

Site to Site VPN Configuration on FTD Managed by FMC

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Introduction

This document describes how to configure Site to Site VPN on Firepower Threat Defense (FTD) managed by FMC.

Prerequisites

Requirements

You should have knowledge of these topics:

- Basic understanding of VPN
- Experience with Firepower Management Center
- Experience with ASA command line

Components Used

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

- Cisco FTD 6.5
- ASA 9.10(1)32
- IKEv2

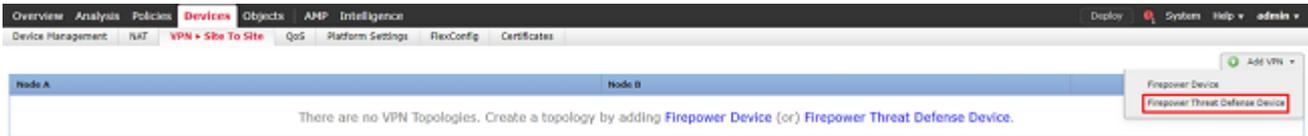
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Configuration

Start with the configuration on FTD with FirePower Management Center.

Step 1. Define the VPN Topology.

1. Navigate to **Devices > VPN > Site To Site**. Under Add VPN, click **Firepower Threat Defense Device**, as shown in this image.

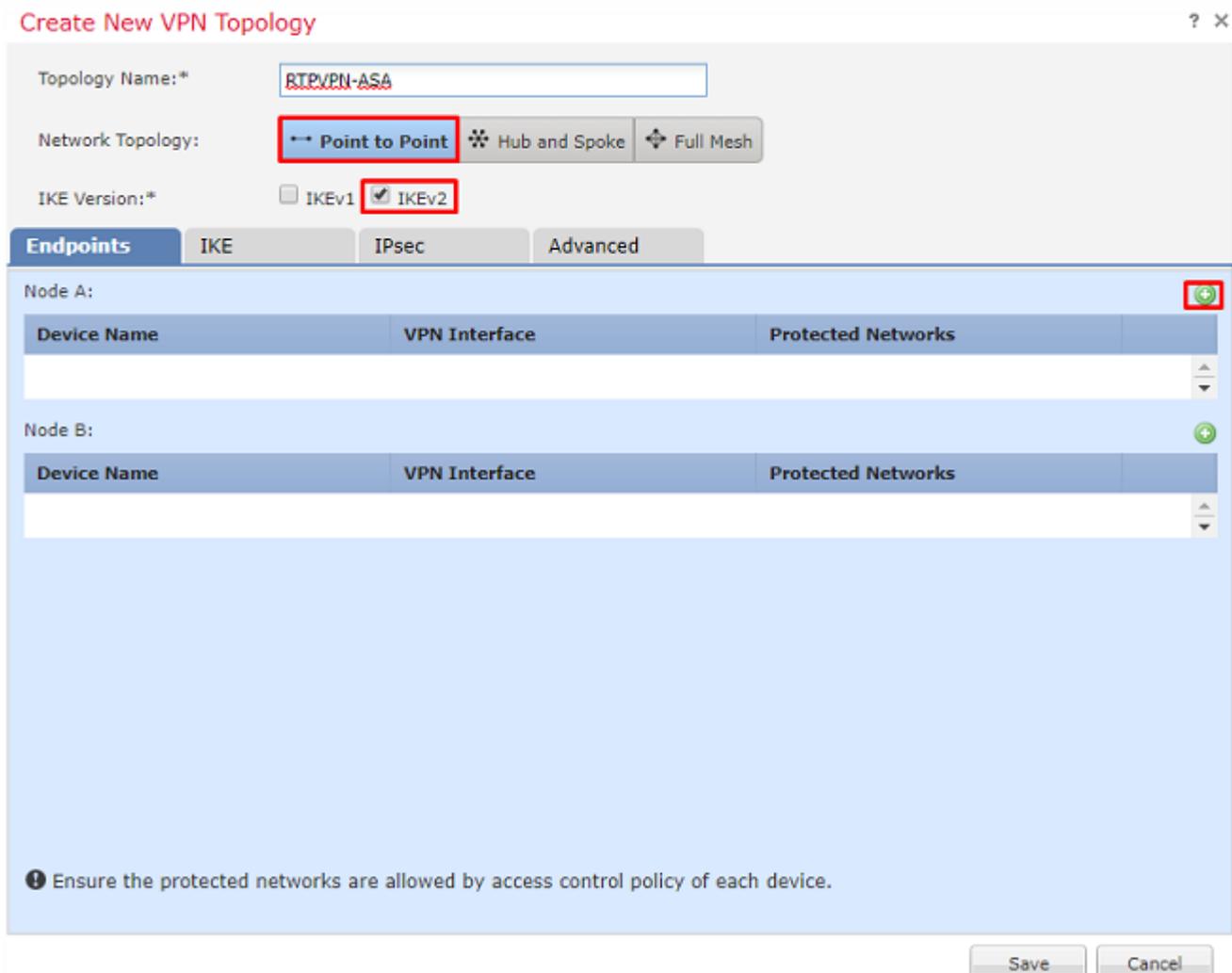


2. **Create New VPN Topology** box appears. Give VPN a name that is easily identifiable.

Network Topology: Point to Point

IKE Version: IKEv2

In this example when you select endpoints, Node A is the FTD, and Node B is the ASA. Click on the green plus button to add devices to the topology, as shown in this image.



3. Add the FTD as the first endpoint.

Choose the interface that a crypto map is placed on. The IP address should auto-populate from the device configuration.

Click the green plus under Protected Networks, as shown in this image, to select what subnets should be encrypted in this VPN.

Add Endpoint ? x

Device:* FTD

Interface:* outside

IP Address:* 172.16.100.20

This IP is Private

Connection Type: Bidirectional

Certificate Map: [dropdown] +

Protected Networks:*

Subnet / IP Address (Network) Access List (Extended)

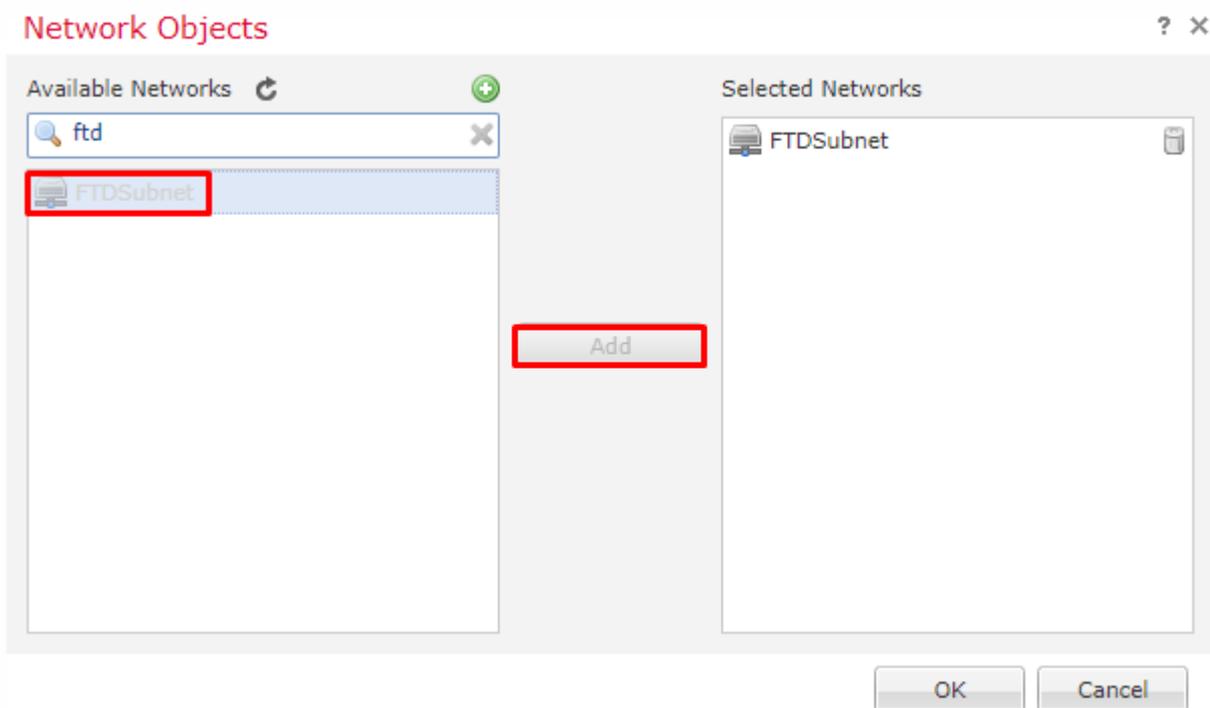
[+]

OK Cancel

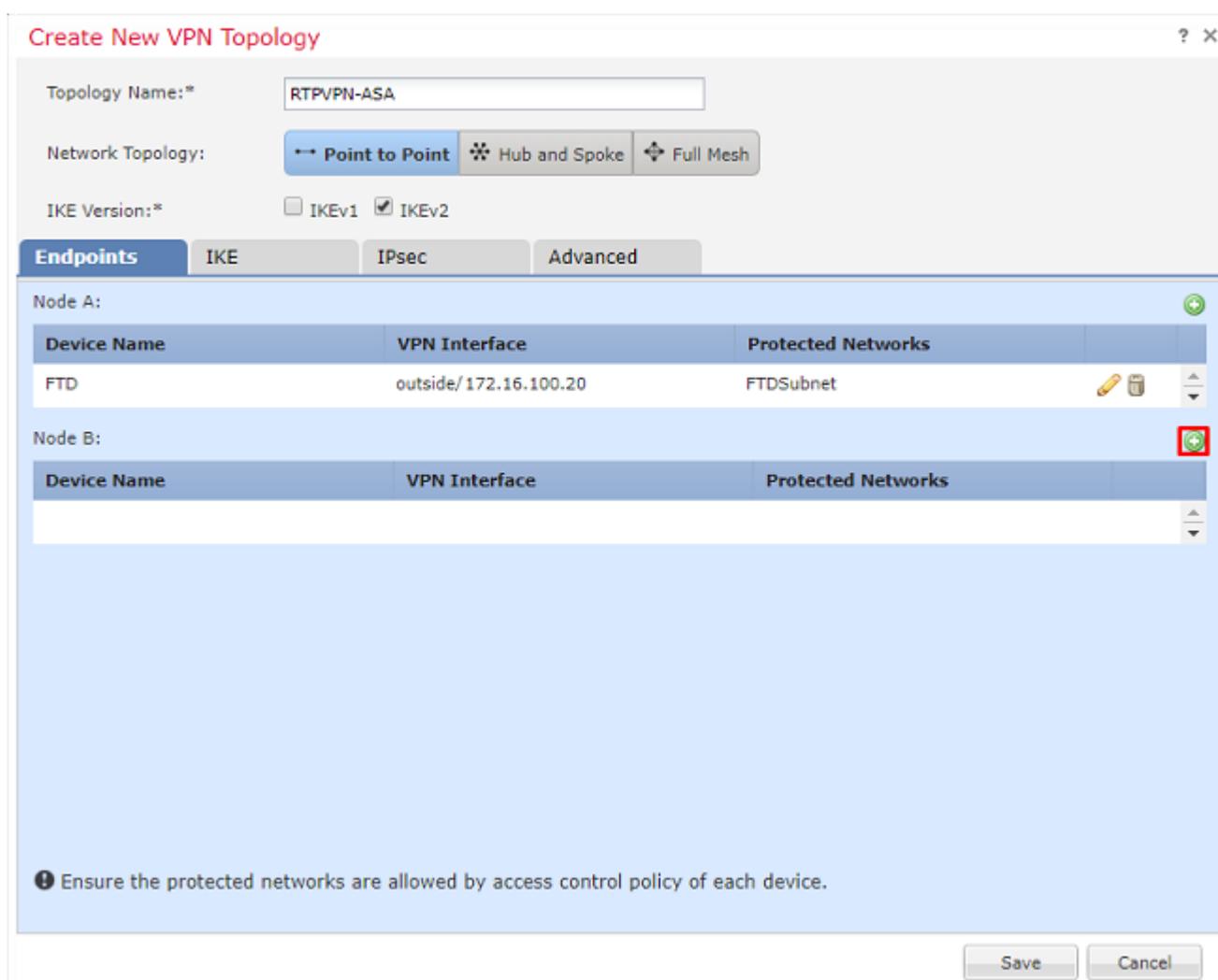
4. Click on green plus and a Network Object is created here.

5. Add all the subnets local to the FTD that needs to be encrypted. Click **Add** to move them to the Selected Networks. Now click **OK**, as shown in this image.

FTDSubnet = 10.10.113.0/24



Node A: (FTD) endpoint is complete. Click the green plus for Node B, as shown in the image.



Node B is an ASA. Devices that are not managed by the FMC are considered Extranet.

6. Add a device name and IP address. Click on the green plus to add protected networks, as shown in the image.

Edit Endpoint ? x

Device:* Extranet v

Device Name:* ASA

IP Address:* Static Dynamic
192.168.200.10

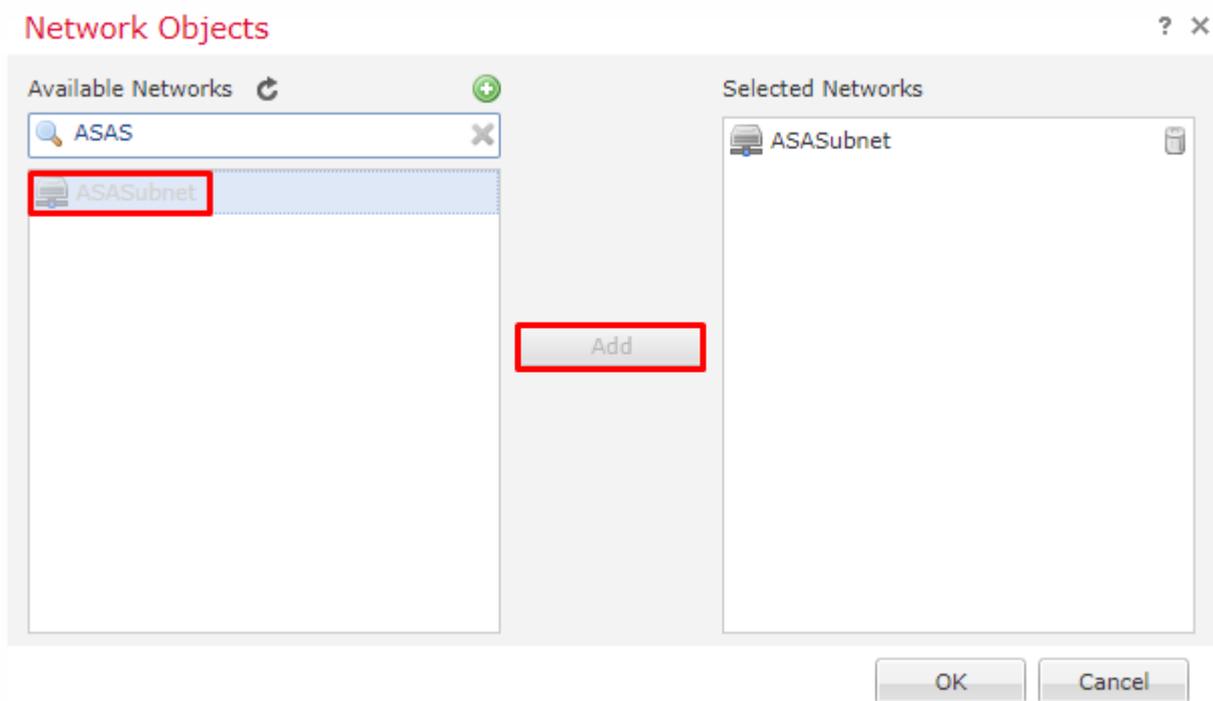
Certificate Map: v +

Protected Networks:*
 Subnet / IP Address (Network) Access List (Extended) +

OK Cancel

7. As shown in this image, select the **ASA subnets** that need to be encrypted and add them to the selected networks.

ASASubnet = 10.10.110.0/24



Step 2. Configure IKE Parameters.

Now both endpoints are in place go through the IKE/IPSEC configuration.

1. Under the **IKE** tab, specify the parameters that are used for the IKEv2 initial exchange. Click the green plus to create a new IKE policy, as shown in the image.

Create New VPN Topology

Topology Name:* RTPVPN-ASA

Network Topology: Point to Point Hub and Spoke Full Mesh

IKE Version:* IKEv1 IKEv2

Endpoints **IKE** IPsec Advanced

IKEv1 Settings

Policy:* preshared_sha_aes256_dh5_5

Authentication Type: Pre-shared Automatic Key

Pre-shared Key Length:* 24 Characters (Range 1-127)

IKEv2 Settings

Policy:* AES-GCM-NULL-SHA

Authentication Type: Pre-shared Automatic Key

Pre-shared Key Length:* 24 Characters (Range 1-127)

Save Cancel

2. In the new IKE policy, specify a priority number as well as the lifetime of phase 1 of the connection. This document uses these parameters for the initial exchange: Integrity (SHA256), Encryption (AES-256), PRF (SHA256), and Diffie-Hellman Group (Group 14)

Note: All IKE policies on the device are sent to the remote peer regardless of what is in the selected policy section. The first IKE Policy matched by the remote peer will be selected for the VPN connection. Choose which policy is sent first using the priority field. Priority 1 will be sent first.

New IKEv2 Policy

? X

Name:*

Description:

Priority: (1-65535)

Lifetime: seconds (120-2147483647)

- Integrity Algorithms**
- Encryption Algorithms
- PRF Algorithms
- Diffie-Hellman Group

Available Algorithms

- MD5
- SHA
- SHA512
- SHA256**
- SHA384
- NULL

Add

Selected Algorithms

- SHA256

Save

Cancel

New IKEv2 Policy

? X

Name:*	<input type="text" value="ASA"/>
Description:	<input type="text"/>
Priority:	<input type="text" value="1"/> (1-65535)
Lifetime:	<input type="text" value="86400"/> seconds (120-2147483647)

Integrity Algorithms	Available Algorithms	Selected Algorithms
Encryption Algorithms	<ul style="list-style-type: none"><input type="checkbox"/> AES<input checked="" type="checkbox"/> AES-256<input type="checkbox"/> DES<input type="checkbox"/> 3DES<input type="checkbox"/> AES-192<input type="checkbox"/> AES-GCM<input type="checkbox"/> AES-GCM-192<input type="checkbox"/> AES-GCM-256<input type="checkbox"/> NULL	<ul style="list-style-type: none"><input checked="" type="checkbox"/> AES-256
PRF Algorithms	<input type="button" value="Add"/>	
Diffie-Hellman Group		

New IKEv2 Policy

? X

Name:*	<input type="text" value="ASA"/>
Description:	<input type="text"/>
Priority:	<input type="text" value="1"/> (1-65535)
Lifetime:	<input type="text" value="86400"/> seconds (120-2147483647)

Integrity Algorithms	Available Algorithms	Selected Algorithms
Encryption Algorithms	<ul style="list-style-type: none">MD5SHASHA512SHA256SHA384	<ul style="list-style-type: none">SHA256
PRF Algorithms	<input type="button" value="Add"/>	
Diffie-Hellman Group		

New IKEv2 Policy

? X

Name:*	<input type="text" value="ASA"/>
Description:	<input type="text"/>
Priority:	<input type="text" value="1"/> (1-65535)
Lifetime:	<input type="text" value="86400"/> seconds (120-2147483647)

Integrity Algorithms	Available Groups	Selected Groups
Encryption Algorithms	<ul style="list-style-type: none">125141516192021	<ul style="list-style-type: none">14
PRF Algorithms	<input type="button" value="Add"/>	
Diffie-Hellman Group		

3. Once the parameters are added, select this policy, and choose the **Authentication Type**.

4. Choose **pre-shared-key** manual. For this document, the PSK cisco123 is used.

Create New VPN Topology ? X

Topology Name:* RTPVPN-ASA

Network Topology: **Point to Point** Hub and Spoke Full Mesh

IKE Version:* IKEv1 IKEv2

Endpoints **IKE** IPsec Advanced

IKEv1 Settings

Policy:* preshared_sha_aes256_dh5_5

Authentication Type: Pre-shared Automatic Key

Pre-shared Key Length:* 24 Characters (Range 1-127)

IKEv2 Settings

Policy:* **ASA**

Authentication Type: **Pre-shared Manual Key**

Key:*

Confirm Key:*

Enforce hex-based pre-shared key only

Save Cancel

Step 3. Configure IPsec Parameters.

1. Under **IPsec**, click on the pencil to edit the transform set and create a new IPsec Proposal, as shown in this image.

Create New VPN Topology ? X

Topology Name: RTPVPN-ASA

Network Topology: **Point to Point** Hub and Spoke Full Mesh

IKE Version: IKEv1 IKEv2

Endpoints IKE **IPsec** Advanced

Crypto Map Type: Static Dynamic

IKEv2 Mode: Tunnel

Transform Sets:

- IKEv1 IPsec Proposals: tunnel_aes256_sha
- IKEv2 IPsec Proposals***: AES-GCM

Enable Security Association (SA) Strength Enforcement

Enable Reverse Route Injection

Enable Perfect Forward Secrecy

Modulus Group: 14

Lifetime Duration*: 28800 Seconds (Range 120-2147483647)

Lifetime Size: 4608000 Kbytes (Range 10-2147483647)

— **ESPv3 Settings**

Save Cancel

2. In order to create a new IKEv2 IPsec Proposal, click the green plus and input the phase 2 parameters.

Select **ESP Encryption** > **AES-GCM-256**. When the GCM algorithm is used for encryption, a Hash algorithm is not needed. With GCM the hash function is built-in.

Edit IKEv2 IPsec Proposal

? X

Name:* ASA

Description:

ESP Hash

ESP Encryption

Available Algorithms

- AES-GCM-256
- AES-256
- AES-GCM-192
- AES-192
- AES-GCM
- AES
- 3DES
- DES
- AES-GMAC-25

Add

Selected Algorithms

- AES-GCM-256

Save Cancel

3. Once the new IPsec proposal has been created add it to the selected transform sets.

IKEv2 IPsec Proposal

? X

Available Transform Sets

Search

- AES-GCM
- AES-SHA
- ASA
- DES_SHA-1

Add

Selected Transform Sets

- ASA

OK Cancel

The newly selected IPsec proposal is now listed under the IKEv2 IPsec Proposals.

If needed, the phase 2 lifetime and PFS can be edited here. For this example, the lifetime will be set as default and PFS disabled.

Create New VPN Topology ? X

Topology Name:

Network Topology: Point to Point Hub and Spoke Full Mesh

IKE Version: IKEv1 IKEv2

Endpoints | IKE | **IPsec** | Advanced

Crypto Map Type: Static Dynamic

IKEv2 Mode:

Transform Sets:

IKEv1 IPsec Proposals	IKEv2 IPsec Proposals*
tunnel_aes256_sha	ASA

Enable Security Association (SA) Strength Enforcement

Enable Reverse Route Injection

Enable Perfect Forward Secrecy

Modulus Group:

Lifetime Duration*: Seconds (Range 120-2147483647)

Lifetime Size: Kbytes (Range 10-2147483647)

— **ESPv3 Settings**

Optional- You must complete either complete the option to Bypass Access Control or Create an Access Control Policy.

Step 4. Bypass Access Control.

Optionally, **sysopt permit-vpn** can be enabled under the **Advanced > Tunnel**.

This removes the possibility to use the Access Control Policy to inspect traffic coming from the users. VPN filters or downloadable ACLs can still be used to filter user traffic. This is a global command and will apply to all VPNs if this checkbox is enabled.

Create New VPN Topology ? X

Topology Name:

Network Topology: Point to Point Hub and Spoke Full Mesh

IKE Version: IKEv1 IKEv2

Endpoints | IKE | IPsec | **Advanced**

IKE
IPsec
Tunnel

NAT Settings

Keepalive Messages Traversal
Interval: Seconds (Range 10 - 3600)

Access Control for VPN Traffic

Bypass Access Control policy for decrypted traffic (sysopt permit-vpn)
Decrypted traffic is subjected to Access Control Policy by default. This option bypasses the inspection, but VPN Filter ACL and authorization ACL downloaded from AAA server are still applied to VPN traffic.

Certificate Map Settings

Use the certificate map configured in the Endpoints to determine the tunnel

Use the certificate OU field to determine the tunnel

Use the IKE identity to determine the tunnel

Use the peer IP address to determine the tunnel

If **sysopt permit-vpn** is not enabled then an access control policy must be created to allow the VPN traffic through the FTD device. If **sysopt permit-vpn** is enabled skip creating an access control policy.

Step 5. Create an Access Control Policy.

Under Access Control Policies, navigate to **Policies > Access Control > Access Control** and select the Policy that targets the FTD device. In order to add a Rule, click **Add Rule**, as shown in the image here.

Traffic must be allowed from the internal network out to the external network and from the external network into the internal network. Create one rule to do both or create two rules to keep them separate. In this example, one rule is created to do both.

Editing Rule - VPN_Traffic

Name: VPN_Traffic, Enabled, Move

Action: Allow

Zones: Networks, VLAN Tags, Users, Applications, Ports, URLs, SGT/ISE Attributes, Inspection, Logging, Comments

Available Networks: ASASubnet, FTDSubnet

Source Networks (2): ASASubnet, FTDSubnet

Destination Networks (2): ASASubnet, FTDSubnet

Buttons: Add To Source Networks, Add to Destination, Save, Cancel

#	Name	Source Zones	Dest Zones	Source Networks	Dest Networks	VL...	Us...	Ap...	So...	De...	URLs	So...	De...	A...	Actions
1	VPN_Traffic	Inside, Outside	Inside, Outside	ASASubnet, FTDSubnet	ASASubnet, FTDSubnet	Any	Any	Any	Any	Any	Any	Any	Any	Any	Access Control: Block All Traffic

Step 6. Configure NAT Exemption.

Configure a NAT Exemption statement for the VPN traffic. NAT exemption must be in place to keep VPN traffic from hitting another NAT statement and incorrectly translating VPN traffic.

1. Navigate to **Devices > NAT**, select the NAT policy that targets the FTD. Create a new rule as you click the **Add Rule** button.

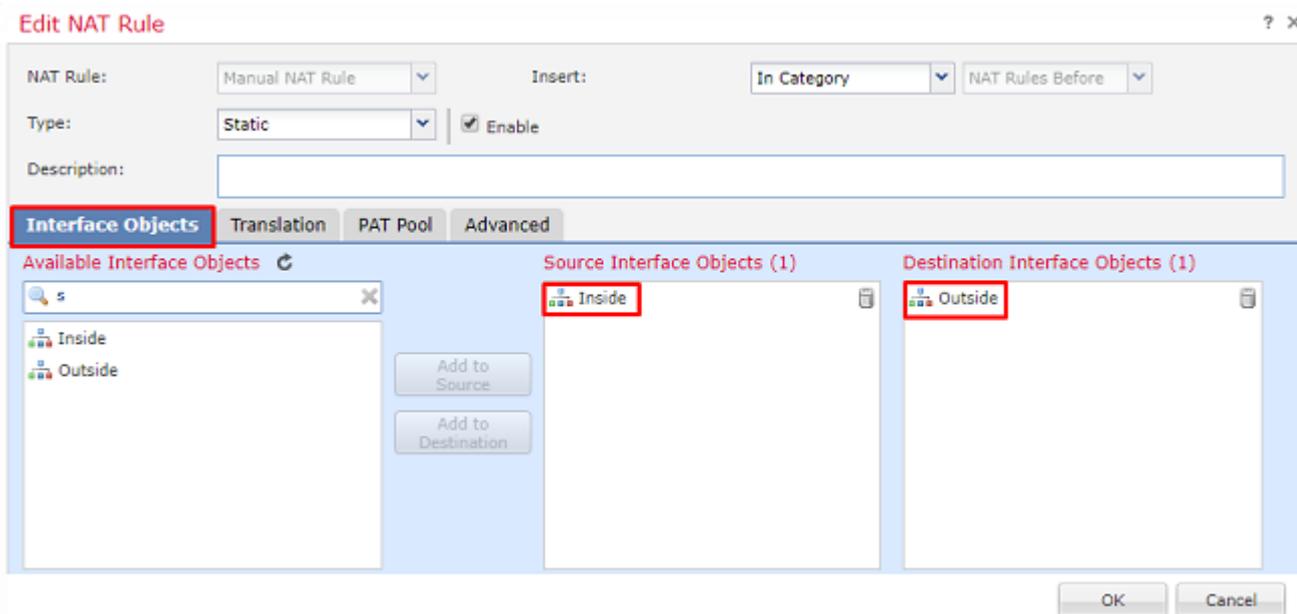
VirtualFTDNAT

Rules

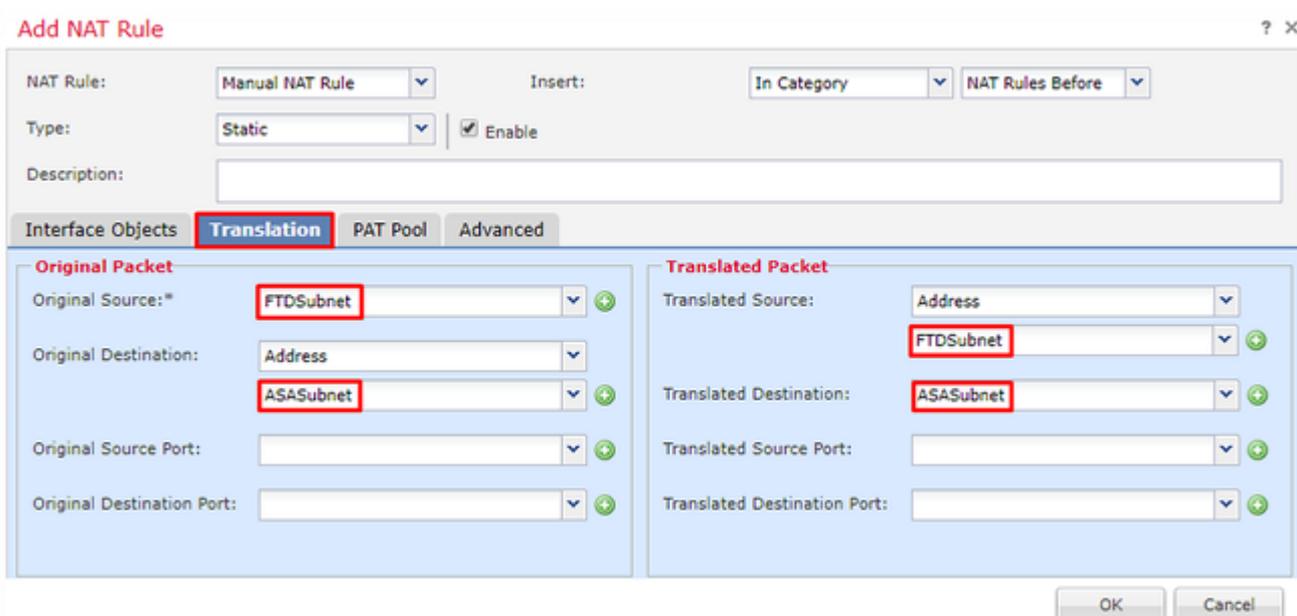
#	Direction	Type	Source Interface Objects	Destination Interface Objects	Original Sources	Original Destinations	Original Services	Translated Sources	Translated Destinations	Translated Services	Options
NAT Rules Before											
Auto NAT Rules											

Buttons: Add Rule

2. Create a new Static Manual NAT Rule. Reference the inside and outside interfaces.



3. Under the **Translation** tab and select the source and destination subnets. As this is a NAT exemption rule, make the original source/destination and the translated source/destination the same, as shown in this image:



4. Lastly, move to the **Advanced** tab and enabled no-proxy-arp and route-lookup.

Add NAT Rule ? X

NAT Rule: Insert:

Type: Enable

Description:

Interface Objects Translation PAT Pool **Advanced**

Translate DNS replies that match this rule

Fallthrough to Interface PAT(Destination Interface)

IPv6

Net to Net Mapping

Do not proxy ARP on Destination Interface

Perform Route Lookup for Destination Interface

Unidirectional

5. Save this rule and look at the final results in the NAT list.

Overview Analysis Policies **Devices** Objects AMP Intelligence Deploy System Help admin

Device Management NAT VPN QoS Platform Settings FlexConfig Certificates

VirtualFTDNAT Show Warnings Save Cancel

Enter Description Policy Assignments

Rules Filter by Device Add Rule

#	Direction	Type	Source Interface...	Destination Interface...	Original Packet			Translated Packet			Options
					Original Sources	Original Destinations	Original Services	Translated Sources	Translated Destinations	Translated Services	
▼ NAT Rules Before											
1	↔	Static	Inside	Outside	FTDSubnet	ASASubnet		FTDSubnet	ASASubnet		Dns:fail route-lk no-prop
▼ Auto NAT Rules											
#	↔	Dynamic	Inside	Outside	any-obj			Interface			Dns:fail
▼ NAT Rules After											

6. Once the configuration is completed, save and deploy the configuration to the FTD.

Step 7. Configure the ASA.

1. Enable IKEv2 on the outside interface of the ASA:

```
Crypto ikev2 enable outside
```

2. Create the IKEv2 Policy that defines the same parameters configured on the FTD:

```
Crypto ikev2 policy 1
Encryption aes-256
Integrity sha256
Group 14
Prf sha256
```

Lifetime seconds 86400

3. Create a group-policy allowing the ikev2 protocol:

```
Group-policy FTD_GP internal
Group-policy FTD_GP attributes
Vpn-tunnel-protocol ikev2
```

4. Create a tunnel group for the peer FTD public IP address. Reference the group-policy and specify the pre-shared-key:

```
Tunnel-group 172.16.100.20 type ipsec-l2l
Tunnel-group 172.16.100.20 general-attributes
Default-group-policy FTD_GP
Tunnel-group 172.16.100.20 ipsec-attributes
ikev2 local-authentication pre-shared-key cisco123
ikev2 remote-authentication pre-shared-key cisco123
```

5. Create an access-list that defines the traffic to be encrypted: (FTDSubnet 10.10.113.0/24) (ASASubnet 10.10.110.0/24)

```
Object network FTDSUBNET
Subnet 10.10.113.0 255.255.255.0
Object network ASASUBNET
Subnet 10.10.110.0 255.255.255.0
Access-list ASAtoFTD extended permit ip object ASASUBNET object FTDSUBNET
```

6. Create an ikev2 ipsec-proposal referencing the algorithms specified on the FTD:

```
Crypto ipsec ikev2 ipsec-proposal FTD
Protocol esp encryption aes-gcm-256
```

7. Create a crypto map entry that ties together the configuration:

```
Crypto map outside_map 10 set peer 172.16.100.20
Crypto map outside_map 10 match address ASAtoFTD
Crypto map outside_map 10 set ikev2 ipsec-proposal FTD
Crypto map outside_map 10 interface outside
```

8. Create a NAT exemption statement that will prevent the VPN traffic from being NATTED by the

firewall:

```
Nat (inside,outside) 1 source static ASASubnet ASASubnet destination static FTDSubnet FTDSubnet no-p
```

Verify

Note: At this time there is no way to review VPN tunnel status from the FMC. There is an enhancement request for this capability [CSCvh77603](#).

Attempt to initiate traffic through the VPN tunnel. With access to the command line of the ASA or FTD, this can be done with the packet tracer command. When using the packet-tracer command to bring up the VPN tunnel it must be run twice to verify the tunnel comes up. The first time the command is issued the VPN tunnel is down so the packet-tracer command will fail with VPN encrypt DROP. Do not use the inside IP address of the firewall as the source IP address in the packet-tracer as this will always fail.

```
firepower# packet-tracer input inside icmp 10.10.113.10 8 0 10.10.110.10
```

```
Phase: 10
Type: VPN
Subtype: encrypt
Result: DROP
Config:
Additional Information:
```

```
firepower# packet-tracer input inside icmp 10.10.113.10 8 0 10.10.110.10
```

```
Phase: 1
Type: ROUTE-LOOKUP
Subtype: Resolve Egress Interface
Result: ALLOW
Config:
Additional Information:
found next-hop 172.16.100.1 using egress ifc outside
```

```
Phase: 2
Type: UN-NAT
Subtype: static
Result: ALLOW
Config:
nat (Inside,outside) source static FTDSubnet FTDSubnet destination static ASASubnet ASASubnet no-proxy-a
Additional Information:
NAT divert to egress interface outside
Untranslate 10.10.110.10/0 to 10.10.110.10/0
```

```
Phase: 3
Type: ACCESS-LIST
Subtype: log
Result: ALLOW
Config:
access-group CSM_FW_ACL_ global
access-list CSM_FW_ACL_ advanced permit ip ifc Inside object-group FMC_INLINE_src_rule_268436483 ifc out
```

```
access-list CSM_FW_ACL_ remark rule-id 268436483: ACCESS POLICY: FTD-Access-Control-Policy - Mandatory
access-list CSM_FW_ACL_ remark rule-id 268436483: L7 RULE: VPN_Traffic
object-group network FMC_INLINE_src_rule_268436483
description: Auto Generated by FMC from src of UnifiedNGFWRule# 1 (FTD-Access-Control-Policy/mandatory)
network-object object ASASubnet
network-object object FTDSubnet
object-group network FMC_INLINE_dst_rule_268436483
description: Auto Generated by FMC from dst of UnifiedNGFWRule# 1 (FTD-Access-Control-Policy/mandatory)
network-object object ASASubnet
network-object object FTDSubnet
Additional Information:
This packet will be sent to snort for additional processing where a verdict will be reached
```

```
Phase: 5
Type: NAT
Subtype:
Result: ALLOW
Config:
nat (Inside,outside) source static FTDSubnet FTDSubnet destination static ASASubnet ASASubnet no-proxy-a
Additional Information:
Static translate 10.10.113.10/0 to 10.10.113.10/0
```

```
Phase: 10
Type: VPN
Subtype: encrypt
Result: ALLOW
Config:
Additional Information:
```

```
Result:
input-interface: Inside
input-status: up
input-line-status: up
output-interface: outside
output-status: up
output-line-status: up
Action: allow
```

In order to monitor the tunnel status navigate to the CLI of the FTD or ASA.

From the FTD CLI verify phase-1 and phase-2 with this command:

Show crypto ikev2 sa

```
<#root>
```

```
> show crypto ikev2 sa
```

```
IKEv2 SAs:
```

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

```
Tunnel-id Local Remote
9528731 172.16.100.20/500 192.168.200.10/500
```

```
READY
```

```
INITIATOR
```

```
Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
```

```
Life/Active Time: 86400/118 sec
Child sa: local selector
10.10.113.0/0 - 10.10.113.255/65535

remote selector
10.10.110.0/0 - 10.10.110.255/65535

ESP spi in/out:
0x66be357d/0xb74c8753
```

Troubleshoot and Debug

Initial Connectivity Issues

When building a VPN there are two sides negotiating the tunnel. Therefore, it is best to get both sides of the conversation when you troubleshoot any type of tunnel failure. A detailed guide on how to debug IKEv2 tunnels can be found here: [How to debug IKEv2 VPNs](#)

The most common cause of tunnel failures is a connectivity issue. The best way to determine this is to take packet captures on the device. Use this command to take packet captures on the device:

```
Capture capout interface outside match ip host 172.16.100.20 host 192.168.200.10
```

Once the capture is in place, try to send traffic over the VPN and check for bi-directional traffic in the packet capture.

Review the packet capture with this command:

show cap capout

```
firepower# show cap capout
```

```
4 packets captured
```

```
1: 11:51:12.059628      172.16.100.20.500 > 192.168.200.10.500:  udp 690
2: 11:51:12.065243      192.168.200.10.500 > 172.16.100.20.500:  udp 619
3: 11:51:12.066692      172.16.100.20.500 > 192.168.200.10.500:  udp 288
4: 11:51:12.069835      192.168.200.10.500 > 172.16.100.20.500:  udp 240
```

Traffic-Specific Issues

Common traffic issues that you experience are:

- Routing issues behind the FTD -- internal network unable to route packets back to the assigned IP addresses and VPN clients.

- Access control lists blocking traffic.
- Network Address Translation not being bypassed for VPN traffic.

For further information regarding VPNs on the FTD managed by FMC, you can find the full configuration guide here: [FTD managed by FMC configuration guide](#)