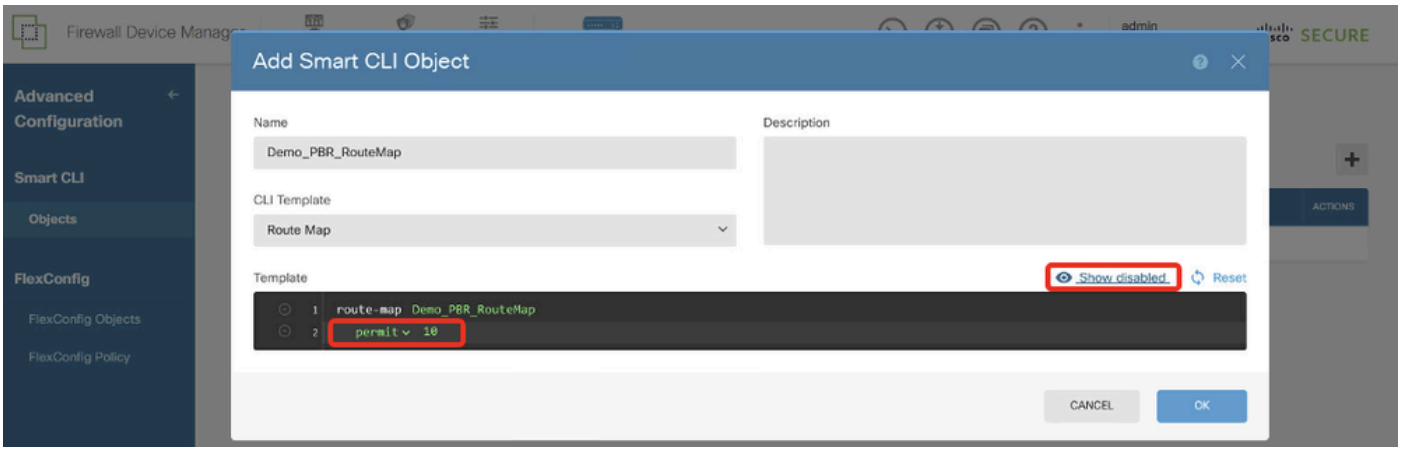
- 名稱:Demo_PBR_RouteMap
- CLI模板：路由對映



Site1FTD_Create_PBR_RouteMap_1

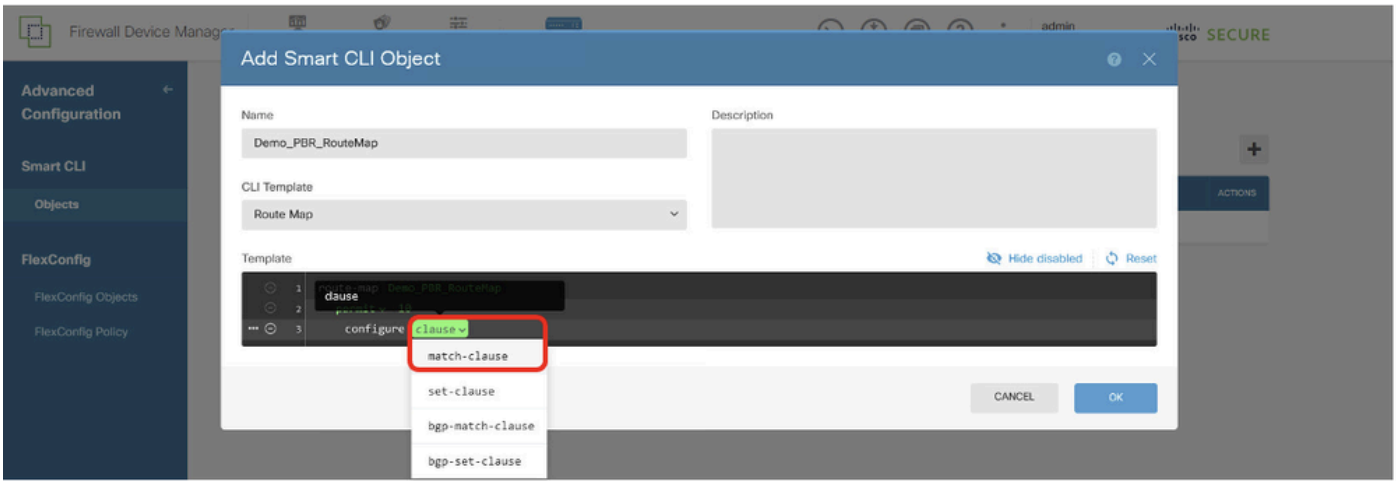
步驟13.2.導覽至Template並進行設定。按一下OK按鈕進行儲存。

第2行，按一下redistribution。選擇permit。按一下「sequence-number, manual input 10」。按一下「Show disabled」。



Site1FTD_Create_PBR_RouteMap_2

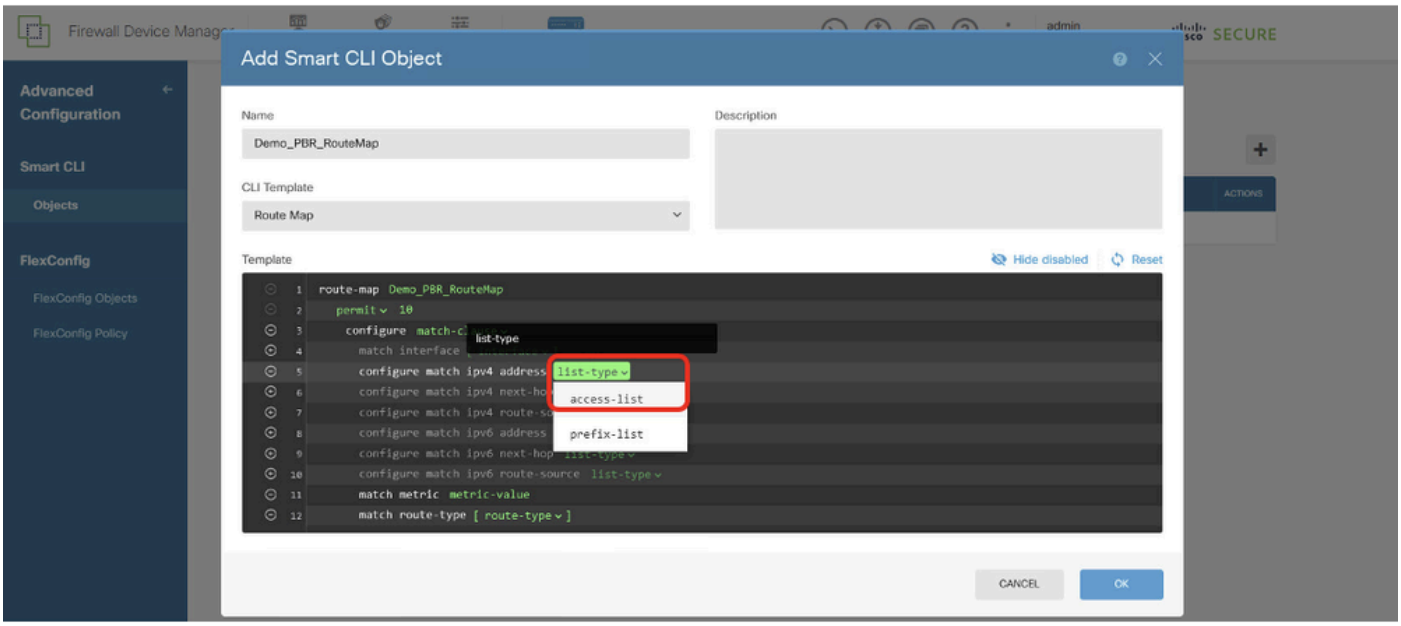
第3行，按一下+ 啟用該行。按一下clause。選擇match-clause。



Site1FTD_Create_PBR_RouteMap_3

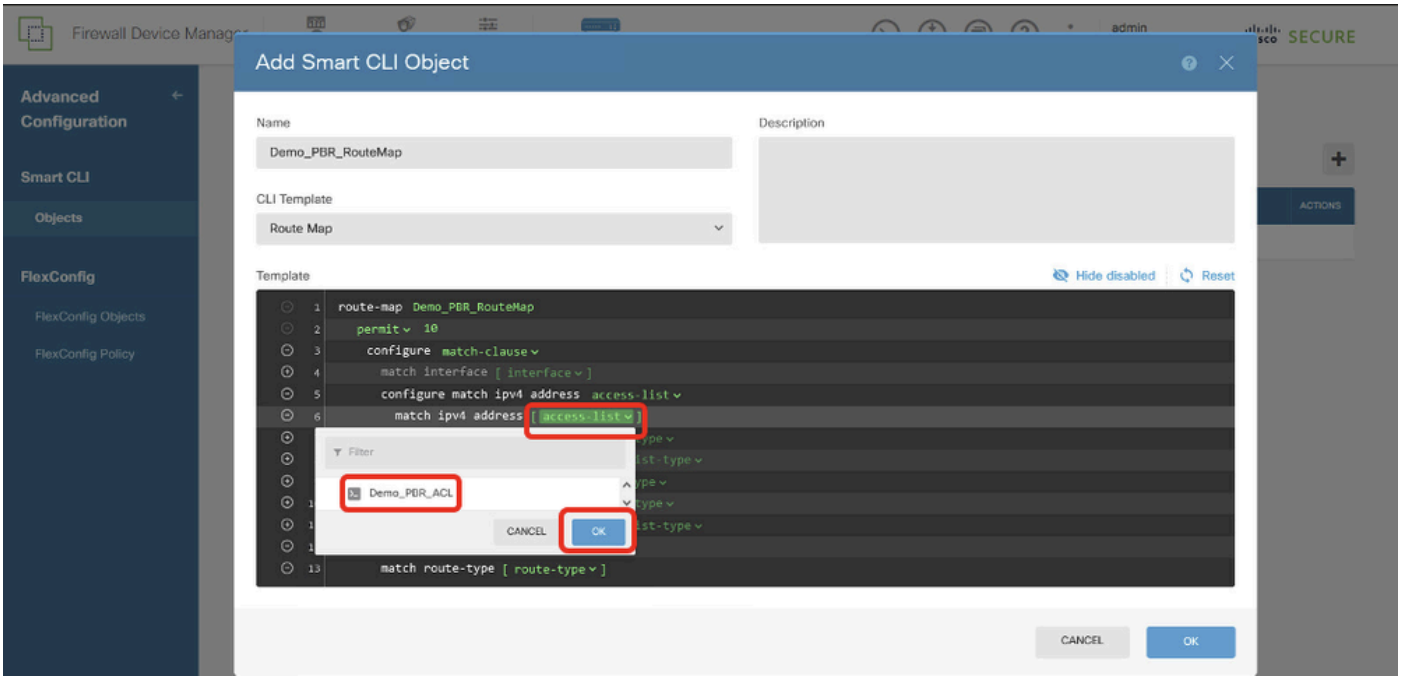
第4行，按一下-禁用該行。

第5行，按一下+啟用該行。按一下「list-type」。選擇access-list。



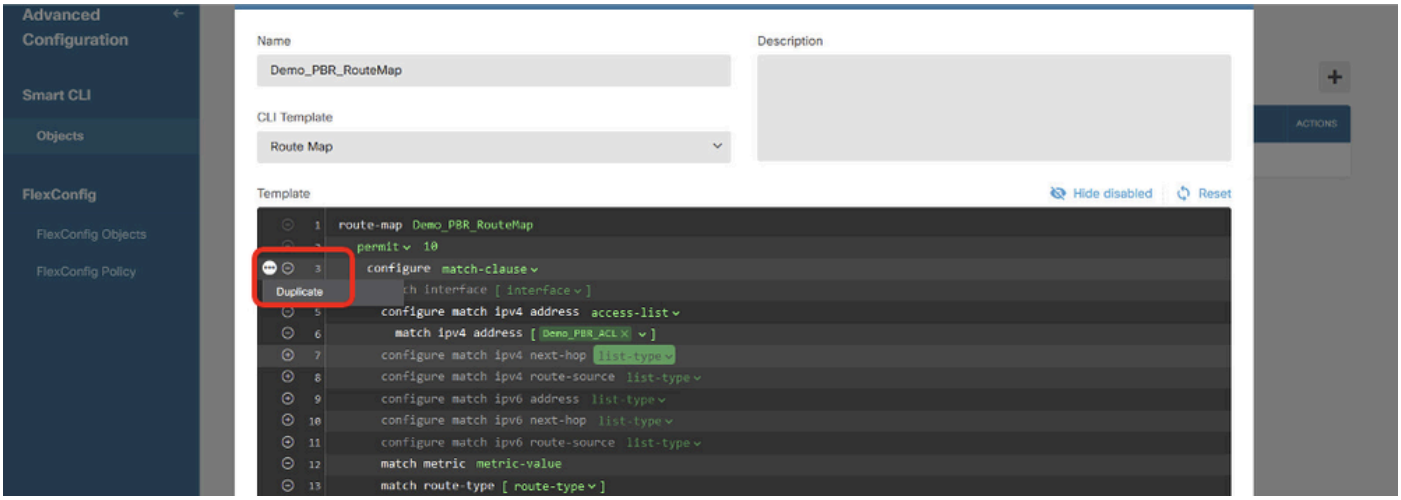
Site1FTD_Create_PBR_RouteMap_4

第6行，按一下access-list。選擇在步驟12中建立的ACL名稱。在本例中，它是Demo_PBR_ACL。



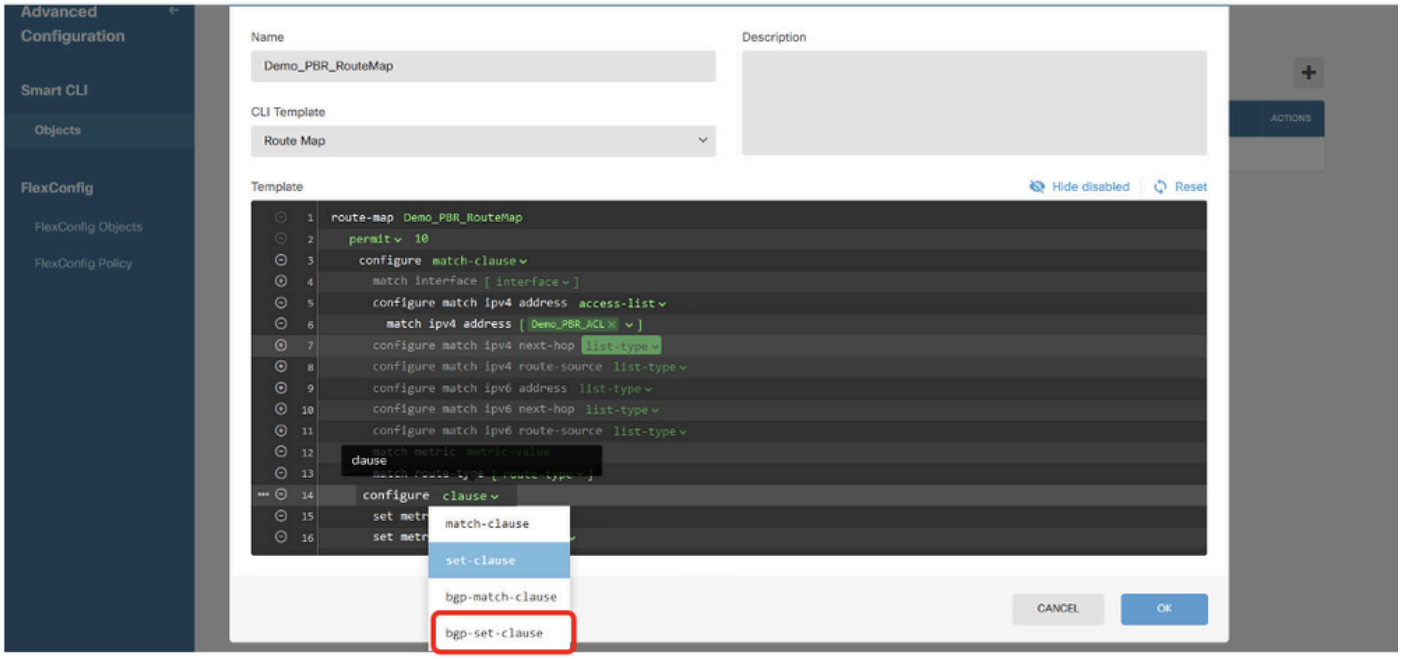
Site1FTD_Create_PBR_RouteMap_5

移回第3行。按一下選項... 按鈕並選擇複製。



Site1FTD_Create_PBR_RouteMap_6

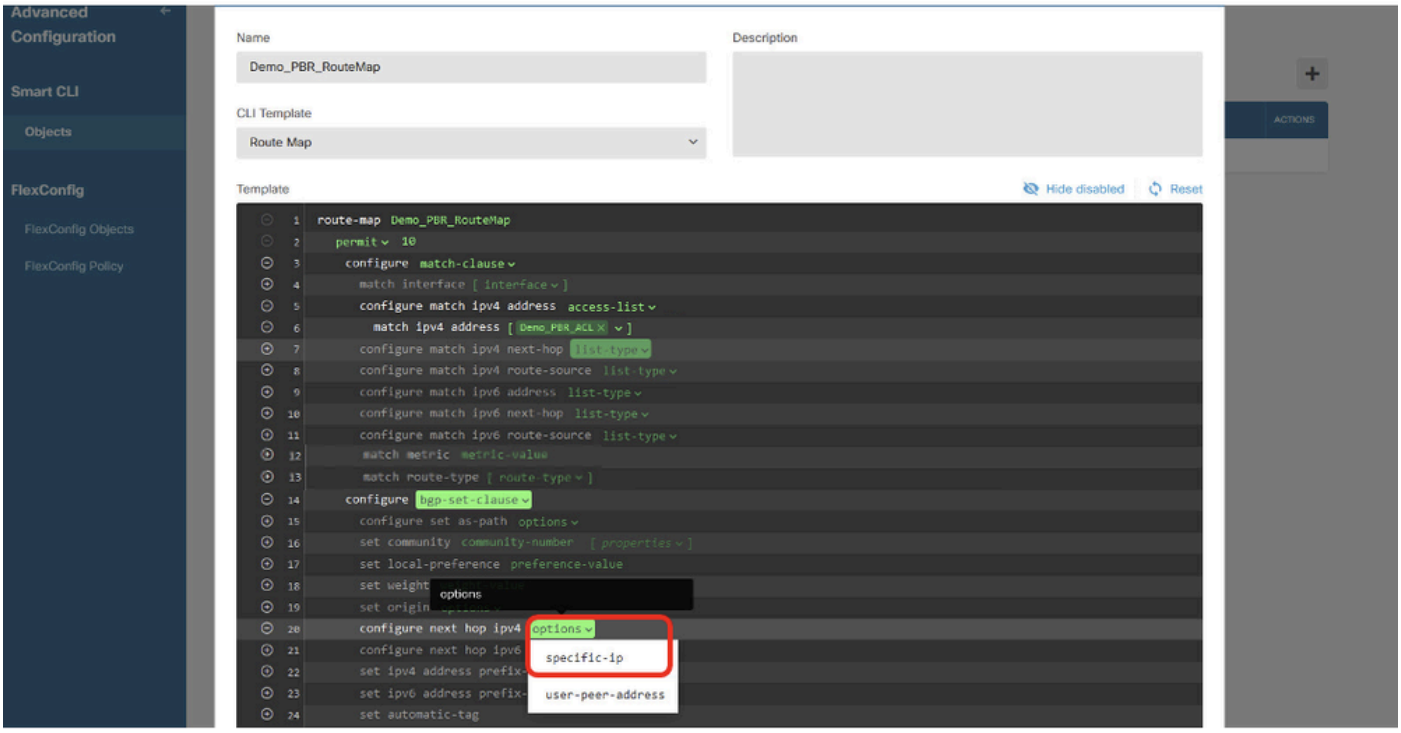
在第14行中，按一下clause並選擇bgp-set-clause。



Site1FTD_Create_PBR_RouteMap_7

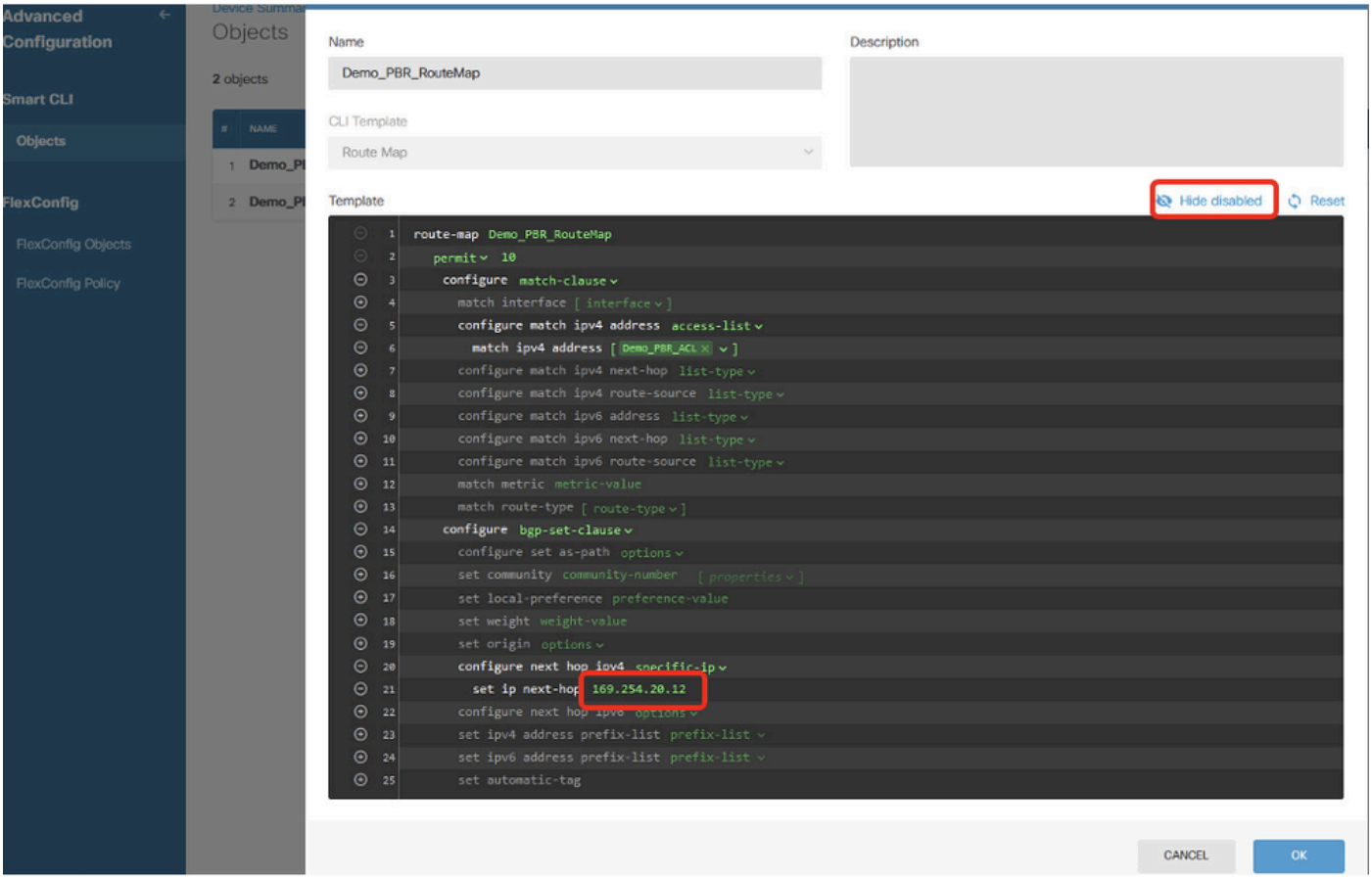
在行12、13、15、16、17、18、19、21、22、23、24中，按一下按鈕以禁用。

第20行，按一下options並選擇specific-ip。



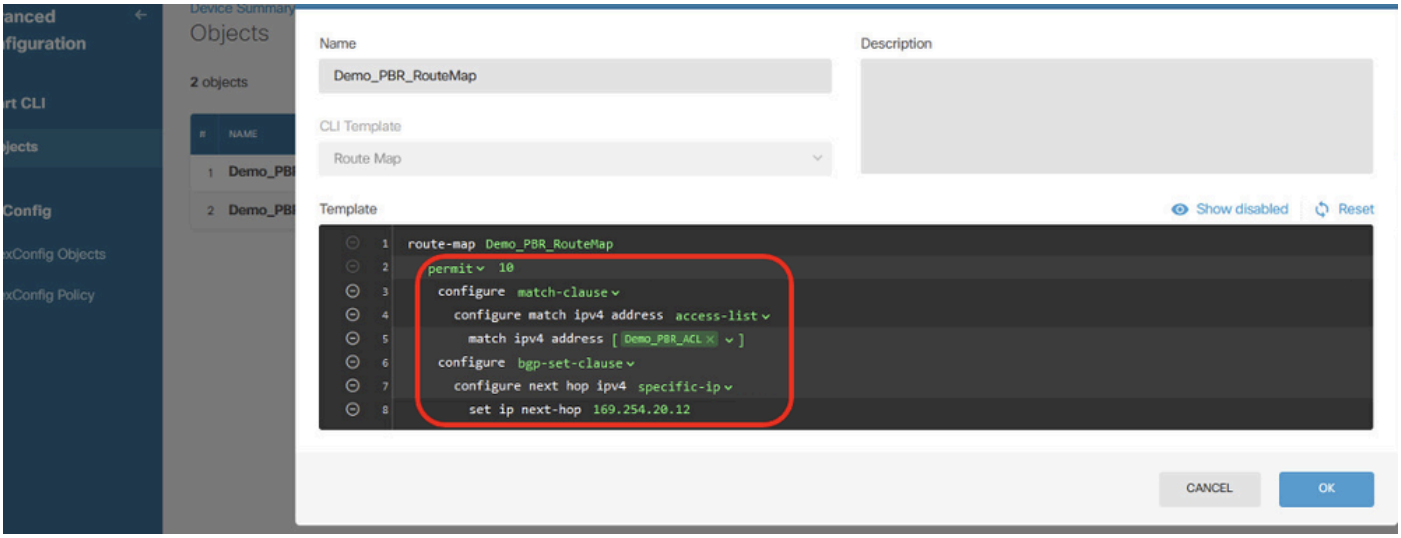
Site1FTD_Create_PBR_RouteMap_8

第21行，按一下ip-address。手動輸入下一跳IP地址。在本範例中，這是對等點Site2 FTD VTI通道2(169.254.20.12)的IP位址。 按一下Hide disabled。



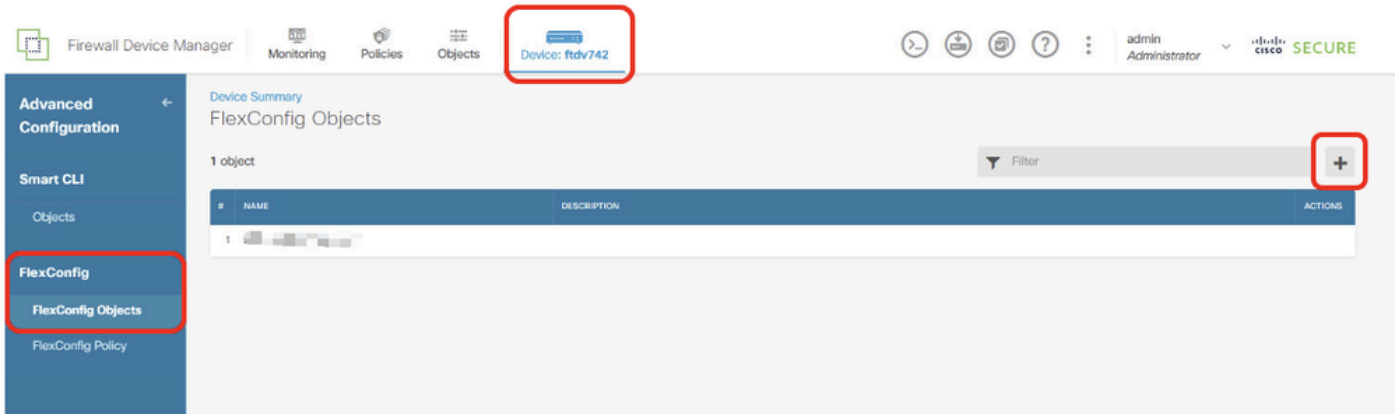
Site1FTD_Create_PBR_RouteMap_9

檢查路由對映的配置。



Site1FTD_Create_PBR_RouteMap_10

步驟14.為PBR建立FlexConfig對象。導航到Device > Advanced Configuration > FlexConfig Objects，然後點選+按鈕。



Site1FTD_Create_PBR_FlexObj_1

步驟14.1.輸入對象的名稱。在本例中，Demo_PBR_FlexObj。在Template和Negate Template編輯器中輸入命令列。

- 模板：

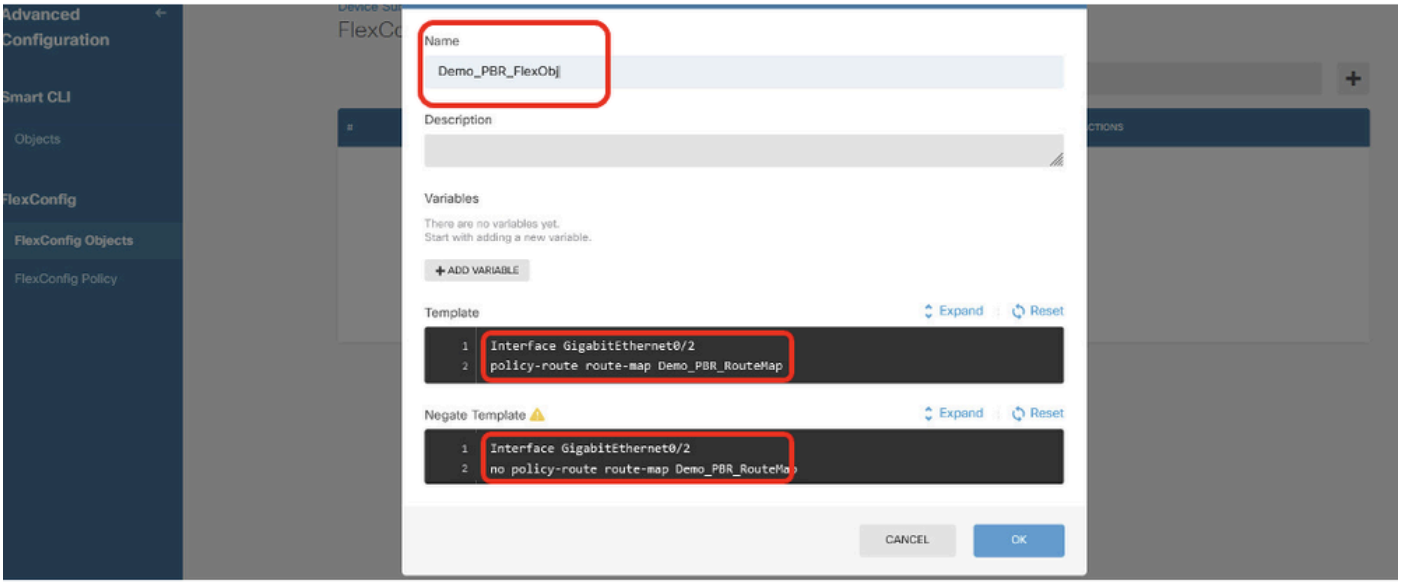
interface GigabitEthernet0/2

policy-route route-map Demo_PBR_RouteMap_Site2

- 否定模板：

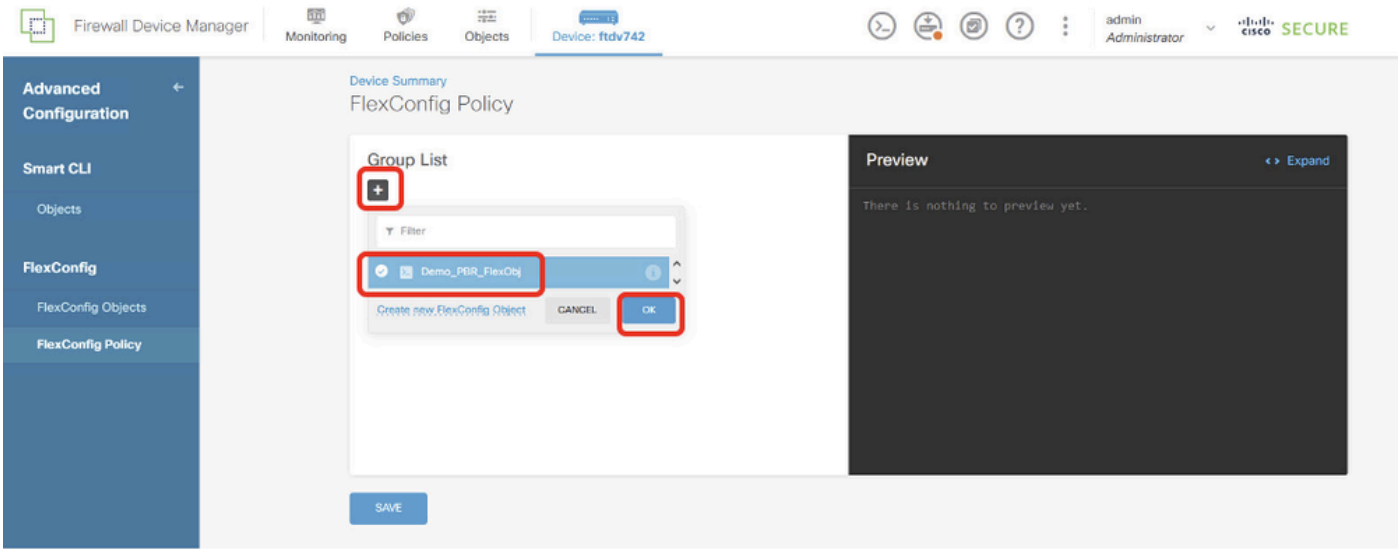
interface GigabitEthernet0/2

no policy-route route-map Demo_PBR_RouteMap_Site2



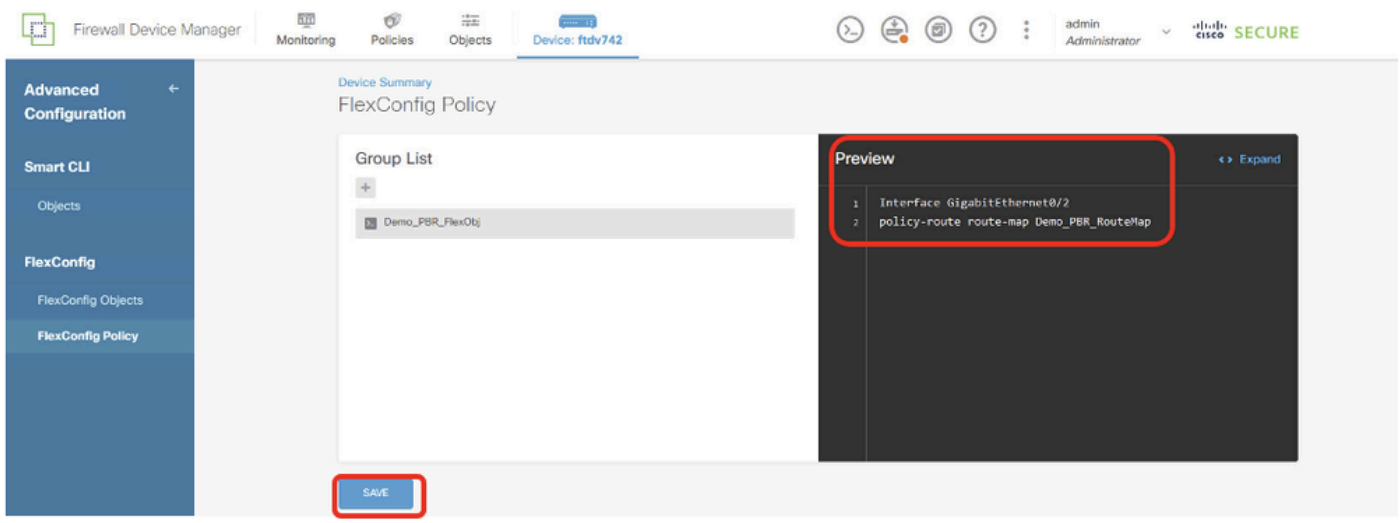
Site1FTD_Create_PBR_FlexObj_2

步驟15.為PBR建立FlexConfig策略。導航到Device > Advanced Configuration > FlexConfig Policy。按一下+按鈕。選擇在步驟14中建立的FlexConfig對象名稱。按一下OK按鈕。



Site1FTD_Create_PBR_FlexPolicy_1

步驟15.1.在預覽視窗中檢驗命令。如果條件良好，請按一下Save。



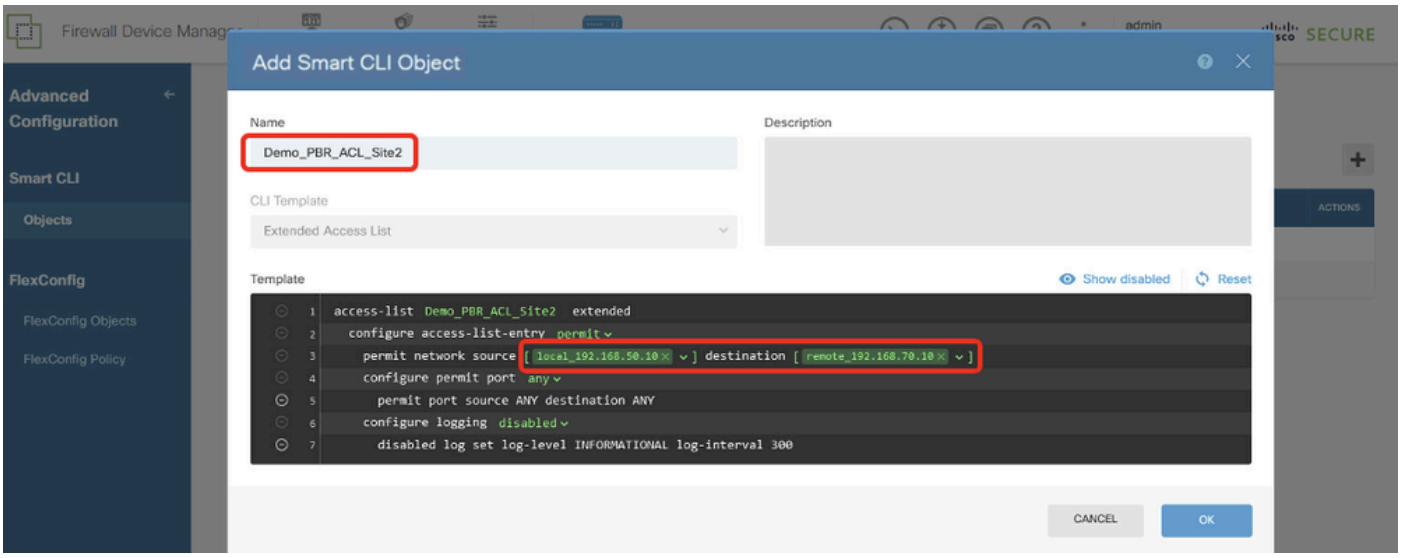
Site1FTD_Create_PBR_FlexPolicy_2

步驟16.部署配置更改。

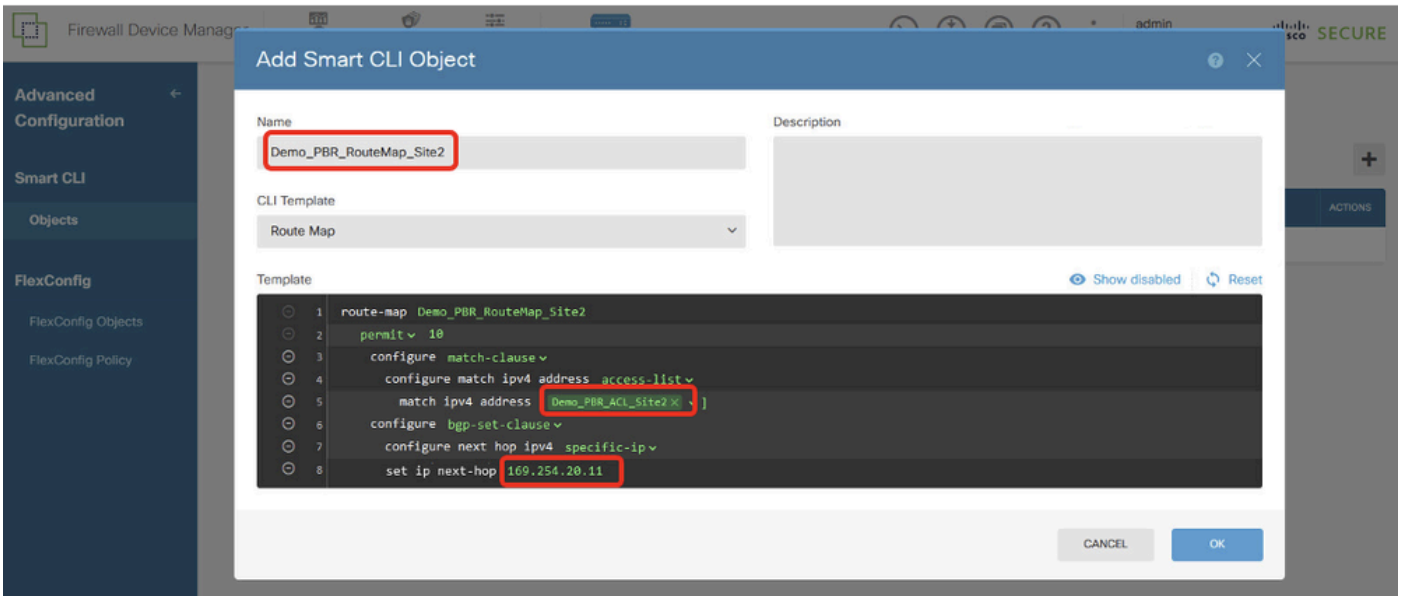
Site1FTD_Deployment_Changes

站點2 FTD PBR配置

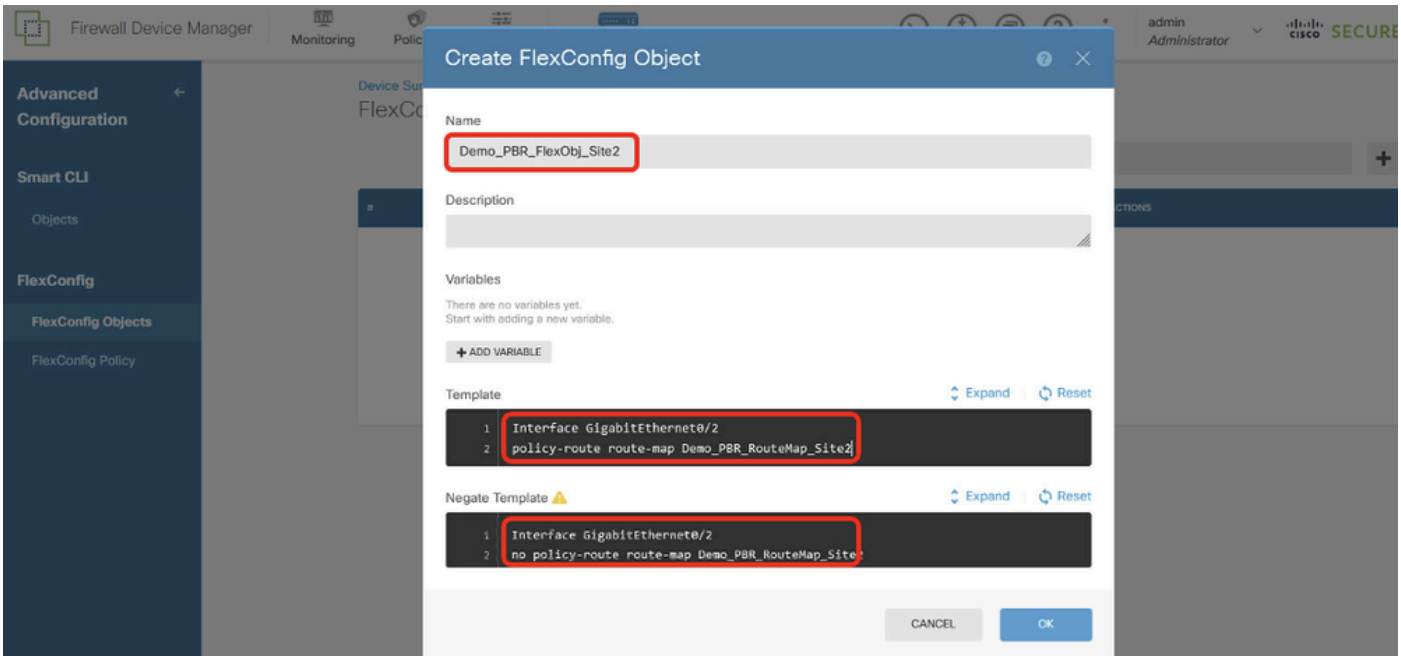
步驟17.重複步驟11至步驟16.以便使用站點2 FTD的相應引數建立PBR。



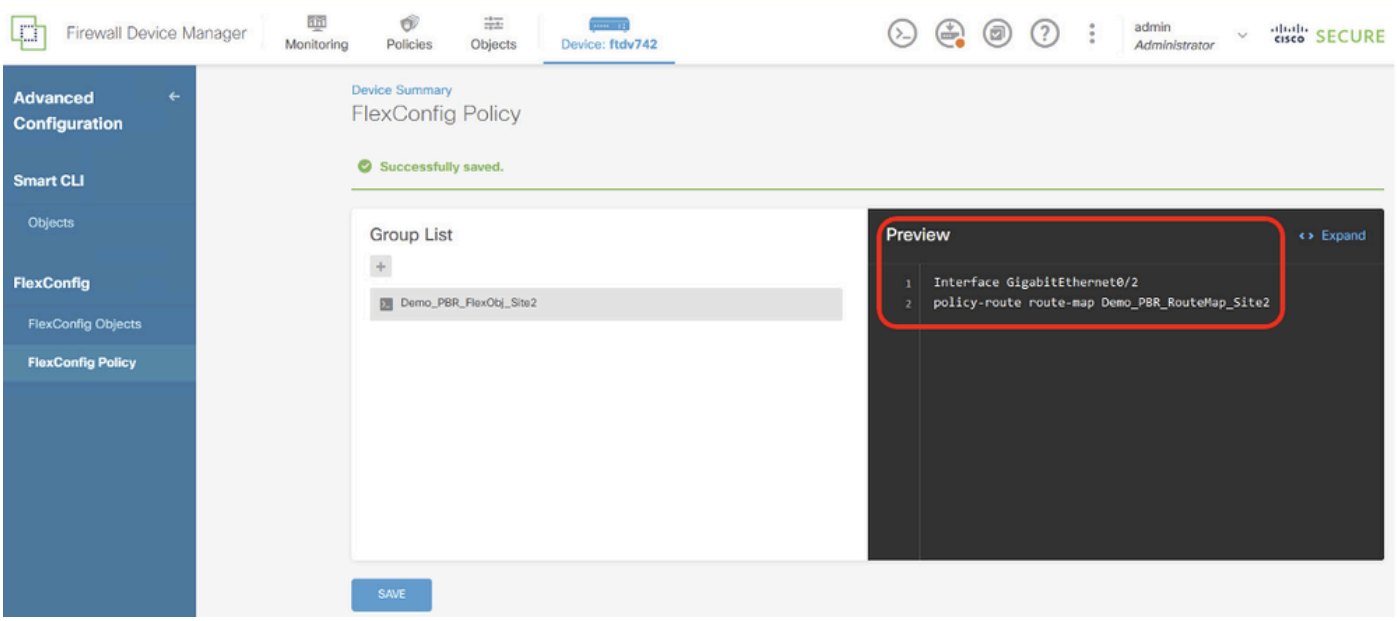
Site2FTD_Create_PBR_ACL



Site2FTD_Create_PBR_RouteMap



Site2FTD_Create_PBR_FlexObj

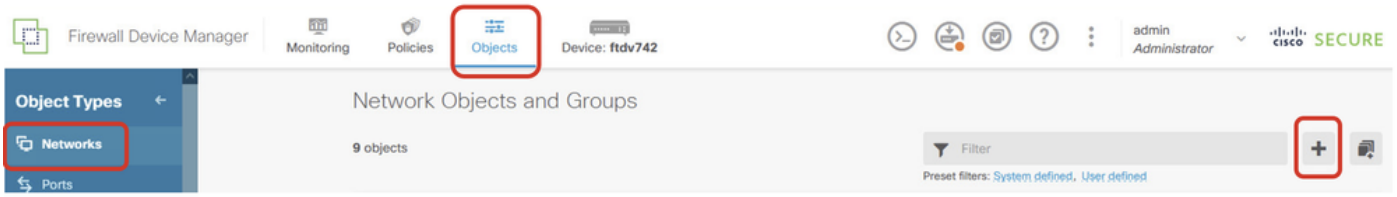


Site2FTD_Create_PBR_FlexPolicy

SLA監控器上的配置

Site1 FTD SLA監控器配置

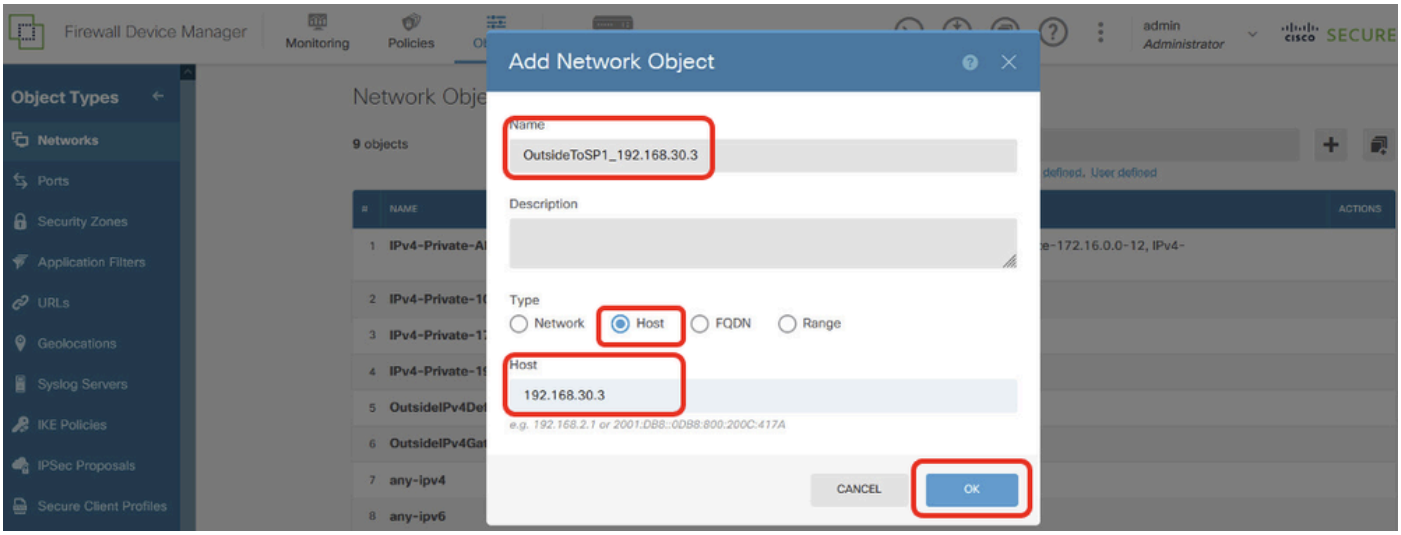
步驟18.為Site1 FTD的SLA監控器建立新的網路對象。導航到對象>網路，單擊+按鈕。



Site1FTD_Create_Network_Object

步驟18.1.為ISP1網關IP地址建立對象。提供必要資訊。按一下「OK」按鈕。

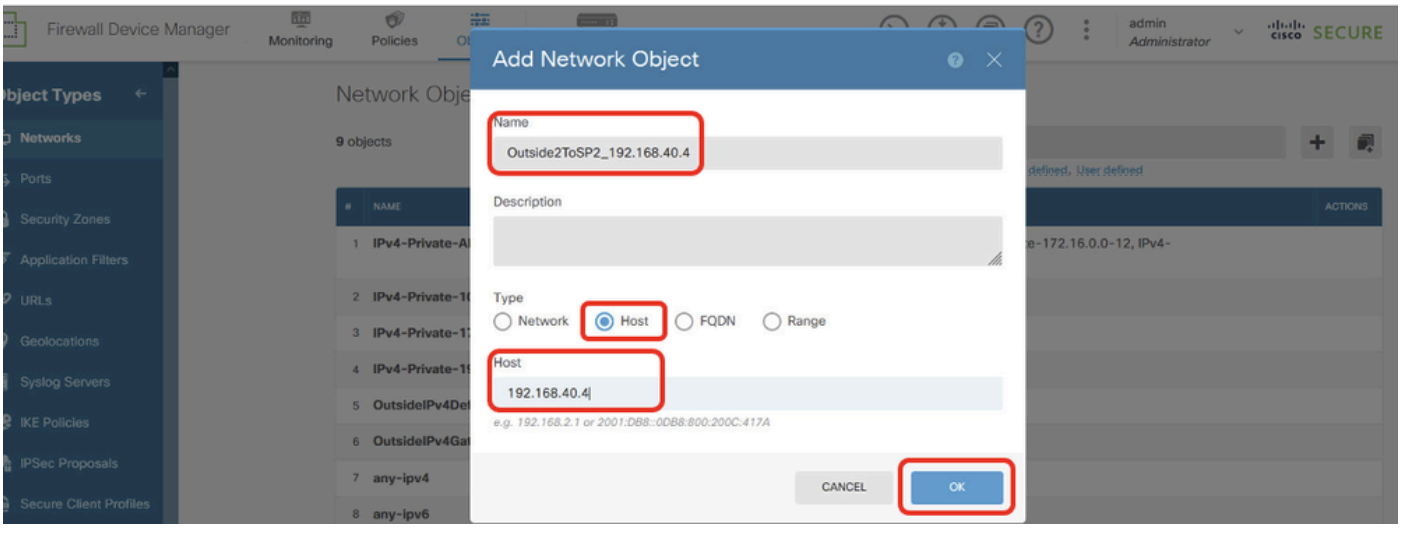
- 名稱:OutsideToSP1_192.168.30.3
- Type:主機
- 主機：192.168.30.3



Site1FTD_Create_SLAMonitor_NetObj_ISP1

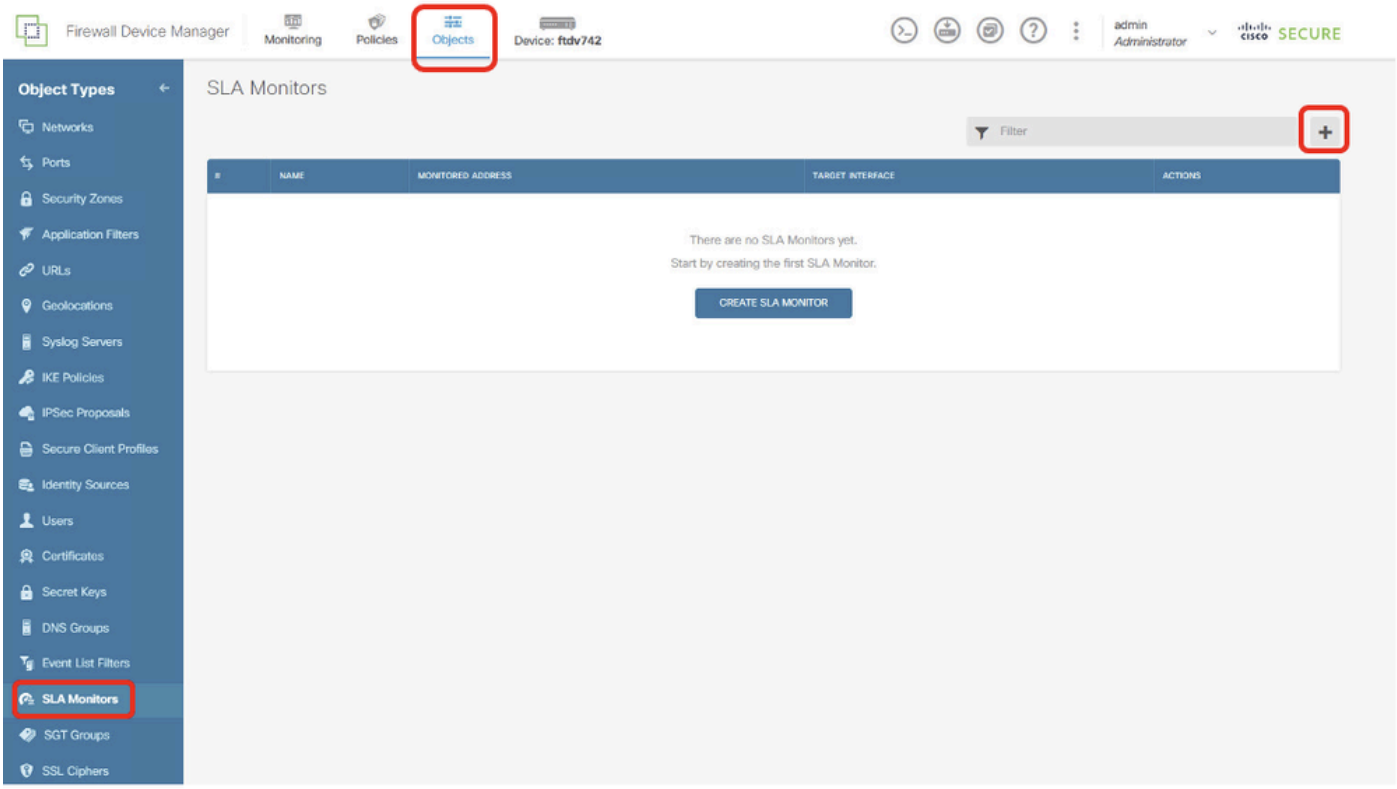
步驟18.2.為ISP2網關IP地址建立對象。提供必要資訊。按一下「OK」按鈕。

- 名稱:Outside2ToSP2_192.168.40.4
- Type:主機
- 主機：192.168.40.4



Site1FTD_Create_SLAMonitor_NetObj_ISP2

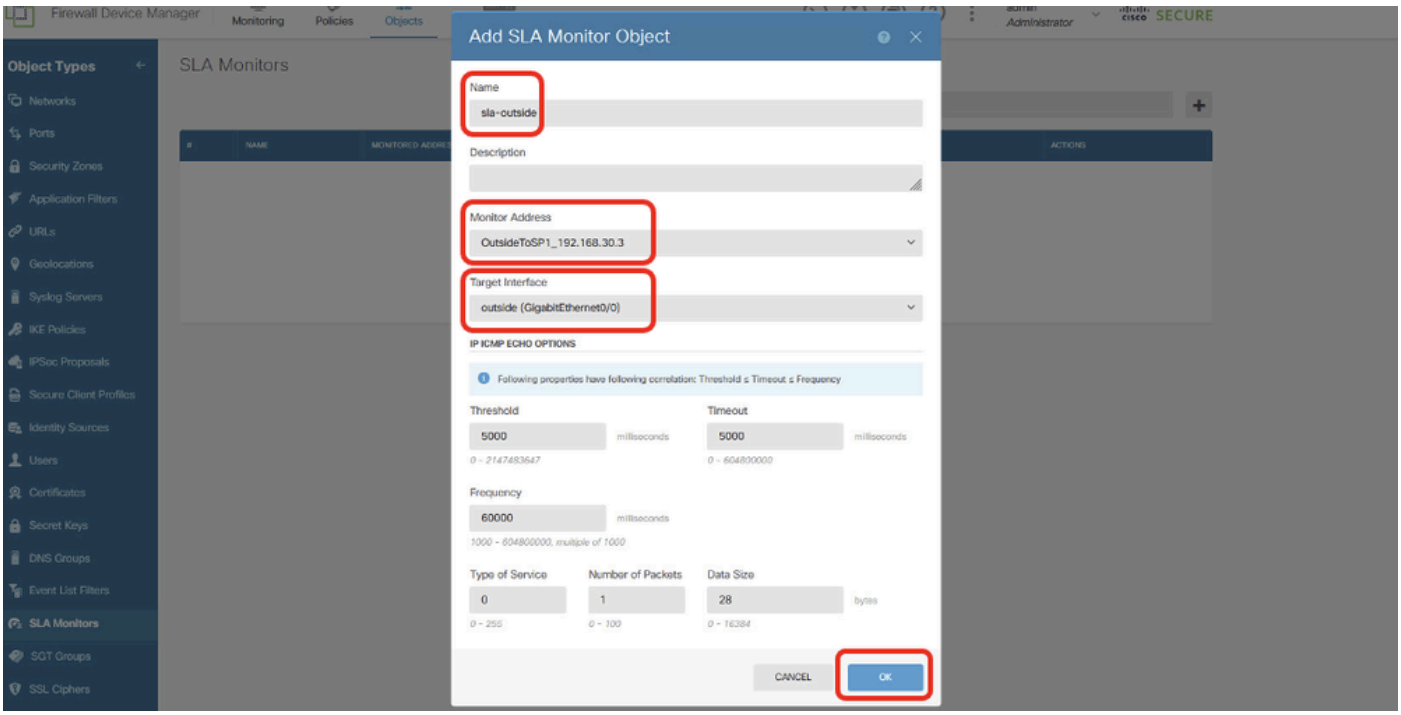
步驟19.建立SLA監控器。導航到對象>對象型別> SLA監控器。按一下+按鈕以建立新的SLA監控器。



Site1FTD_Create_SLAMonitor

步驟19.1.在新增SLA監控對象視窗中，為ISP1網關提供必要的資訊。按一下OK按鈕進行儲存。

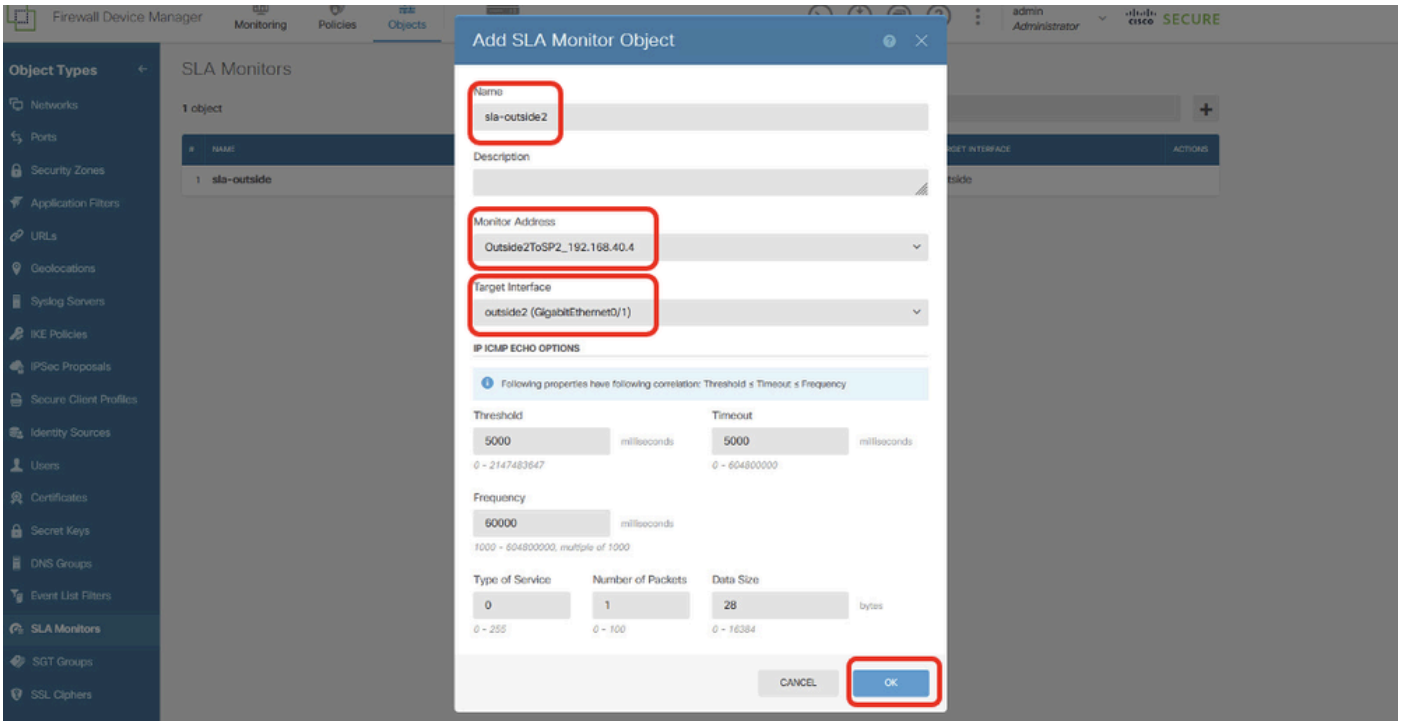
- 名稱:sla-outside
- 監控器地址：OutsideToSP1_192.168.30.3
- 目標介面：outside(GigabitEthernet0/0)
- IP ICMP ECHO選項：預設



Site1FTD_Create_SLAMonitor_NetObj_ISP1_Details

步驟19.2.繼續按一下+按鈕為ISP2網關建立新的SLA監控器。在新增SLA監控對象視窗中，為ISP2網關提供必要的資訊。按一下OK按鈕進行儲存。

- 名稱:sla-outside2
- 監控器地址：Outside2ToSP2_192.168.40.4
- 目標介面：outside2(GigabitEthernet0/1)
- IP ICMP ECHO選項：預設



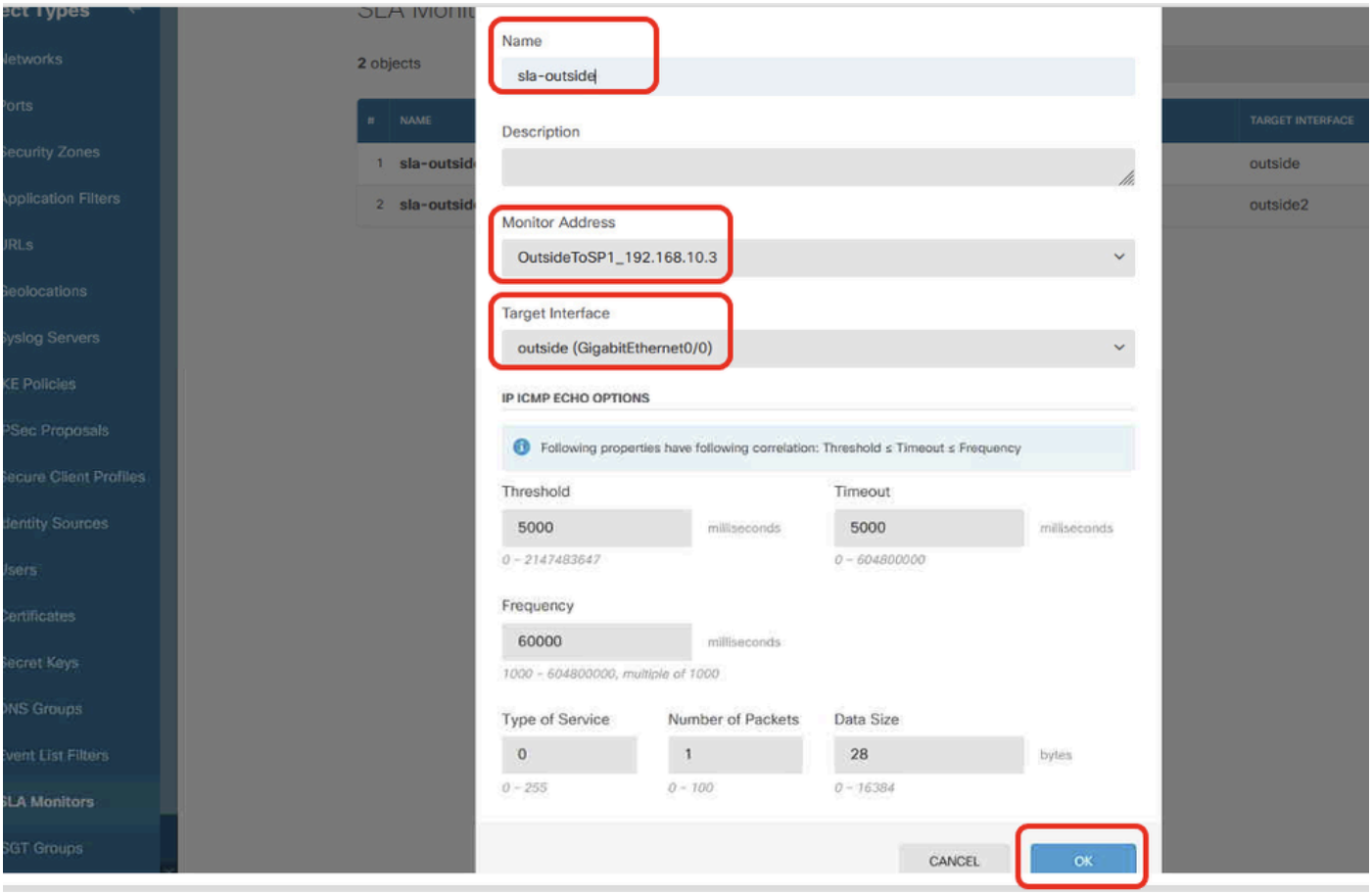
Site1FTD_Create_SLAMonitor_NetObj_ISP2_Details

步驟20.部署配置更改。

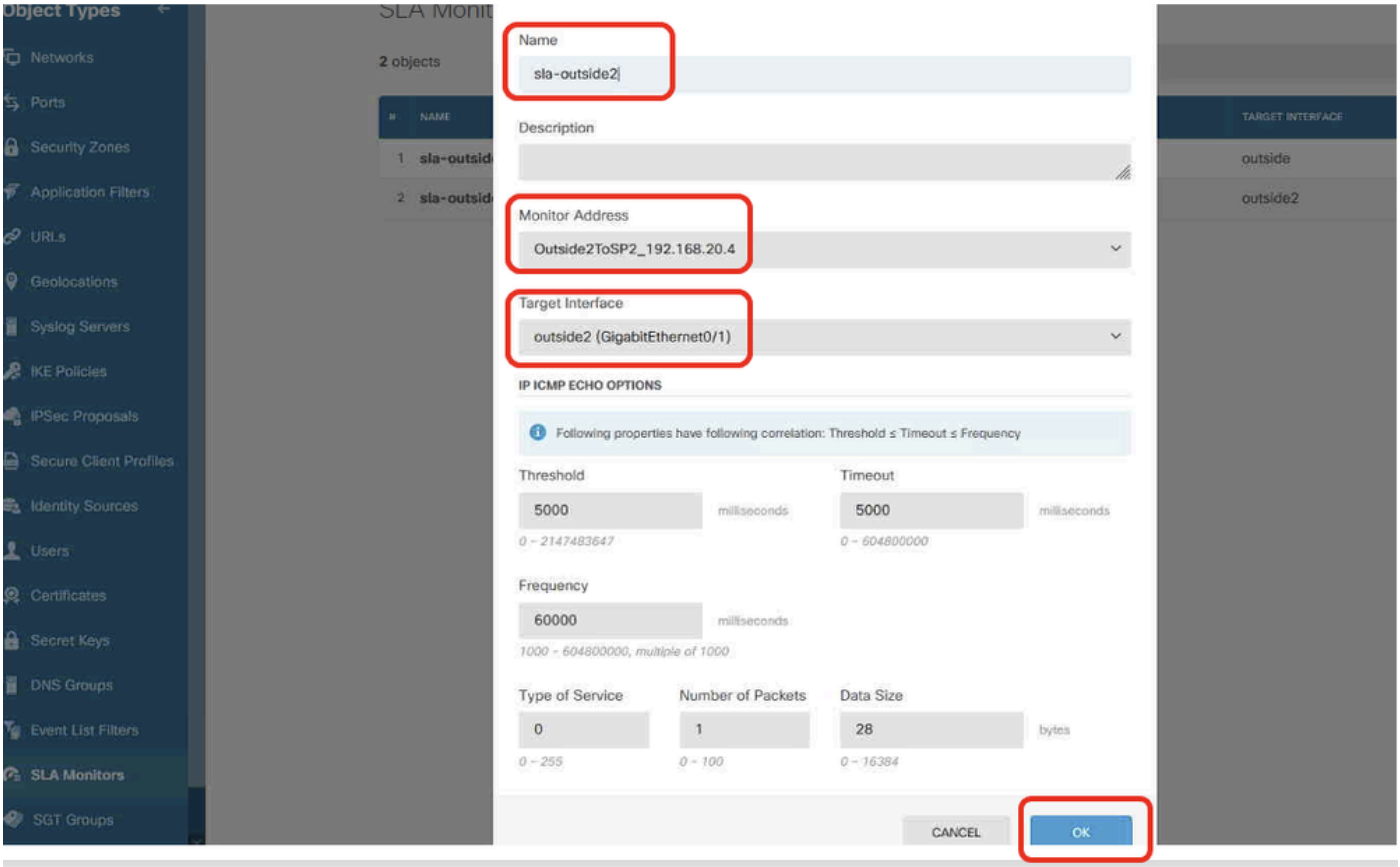
Site1FTD_Deployment_Changes

站點2 FTD SLA監控器配置

步驟21.重複步驟18。到步驟20。使用站點2 FTD上的相應引數建立SLA監控器。



Site2FTD_Create_SLAMonitor_NetObj_ISP1_Details

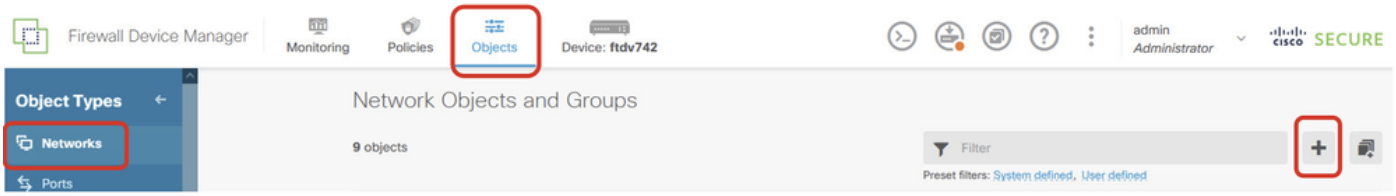


Site2FTD_Create_SLAMonitor_NetObj_ISP2_Details

靜態路由上的配置

站點1 FTD靜態路由配置

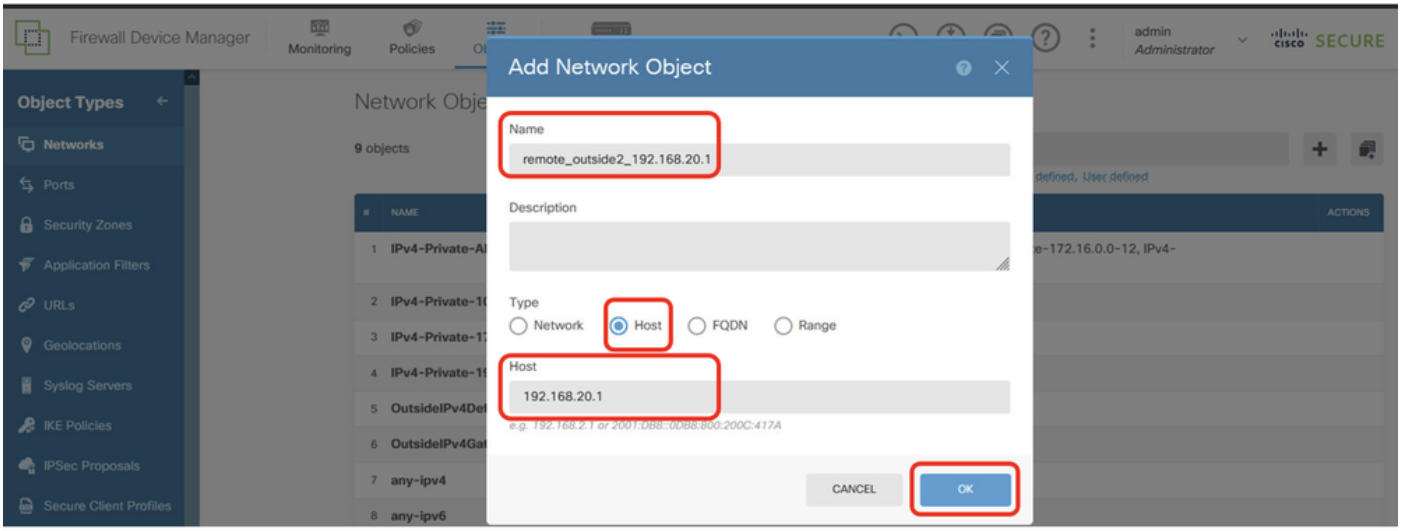
步驟22.為Site1 FTD建立將由靜態路由使用的新網路對象。導航到Objects > Networks，單擊+按鈕。



Site1FTD_Create_Obj

步驟22.1.為對等Site2 FTD的outside2 IP地址建立對象。提供必要資訊。按一下「OK」按鈕。

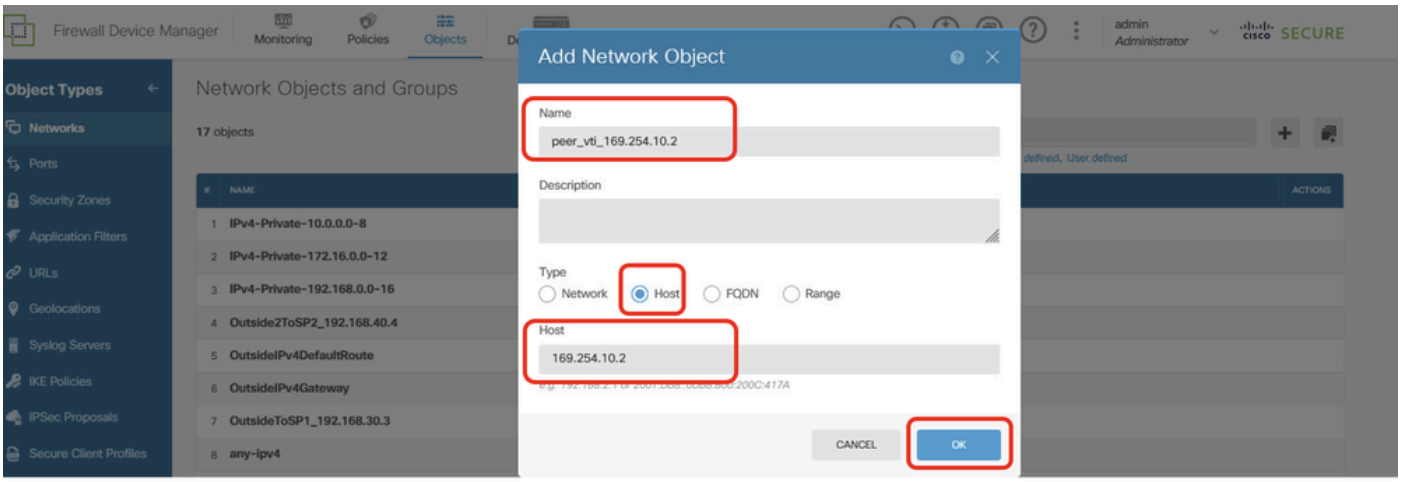
- 名稱:remote_outside2_192.168.20.1
- Type:主機
- 網路：192.168.20.1



Site1FTD_Create_NetObj_StaticRoute_1

步驟22.2.為對等點Site2 FTD的VTI Tunnel1 IP位址建立對象。提供必要資訊。按一下「OK」按鈕。

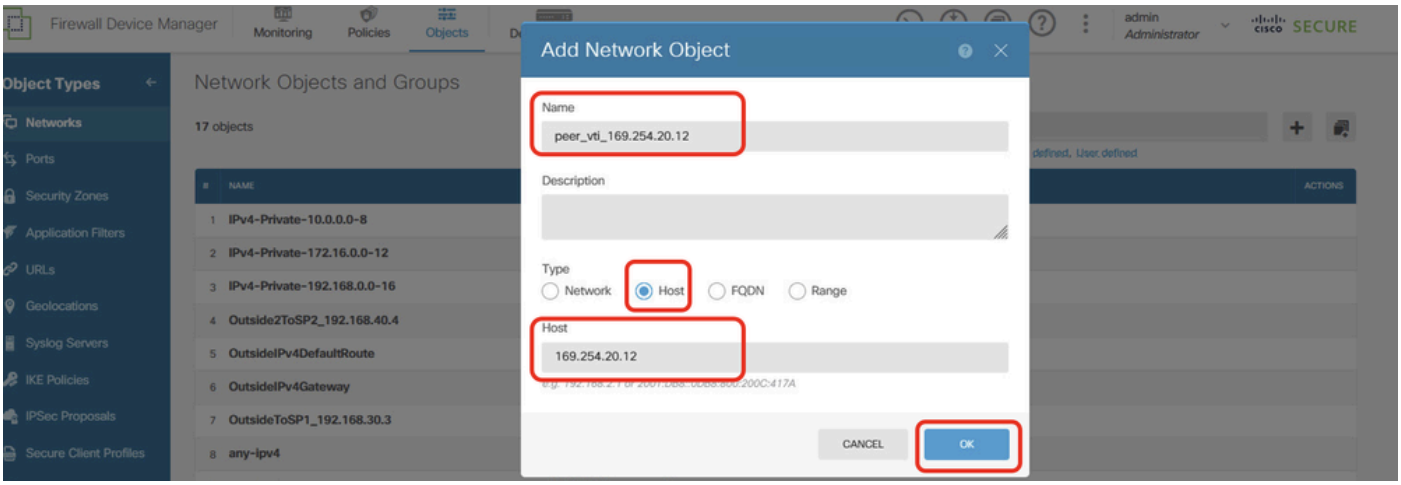
- 名稱:peer_vti_169.254.10.2
- Type:主機
- 網路：169.254.10.2



Site1FTD_Create_NetObj_StaticRoute_2

步驟22.3.為對等點Site2 FTD的VTI隧道2 IP地址建立對象。提供必要資訊。按一下「OK」按鈕。

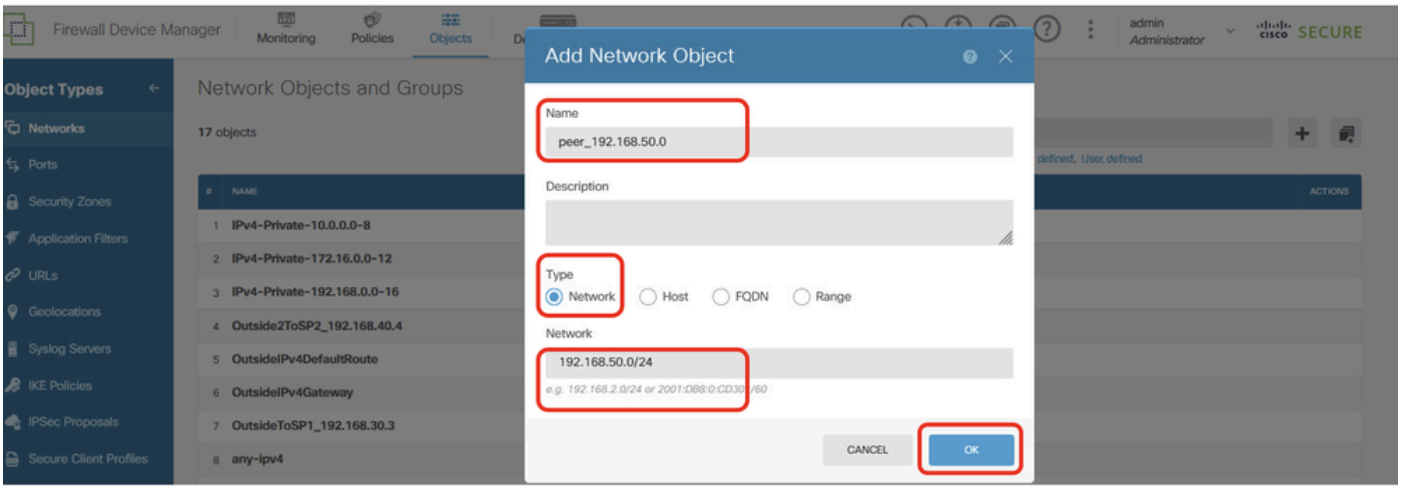
- 名稱:peer_vti_169.254.20.12
- Type:主機
- 網路：169.254.20.12



Site1FTD_Create_NetObj_StaticRoute_3

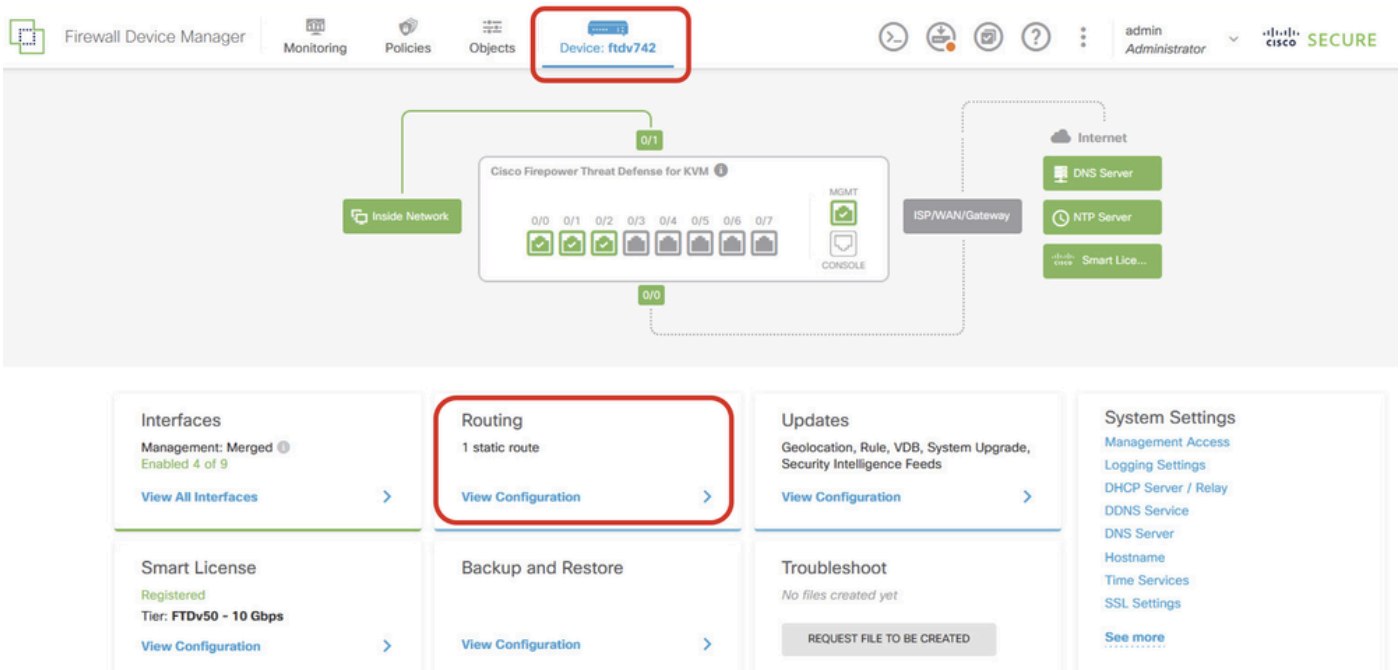
步驟22.4.為對等體Site2 FTD的內部網路建立對象。提供必要資訊。按一下「OK」按鈕。

- 名稱:peer_192.168.50.0
- Type:網路
- 網路：192.168.50.0/24

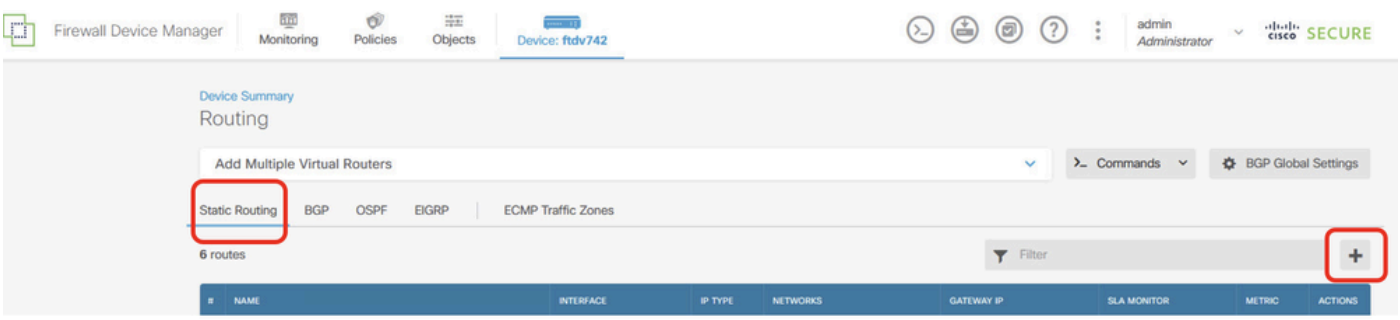


Site1FTD_Create_NetObj_StaticRoute_4

步驟23.導覽至Device > Routing。按一下「View Configuration」。按一下Static Routing頁籤。按一下+按鈕新增新的靜態路由。



Site1FTD_View_Route_Configuration

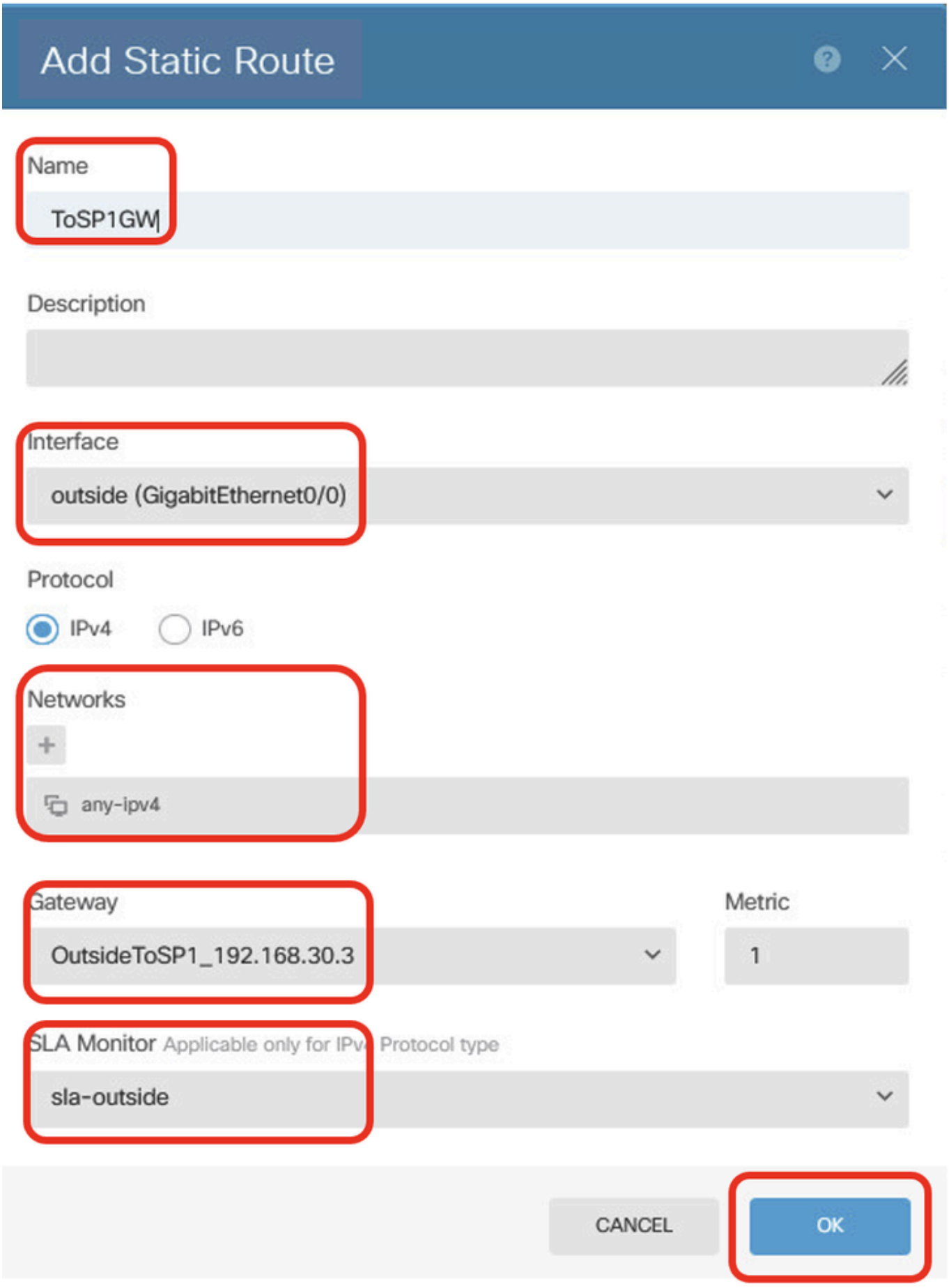


Site1FTD_Add_Static_Route

步驟23.1.使用具有SLA監控的ISP1網關建立預設路由。如果ISP1網關發生中斷，流量會通過ISP2切換到備用預設路由。ISP1恢復後，流量會恢復為使用ISP1。請提供必要的資訊。按一下

OK按鈕進行儲存。

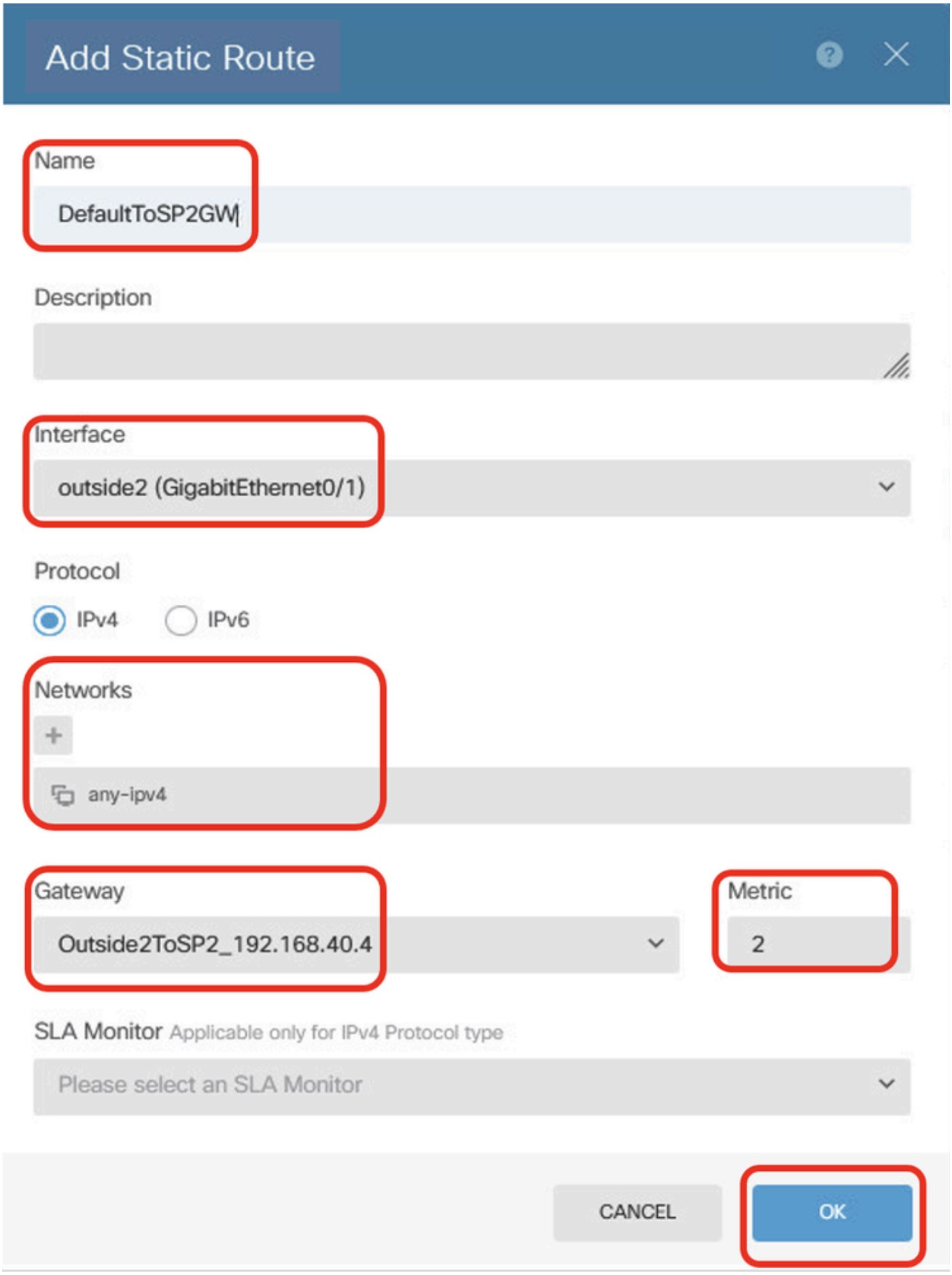
- 名稱:到SP1GW
- Interface:outside(GigabitEthernet0/0)
- 通訊協定：IPv4
- 網路：any-ipv4
- 網關：OutsideToSP1_192.168.30.3
- 指標：1
- SLA監控：sla-outside



Site1FTD_Create_StaticRoute_1

步驟23.2.通過網關ISP2網關建立備用預設路由。指標必須大於1。在本例中，指標為2。請提供必要資訊。按一下OK按鈕進行儲存。

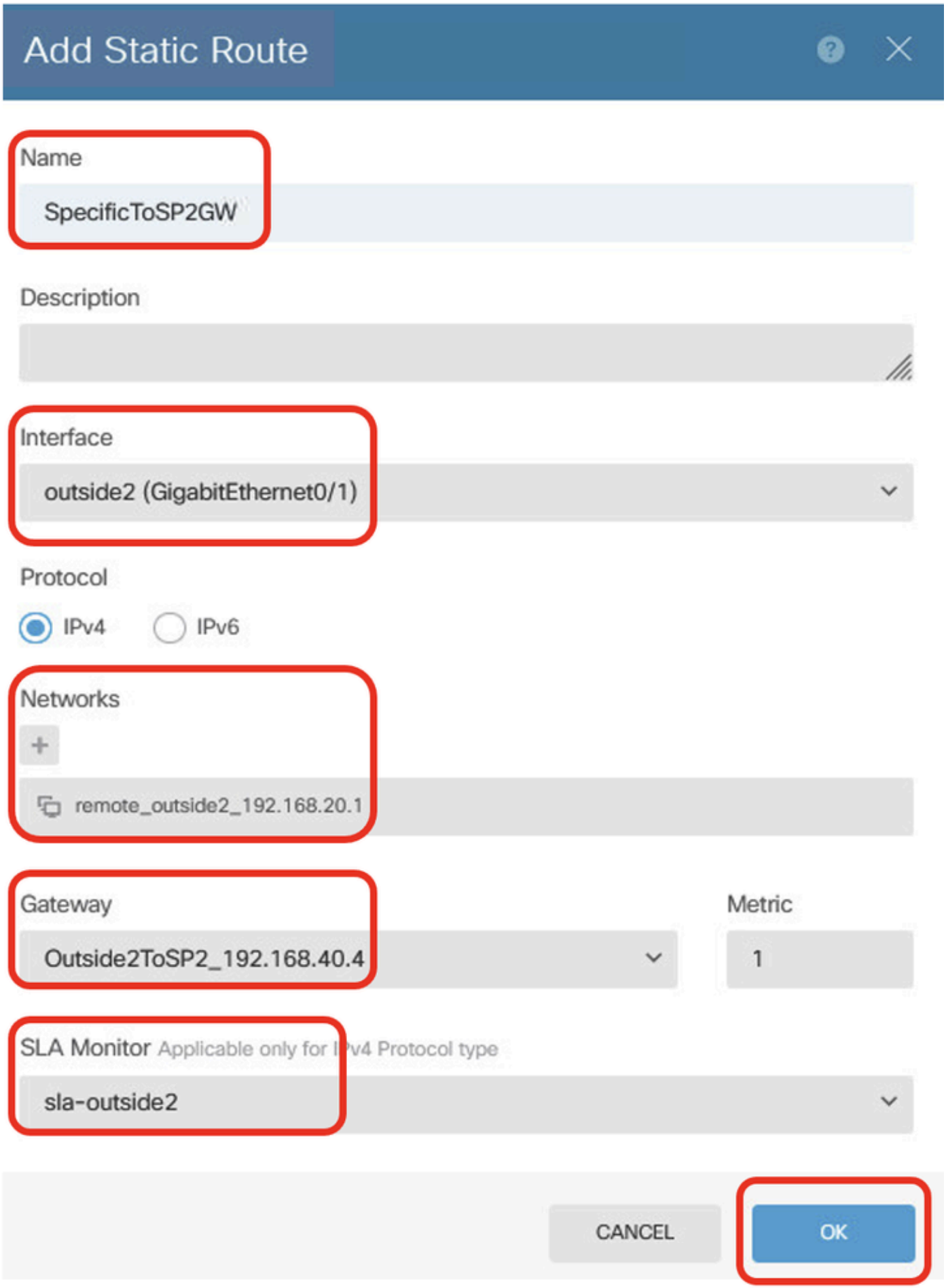
- 名稱:DefaultToSP2GW
- Interface:outside2(GigabitEthernet0/1)
- 通訊協定：IPv4
- 網路：any-ipv4
- 網關：Outside2ToSP2_192.168.40.4
- 指標：2



Site1FTD_Create_StaticRoute_2

步驟23.3.為通過ISP2網關且具有SLA監控的對等Site2 FTD的outside2 IP地址的目標流量建立靜態路由，用於與Site2 FTD的outside2建立VPN。請提供必要資訊。按一下OK按鈕進行儲存。

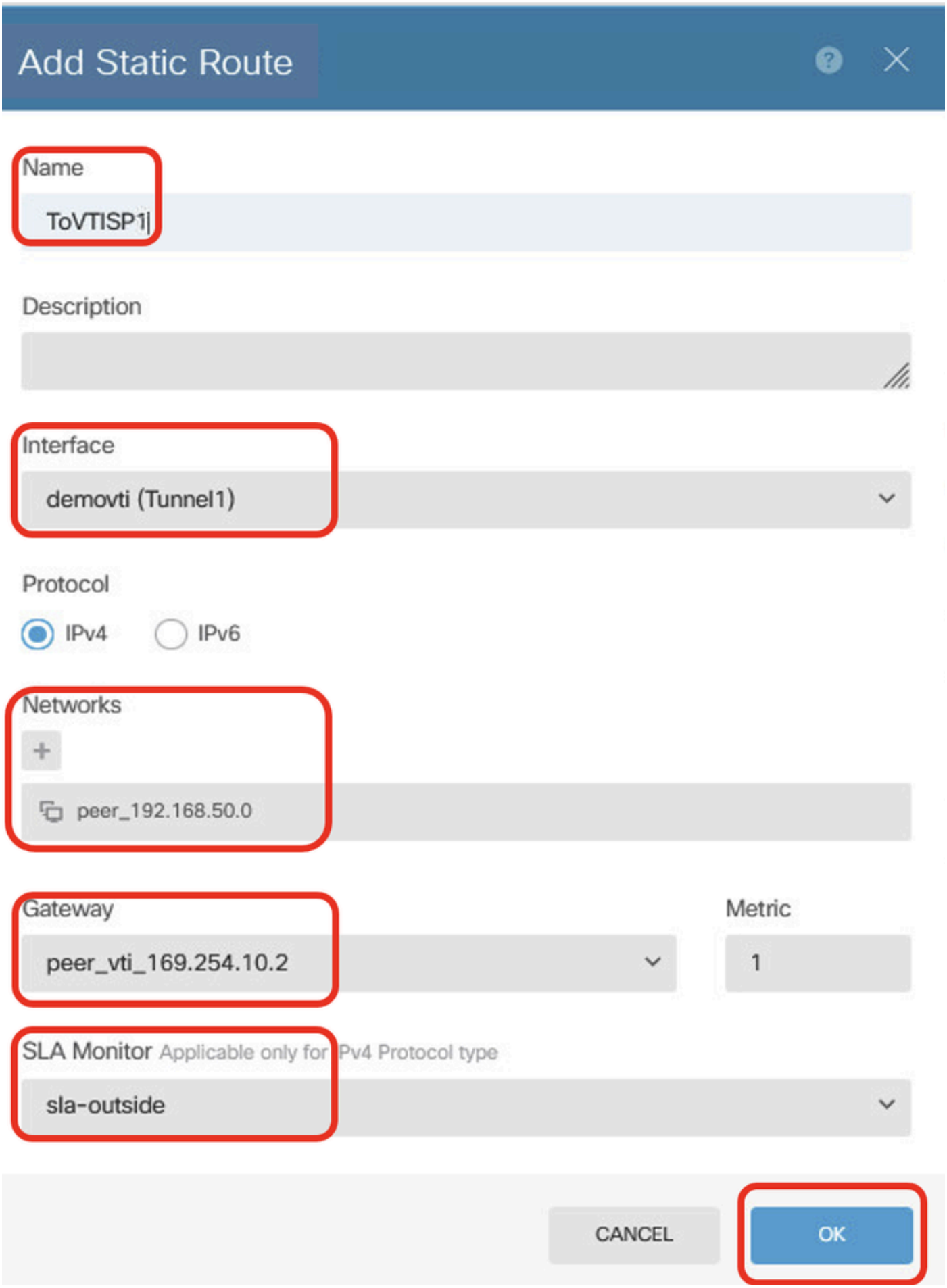
- 名稱:SpecificToSP2GW
- Interface:outside2(GigabitEthernet0/1)
- 通訊協定：IPv4
- 網路：remote_outside2_192.168.20.1
- 網關：Outside2ToSP2_192.168.40.4
- 指標：1
- SLA監控：sla-outside2



Site1FTD_Create_StaticRoute_3

步驟23.4.為通過站點2 FTD的對等VTI隧道1作為網關到達對等Site2 FTD的內部網路的目的地流量建立靜態路由，並使用SLA監控來加密通過隧道1的客戶端流量。如果ISP1網關遇到中斷，VPN流量會切換到ISP2的VTI隧道2。一旦ISP1恢復，流量將恢復到ISP1的VTI隧道1。請提供必要資訊。按一下OK按鈕進行儲存。

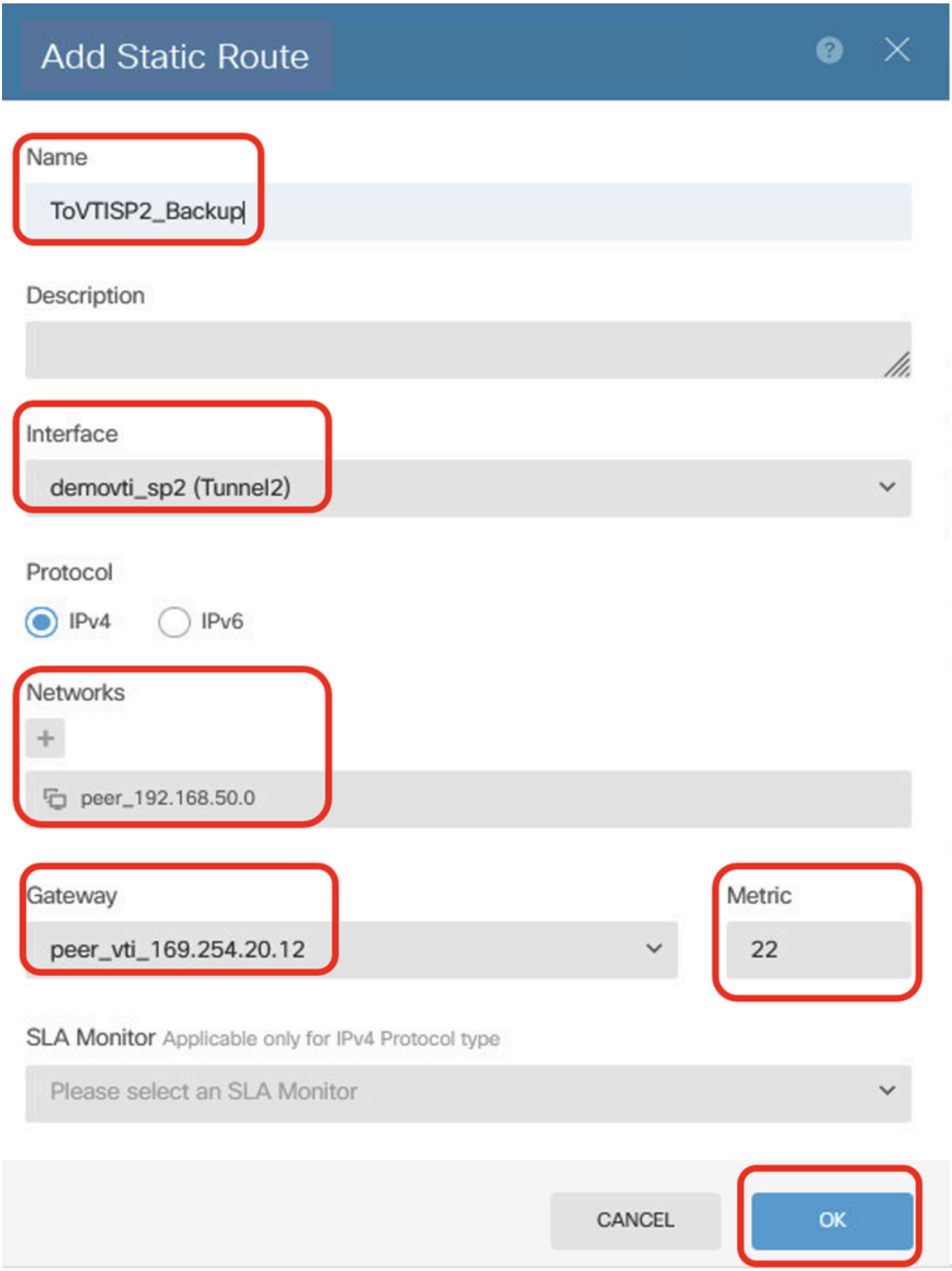
- 名稱:ToVTISP1
- Interface:demovti(Tunnel1)
- 通訊協定：IPv4
- 網路：peer_192.168.50.0
- 網關：peer_vti_169.254.10.2
- 指標：1
- SLA監控：sla-outside



Site1FTD_Create_StaticRoute_4

步驟23.5.為通過站點2 FTD的對等VTI隧道2作為網關到達對等站點2 FTD的內部網路的目標流量建立備份靜態路由，用於通過隧道2加密客戶端流量。將度量設定為大於1的值。在本示例中，度量為22。請提供必要信息。按一下OK按鈕進行儲存。

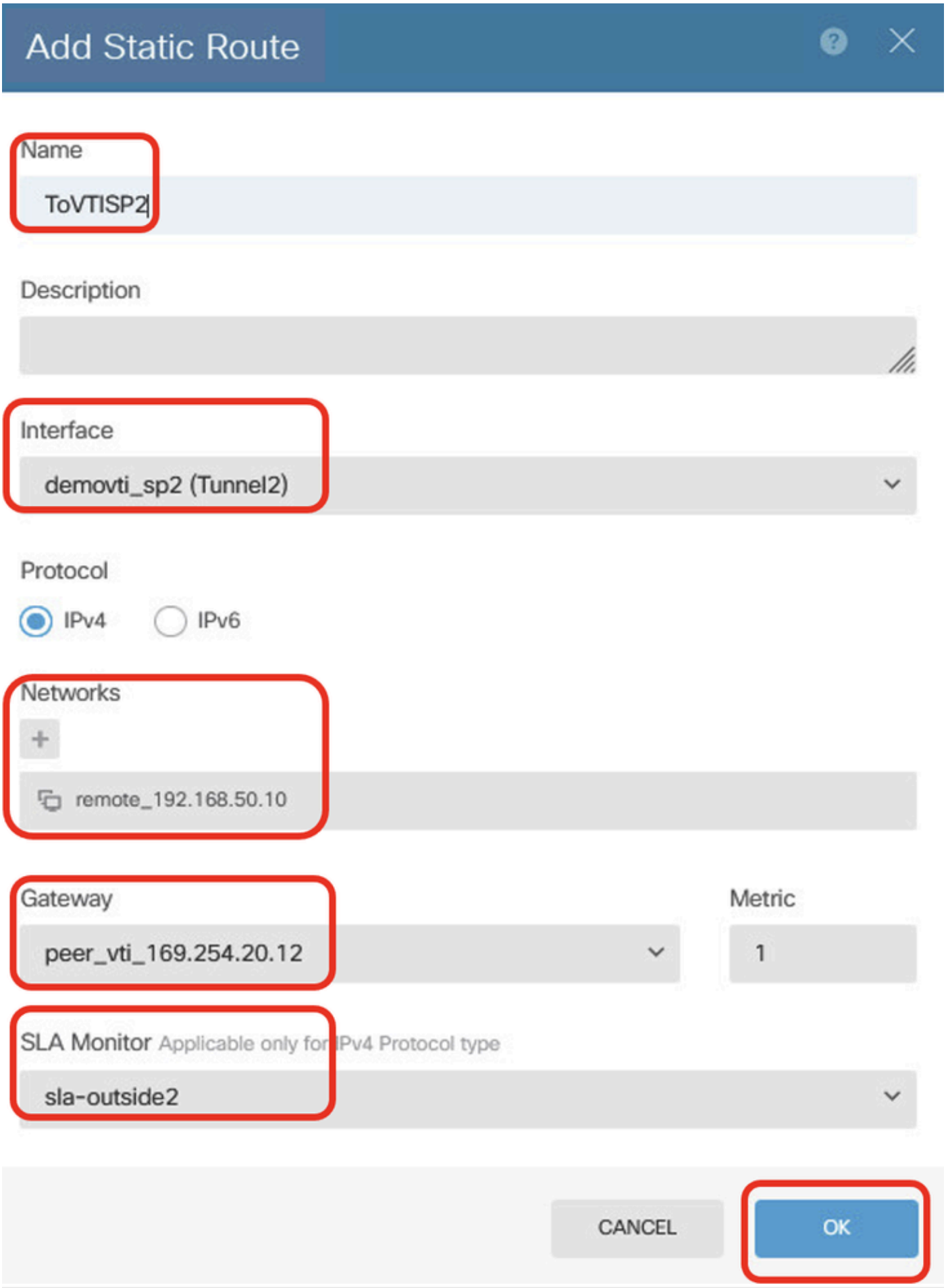
- 名稱:ToVTISP2_Backup
- Interface:demovti_sp2（隧道2）
- 通訊協定：IPv4
- 網路：peer_192.168.50.0
- 網關：peer_vti_169.254.20.12
- 指標：22



Site1FTD_Create_StaticRoute_5

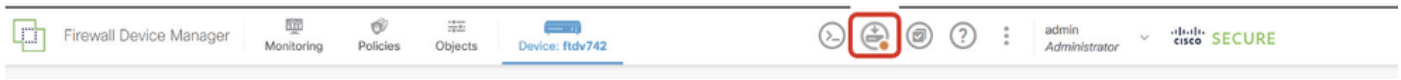
步驟23.6.為PBR流量建立靜態路由。通過Site2 FTD的對等VTI隧道2作為網關，通過SLA監控到Site2客戶端2的目標流量。請提供必要資訊。按一下OK按鈕進行儲存。

- 名稱:ToVTISP2
- Interface:demovti_sp2（隧道2）
- 通訊協定：IPv4
- 網路：remote_192.168.50.10
- 網關：peer_vti_169.254.20.12
- 指標：1
- SLA監控：sla-outside2



Site1FTD_Create_StaticRoute_6

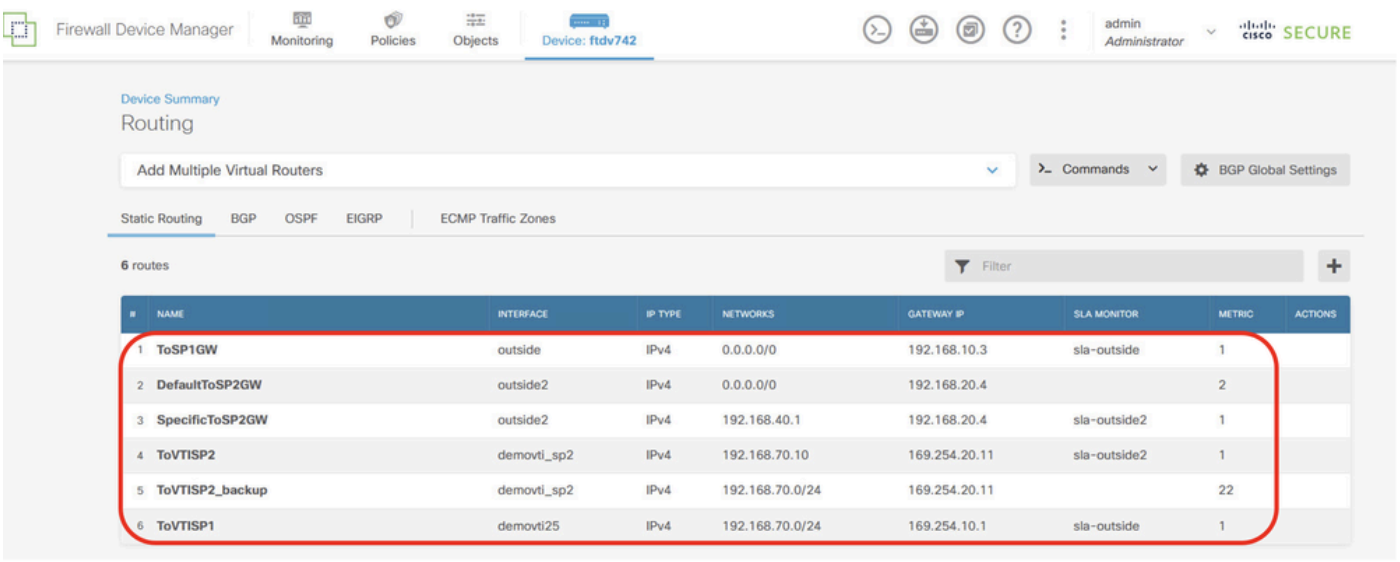
步驟24.部署配置更改。



Site1FTD_Deployment_Changes

站點2 FTD靜態路由配置

步驟25.重複步驟22到24，為Site2 FTD建立具有相應引數的靜態路由。



Site2FTD_Create_StaticRoute

驗證

使用本節內容，確認您的組態是否正常運作。透過主控台或SSH導覽至Site1 FTD和Site2 FTD的CLI。

ISP1和ISP2工作正常

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
```

路由

```
// 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监控

```
// 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測試

場景1. Site1客戶端1 ping Site2客戶端1。

ping之前，請檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD。

在本範例中，Tunnel1顯示用於封裝的1497封包和用於解除封裝的1498封包。

```
// 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客戶端1成功ping Site2客戶端1。

```
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
```

檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD after successfully。

在本範例中，通道1顯示用於封裝的1502封包和用於解除封裝的1503封包，兩個計數器增加5封包，與5個ping回應要求相符。這表示從Site1 Client1到Site2 Client1的ping是通過ISP1隧道1路由的。通道2顯示封裝或解除封裝計數器沒有增加，從而確認沒有用於此流量。

```
// 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
```

場景2. Site1客戶端2 ping Site2客戶端2。

ping之前，請檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD。

在本範例中，Tunnel2顯示用於封裝的21個封包和用於解除封裝的20個封包。

```
// 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客戶端2成功ping Site2客戶端2。

```
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
```

檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD after successfully。

在本範例中，通道2顯示26個封包進行封裝，25個封包進行解除封裝，兩個計數器增加5個封包，與5個ping回應要求相符。這表示Site1 Client2對Site2 Client2的ping是透過ISP2通道2路由的。通道1沒有顯示封裝或解除封裝計數器的增加，這確認沒有將此流量使用。

```
// 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發生中斷，而ISP2正常工作

在本示例中，手動關閉ISP1的介面E0/1以模擬ISP1遇到中斷。

```
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

Tunnel1發生故障。只有Tunnel2與IKEV2 SA一起處於活動狀態。

```
// 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                    G
      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                    G
      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
```

路由

在路由表中，備份路由將生效。

```
// 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監控

在Site1 FTD上，SLA監控器顯示ISP1的條目編號和超時（目標地址為192.168.30.3）855903900。

```
// 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測試

ping之前，請檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD。

在本範例中，Tunnel2顯示用於封裝的36個封包和用於解除封裝的35個封包。

```
// 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客戶端1成功ping Site2客戶端1。

```
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客戶端2成功ping Site2客戶端2。

```
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
```

檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD afsuccessfully。

在本範例中，通道2顯示46個封包進行封裝，45個封包進行解除封裝，兩個計數器增加10個封包，與10個ping回應要求相符。這表示已透過ISP2通道2路由ping封包。

```
// 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發生中斷，而ISP1工作正常

在本示例中，手動關閉ISP2上的介面E0/1以模擬ISP2遇到中斷。

```
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

隧道2倒塌了。只有Tunnel1與IKEV2 SA一起處於活動狀態。

```
// 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
```

路由

在路由表中，與ISP2相關的路由因PBR流量而消失。

```
// 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監控

在Site1 FTD上，SLA監控器顯示ISP2的條目編號和超時（目標地址為192.168.40.4）188426425。

```
// 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測試

ping之前，請檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD。

在本範例中，通道1顯示用於封裝的74個封包和用於解除封裝的73個封包。

```
// 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客戶端1成功ping Site2客戶端1。

```
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客戶端2成功ping Site2客戶端2。

```
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
```

檢查show crypto ipsec sa的計數器 | inc interface:|encap|decap on Site1 FTD after successfully。

在本範例中，通道1顯示84個封包進行封裝，83個封包進行解除封裝，兩個計數器增加10個封包，與10個ping回應要求相符。這表示ping封包是透過ISP1通道1路由。

```
// 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
```

疑難排解

本節提供的資訊可用於對組態進行疑難排解。

您可以使用這些debug命令對VPN部分進行故障排除。

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

您可以使用這些debug命令對PBR部分進行故障排除。

```
debug policy-route
```

您可以使用這些debug命令對SLA監控器部分進行故障排除。

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

關於此翻譯

思科已使用電腦和人工技術翻譯本文件，讓全世界的使用者能夠以自己的語言理解支援內容。請注意，即使是最佳機器翻譯，也不如專業譯者翻譯的內容準確。Cisco Systems, Inc. 對這些翻譯的準確度概不負責，並建議一律查看原始英文文件（提供連結）。