Configure FTD BGP over IPSec VPN

Contents

Introduction

This document describes how to configure Border Gateway Protocol (BGP) neighborship over an IPsec site-to-site VPN tunnel between two Cisco FirePower Threat Defense (FTD).

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- BGP configurations on FTD
- IPsec site-to-site VPN tunnel configurations on FTD

Components Used

The information in this document is based on Cisco FTDv running 6.4.0.7 and 6.4.0.9.

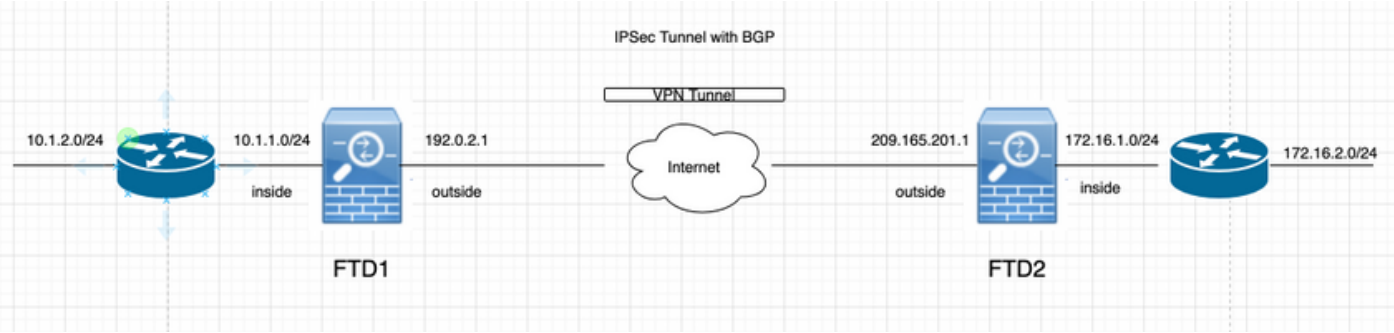
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Configure

This section describes the configuration needed on the FTDs to bring up BGP neighborship

through an IPSec Tunnel.

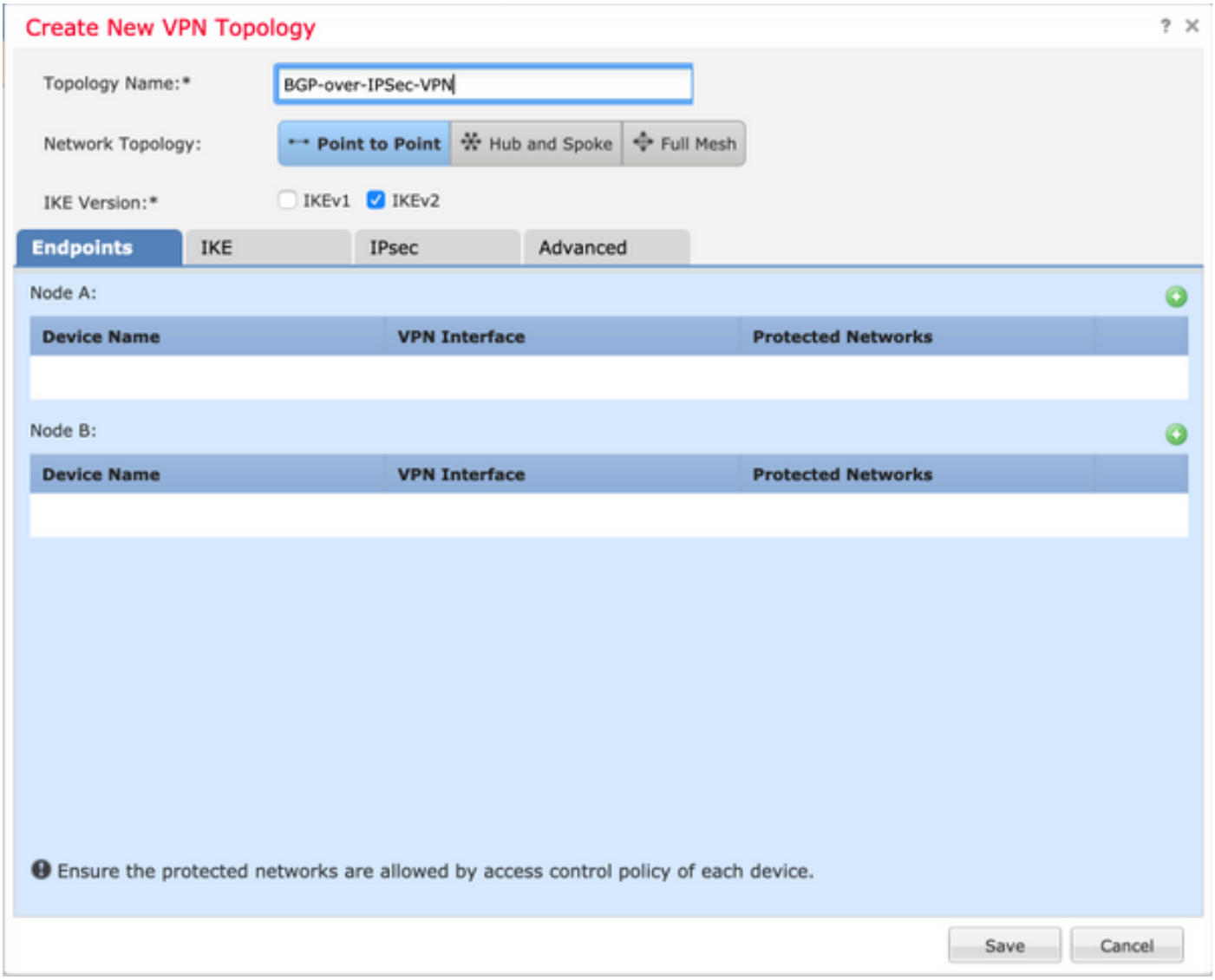
Network Diagram



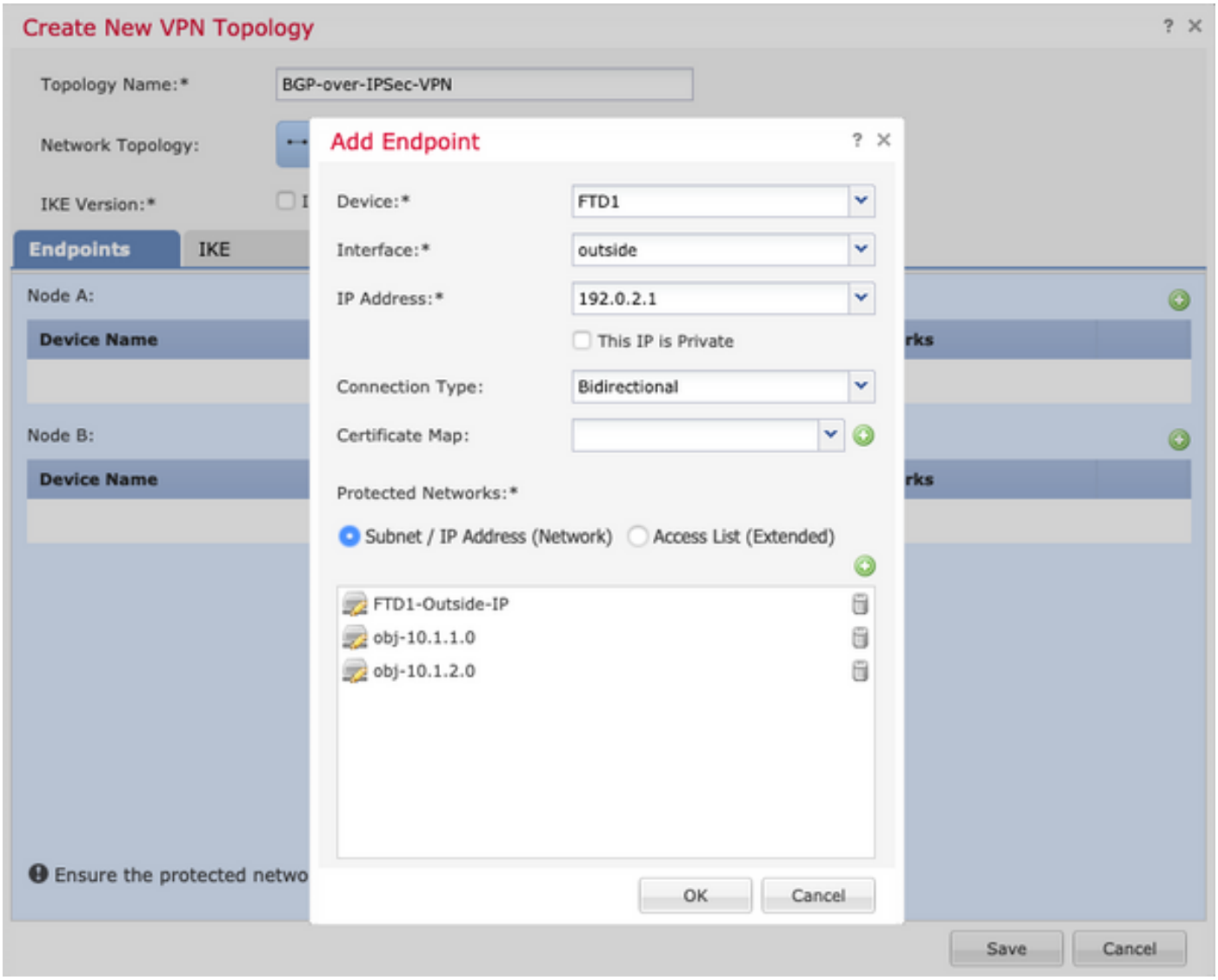
Configure IPSec VPN

Step 1. Create a new Point-to-Point VPN Topology.

Navigate to **Devices > VPN > Site-to-Site**, and add a new FirePower Threat Defense Device VPN.

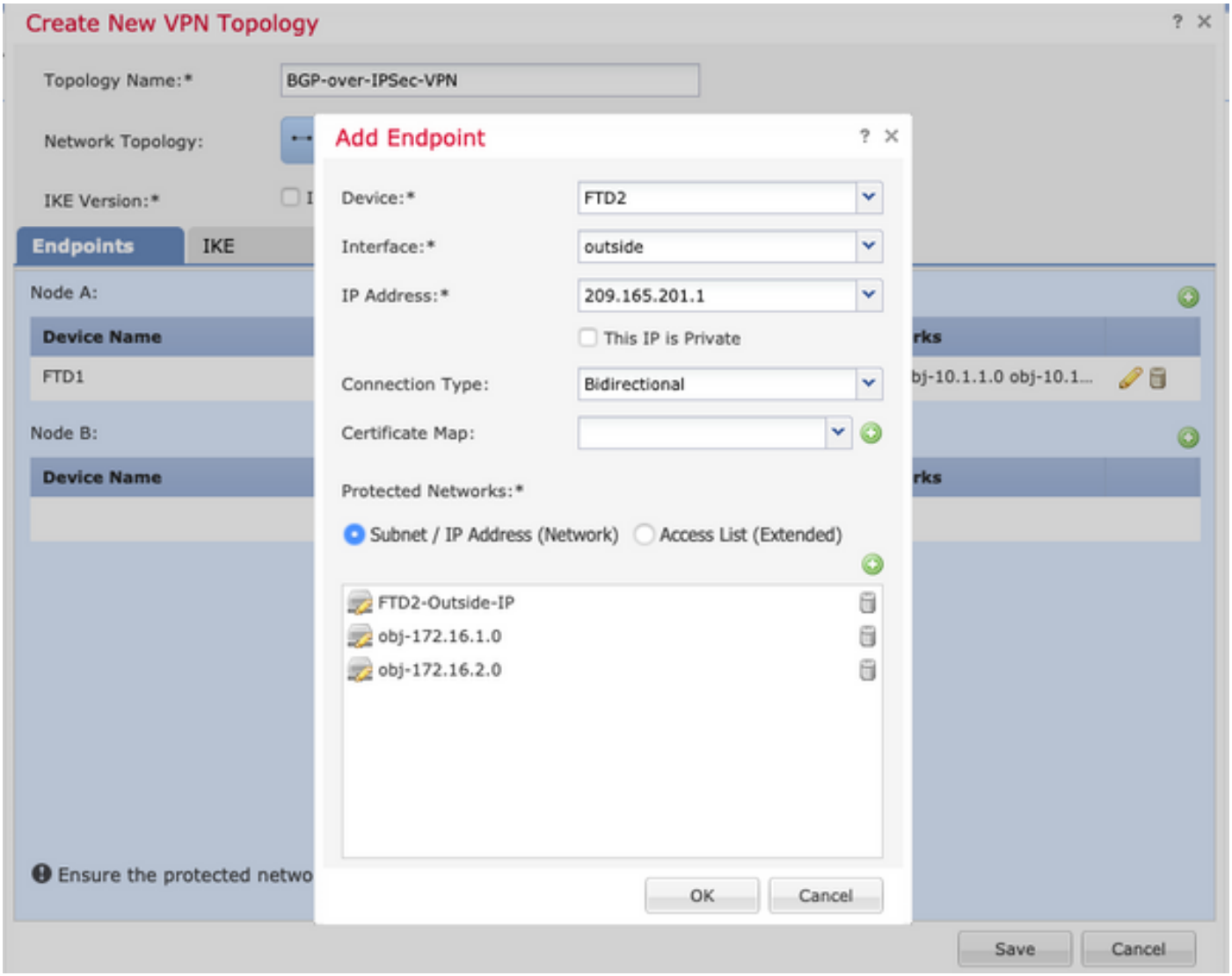


Step 2. Configure FTD1 as one of the endpoints.



- Object network FTD1-Outside-IP contains the outside interface IP address of the FTD1.
- Objects obj-10.1.1.0 and obj-10.1.2.0 contain subnet 10.1.1.0/24 and 10.1.2.0/24 respectively. VPN traffic is generated from these subnets. In the BGP configuration section here, BGP is configured to advertise these subnets to its neighbors.

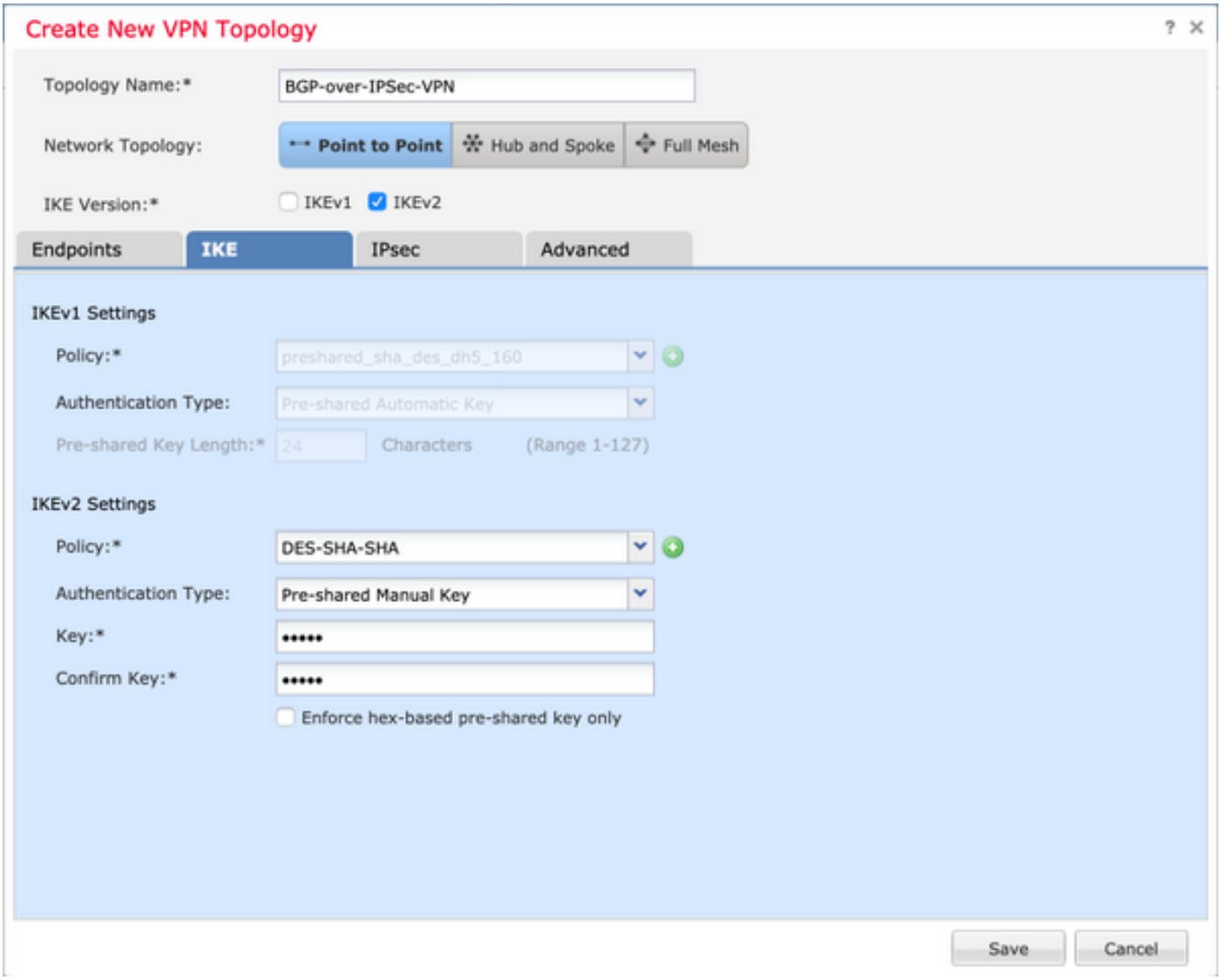
Step 3. Configure FTD2 as the second endpoint.



- Object network FTD2-Outside-IP contains the outside interface IP address of the FTD2.
- Objects obj-172.16.1.0 and obj-172.16.2.0 contain subnet 172.16.1.0/24 and 172.16.2.0/24 respectively. VPN traffic is generated from these subnets. In the BGP configuration section here, BGP is configured to advertise these subnets to its neighbors.

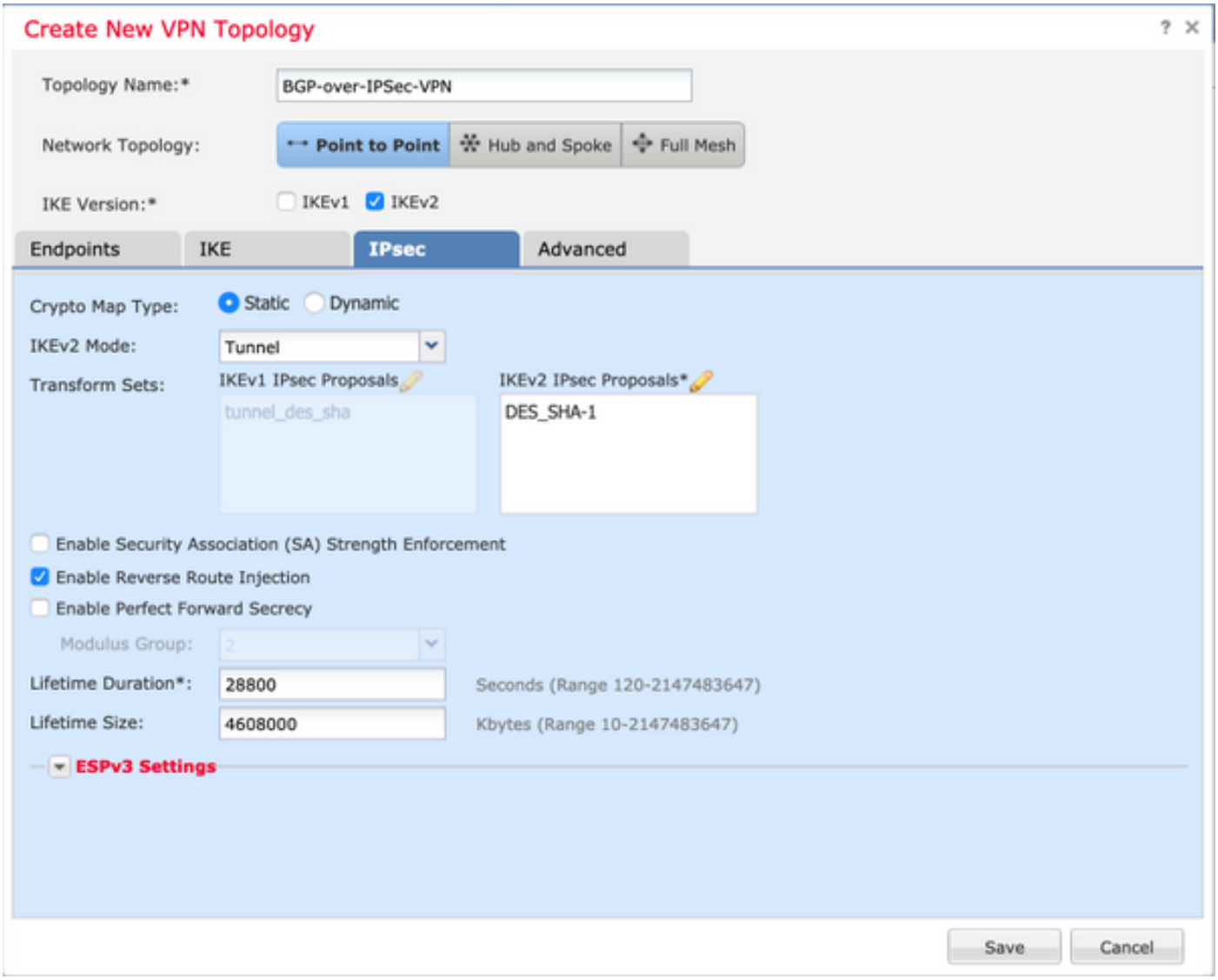
Step 4. Configure the IKE parameters.

1. Configure the IKEv2 policy.
2. Configure the Authentication Method (PSK/Certificate).

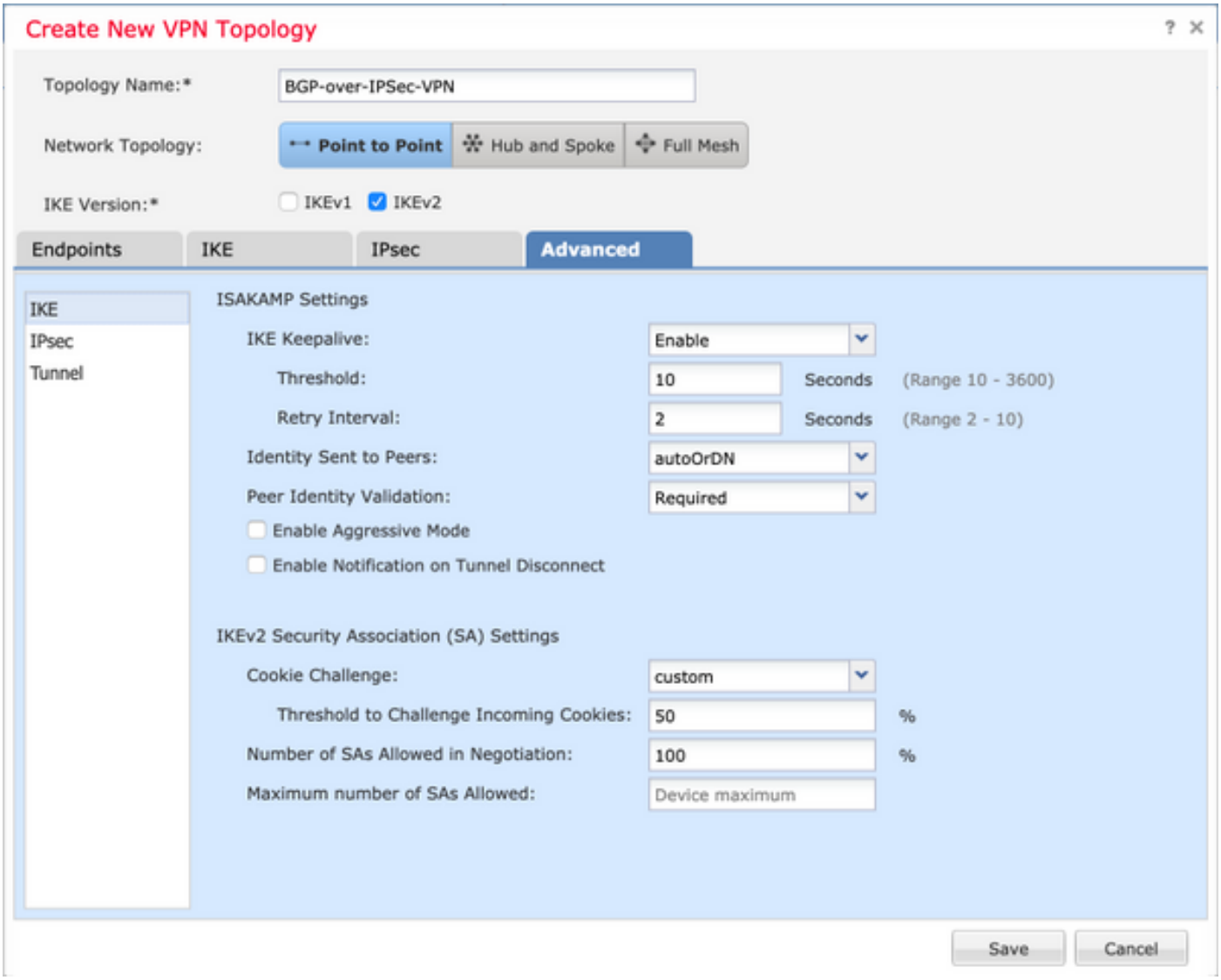


Step 5. Configure the necessary IPSec Parameters.

1. Configure Crypto map type (Static or Dynamic)
2. Configure IKEv2 Mode (Tunnel or Transport)
3. Configure IPSec Proposals
4. Enable Perfect Forward Secrecy (Optional)
5. Enable Reverse Route Injection (Optional)



Step 6. Configure Advanced Settings as needed.

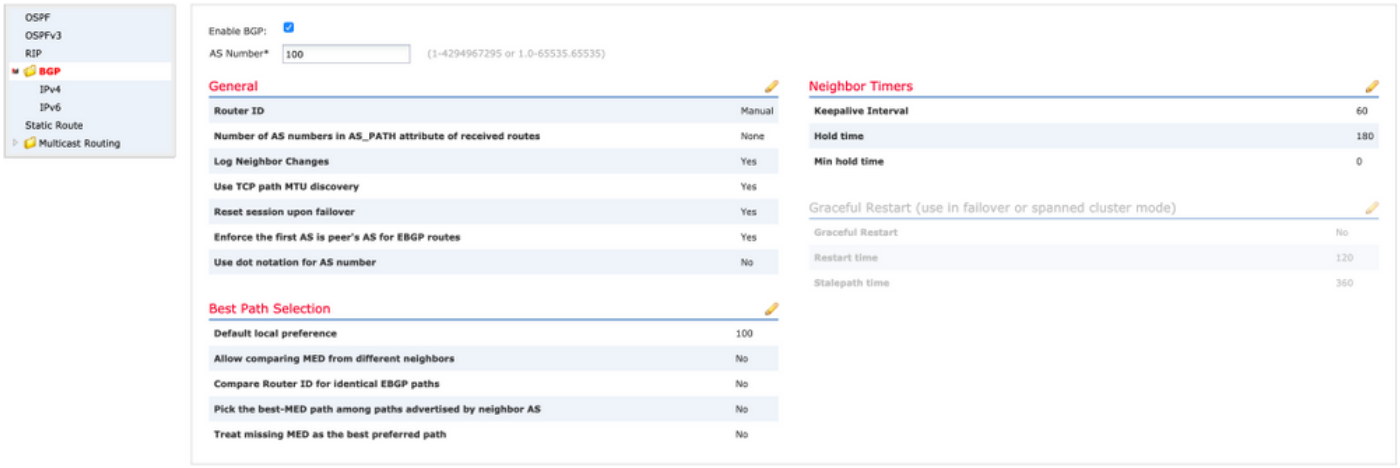


Configure BGP

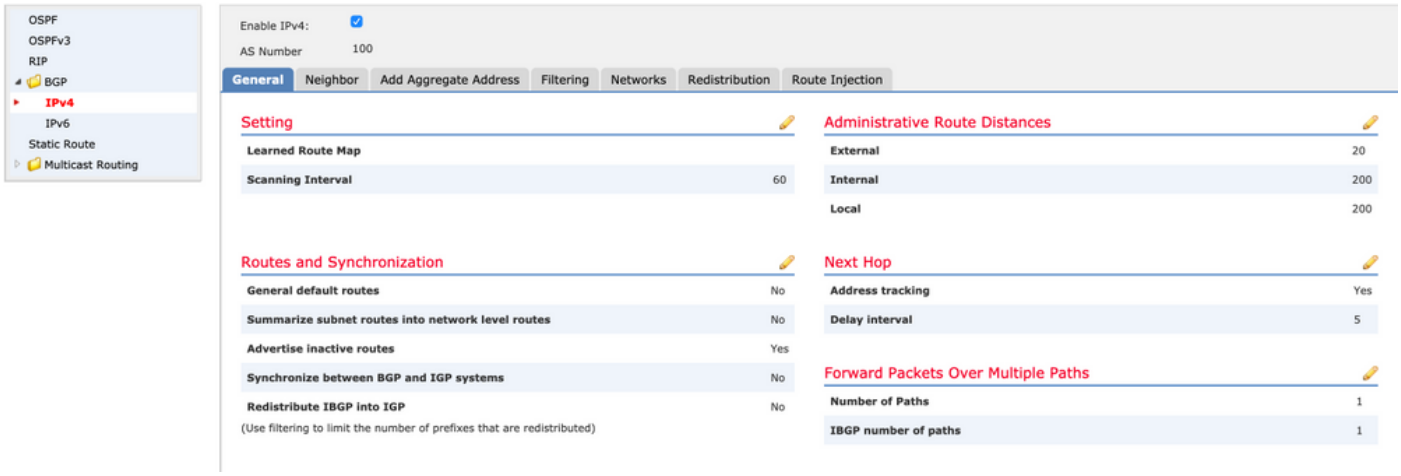
This is the procedure to configure FTD1 and FTD2.

Under **Device Management** and select the device, then navigate to **Routing > BGP**.

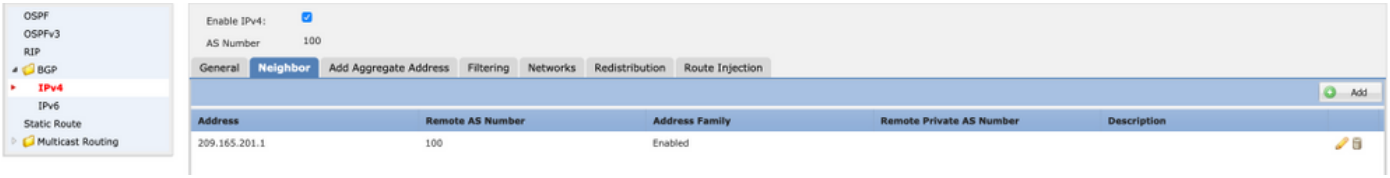
1. Enable BGP and configure the Autonomous System (AS) Number, as shown in this image.



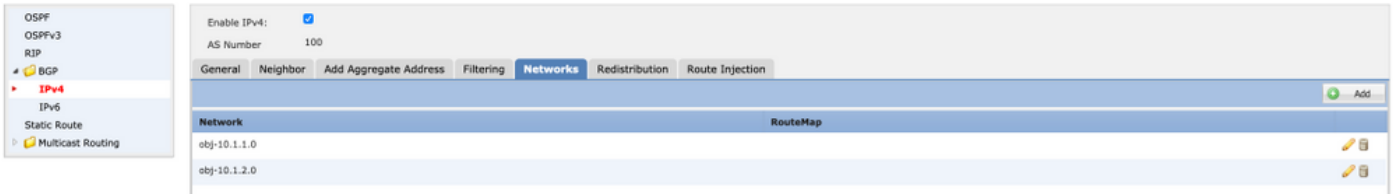
2. Navigate to **BGP > IPv4** and enable BGP IPv4 on the FTD, as shown in this image.



3. Under the **Neighbor** Tab, add the other FTD as a neighbor and enable the neighbor, as shown in this image.



4. Under the **Networks** Tab, add the networks that you want to advertise through BGP.



5. All other BGP settings are optional and you may configure them as per your environment.

Final Configuration on both the Devices

FTD1

```
!--- FTD Version ---! ftd1# show version ----------------------[ ftd1 ]----------------------
Model : Cisco Firepower Threat Defense for VMWare (75) Version 6.4.0.7 (Build 53) UUID :
cbd4966c-daf4-11ea-8637-c8977622bc2d Rules update version : 2018-10-10-001-vrt VDB version : 309
------------------------------------------------- Cisco Adaptive Security Appliance Software
Version 9.12(2)151 !--- Configure the Inside and outside interface ---! interface
GigabitEthernet0/0 nameif outside cts manual propagate sgt preserve-untag policy static sgt
disabled trusted security-level 0 ip address 192.0.2.1 255.255.255.0 ! interface
GigabitEthernet0/1 nameif inside cts manual propagate sgt preserve-untag policy static sgt
disabled trusted security-level 0 ip address 10.1.1.1 255.255.255.0 !--- Configure VPN ---! !---
Configure IPSec Policy ---! crypto ipsec ikev2 ipsec-proposal CSM_IP_1 protocol esp encryption
des protocol esp integrity sha-1 !--- Configure Crypto Map ---! crypto map CSM_outside_map 1
match address CSM_IPSEC_ACL_2 crypto map CSM_outside_map 1 set peer 209.165.201.1 crypto map
CSM_outside_map 1 set ikev2 ipsec-proposal CSM_IP_1 crypto map CSM_outside_map 1 set reverse-
route !--- Apply the Crypto Map to the outside interface ---! crypto map CSM_outside_map
interface outside !--- Configure IKEv2 policy ---! crypto ikev2 policy 80 encryption des
integrity sha group 5 prf sha lifetime seconds 86400 !--- Enable IKEv2 on the outside interface
---! crypto ikev2 enable outside !--- Configure BGP Router Process ---! router bgp 100 bgp log-
neighbor-changes bgp router-id 10.127.248.35 address-family ipv4 unicast neighbor 209.165.201.1
remote-as 100 neighbor 209.165.201.1 transport path-mtu-discovery disable neighbor 209.165.201.1
```

activate network 10.1.1.0 mask 255.255.255.0 network 10.1.2.0 mask 255.255.255.0 no auto-summary no synchronization exit-address-family ! !--- Configure the necessary routes ---! route outside 0.0.0.0 0.0.0.0 192.0.2.100 1 route inside 10.1.2.0 255.255.255.0 10.1.1.100 1

FTD2

!--- FTD Version ---! ftd2# show version ----------------------[ftd2]---------------------- Model : Cisco Firepower Threat Defense for VMWare (75) Version 6.4.0.9 (Build 62) UUID : 4ebe8e3a-dd8d-11ea-a599-a348a450d5ff Rules update version : 2018-10-10-001-vrt VDB version : 309 -- Cisco Adaptive Security Appliance Software Version 9.12(2)33 !--- Configure the Inside and outside interface ---! interface GigabitEthernet0/0 nameif outside cts manual propagate sgt preserve-untag policy static sgt disabled trusted security-level 0 ip address 209.165.201.1 255.255.255.0 ! interface GigabitEthernet0/1 nameif inside cts manual propagate sgt preserve-untag policy static sgt disabled trusted security-level 0 ip address 172.16.1.1 255.255.255.0 !--- Configure VPN ---! !-- Configure IPSec Policy ---! crypto ipsec ikev2 ipsec-proposal CSM_IP_1 protocol esp encryption des protocol esp integrity sha-1 !--- Configure Crypto Map ---! crypto map CSM_outside_map 2 match address CSM_IPSEC_ACL_2 crypto map CSM_outside_map 2 set peer 192.0.2.1 crypto map CSM_outside_map 2 set ikev2 ipsec-proposal CSM_IP_1 crypto map CSM_outside_map 2 set reverse-route !--- Apply the Crypto Map to the outside interface ---! crypto map CSM_outside_map interface outside !--- Configure IKEv2 policy ---! crypto ikev2 policy 80 encryption des integrity sha group 5 prf sha lifetime seconds 86400 !--- Enable IKEv2 on the outside interface ---! crypto ikev2 enable outside !--- Configure BGP Router Process ---! router bgp 100 bgp log-neighbor-changes bgp router-id 10.127.248.36 address-family ipv4 unicast neighbor 192.0.2.1 remote-as 100 neighbor 192.0.2.1 transport path-mtu-discovery disable neighbor 192.0.2.1 activate network 172.16.1.0 mask 255.255.255.0 network 172.16.2.0 mask 255.255.255.0 no auto-summary no synchronization exit-address-family !--- Configure the necessary routes ---! route outside 0.0.0.0 0.0.0.0 209.165.201.100 1 route inside 172.16.2.0 255.255.255.0 172.16.1.100 1

Verify

FTD1

!--- Check the IKEv2 sa with remote peer ---! ftd1# show crypto ikev2 sa IKEv2 SAs: Session-id:34, Status:UP-ACTIVE, IKE count:1, CHILD count:1 Tunnel-id Local Remote Status Role 315310279 192.0.2.1/500 209.165.201.1/500 READY INITIATOR Encr: DES, Hash: SHA96, DH Grp:5, Auth sign: PSK, Auth verify: PSK Life/Active Time: 86400/32514 sec Child sa: local selector 192.0.2.1/0 - 192.0.2.1/65535 remote selector 209.165.201.1/0 - 209.165.201.1/65535 ESP spi in/out: 0xd8ba0545/0x4b6beb6c !--- Check the IPSec sa with remote peer and check the number of encrypts and decrypts---! ftd1# show crypto ipsec sa interface: outside Crypto map tag: CSM_outside_map, seq num: 1, local addr: 192.0.2.1 access-list CSM_IPSEC_ACL_2 extended permit ip host 192.0.2.1 host 209.165.201.1 local ident (addr/mask/prot/port): (192.0.2.1/255.255.255.255/0/0) remote ident (addr/mask/prot/port): (209.165.201.1/255.255.255.255/0/0) current_peer: 209.165.201.1 #pkts encaps: 1110, #pkts encrypt: 1110, #pkts digest: 1110 #pkts decaps: 1111, #pkts decrypt: 1111, #pkts verify: 1111 #pkts compressed: 0, #pkts decompressed: 0 #pkts not compressed: 1110, #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.: 192.0.2.1/500, remote crypto endpt.: 209.165.201.1/500 path mtu 1500, ipsec overhead 58(36), media mtu 1500 PMTU time remaining (sec): 0, DF policy: copy-df ICMP error validation: disabled, TFC packets: disabled current outbound spi: 4B6BEB6C current inbound spi : D8BA0545 inbound esp sas: spi: 0xD8BA0545 (3636069701) SA State: active transform: esp-des esp-sha-hmac no compression in use settings ={L2L, Tunnel, IKEv2, } slot: 0, conn_id: 1515, crypto-map: CSM_outside_map sa timing: remaining key lifetime (kB/sec): (4101105/21619) IV size: 8 bytes replay detection support: Y Anti replay bitmap: 0xFFFFFFFF 0xFFFFFFFF outbound esp sas: spi: 0x4B6BEB6C (1265363820) SA State: active transform: esp-des esp-sha-hmac no compression in use settings ={L2L, Tunnel, IKEv2, } slot: 0, conn_id: 1515, crypto-map: CSM_outside_map sa timing: remaining key lifetime (kB/sec): (4239345/21619) IV size: 8 bytes replay detection support: Y Anti replay bitmap: 0x00000000 0x00000001 !--- Check the BGP router summary ---! ftd1# show bgp summary BGP router identifier

10.127.248.35, local AS number 100 BGP table version is 43, main routing table version 43 4 network entries using 800 bytes of memory 4 path entries using 320 bytes of memory 2/2 BGP path/bestpath attribute entries using 416 bytes of memory 0 BGP route-map cache entries using 0 bytes of memory 0 BGP filter-list cache entries using 0 bytes of memory BGP using 1536 total bytes of memory BGP activity 20/16 prefixes, 26/22 paths, scan interval 60 secs Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd 209.165.201.1 4 100 494 488 43 0 0 09:01:15 2 !--- Check the BGP neighborship ---! ftd1# show bgp neighbors BGP neighbor is 209.165.201.1, context single_vf, remote AS 100, internal link BGP version 4, remote router ID 10.127.248.36 BGP state = Established, up for 09:01:18 Last read 00:00:52, last write 00:00:12, hold time is 180, keepalive interval is 60 seconds Neighbor sessions: 1 active, is not multisession capable (disabled) Neighbor capabilities: Route refresh: advertised and received(new) Four-octets ASN Capability: advertised and received Address family IPv4 Unicast: advertised and received Multisession Capability: Message statistics: InQ depth is 0 OutQ depth is 0 Sent Rcvd Opens: 1 1 Notifications: 0 0 Updates: 3 3 Keepalives: 484 490 Route Refresh: 0 0 Total: 488 494 Default minimum time between advertisement runs is 0 seconds For address family: IPv4 Unicast Session: 209.165.201.1 BGP table version 43, neighbor version 43/0 Output queue size : 0 Index 19 19 update-group member Sent Rcvd Prefix activity: ---- ---- Prefixes Current: 2 2 (Consumes 160 bytes) Prefixes Total: 2 2 Implicit Withdraw: 0 0 Explicit Withdraw: 0 0 Used as bestpath: n/a 2 Used as multipath: n/a 0 Outbound Inbound Local Policy Denied Prefixes: -------- ------- Bestpath from this peer: 2 n/a Invalid Path: 1 n/a Total: 3 0 Number of NLRIs in the update sent: max 1, min 0 Address tracking is enabled, the RIB does have a route to 209.165.201.1 Connections established 2; dropped 1 Last reset 09:01:34, due to Peer closed the session of session 1 Transport(tcp) path-mtu-discovery is disabled Graceful-Restart is disabled !--- Check the routes learned from BGP ---! ftd1# sh route bgp 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 Gateway of last resort is 192.0.2.100 to network 0.0.0.0 B 172.16.1.0 255.255.255.0 [200/0] via 209.165.201.1, 00:00:57 B 172.16.2.0 255.255.255.0 [200/0] via 172.16.1.100, 09:01:23

FTD2

!--- Check the IKEv2 sa with remote peer ---! ftd2# show crypto ikev2 sa IKEv2 SAs: Session-id:34, Status:UP-ACTIVE, IKE count:1, CHILD count:1 Tunnel-id Local Remote Status Role 862624945 209.165.201.1/500 192.0.2.1/500 READY RESPONDER Encr: DES, Hash: SHA96, DH Grp:5, Auth sign: PSK, Auth verify: PSK Life/Active Time: 86400/32429 sec Child sa: local selector 209.165.201.1/0 - 209.165.201.1/65535 remote selector 192.0.2.1/0 - 192.0.2.1/65535 ESP spi in/out: 0x4b6beb6c/0xd8ba0545 !--- Check the IPSec sa with remote peer and check the number of encrypts and decrypts---! ftd2# show crypto ipsec sa interface: outside Crypto map tag: CSM_outside_map, seq num: 2, local addr: 209.165.201.1 access-list CSM_IPSEC_ACL_2 extended permit ip host 209.165.201.1 host 192.0.2.1 local ident (addr/mask/prot/port): (209.165.201.1/255.255.255.255/0/0) remote ident (addr/mask/prot/port): (192.0.2.1/255.255.255.255/0/0) current_peer: 192.0.2.1 #pkts encaps: 1107, #pkts encrypt: 1107, #pkts digest: 1107 #pkts decaps: 1106, #pkts decrypt: 1106, #pkts verify: 1106 #pkts compressed: 0, #pkts decompressed: 0 #pkts not compressed: 1107, #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.: 209.165.201.1/500, remote crypto endpt.: 192.0.2.1/500 path mtu 1500, ipsec overhead 58(36), media mtu 1500 PMTU time remaining (sec): 0, DF policy: copy-df ICMP error validation: disabled, TFC packets: disabled current outbound spi: D8BA0545 current inbound spi : 4B6BEB6C inbound esp sas: spi: 0x4B6BEB6C (1265363820) SA State: active transform: esp-des esp-sha-hmac no compression in use settings ={L2L, Tunnel, IKEv2, } slot: 0, conn_id: 1516, crypto-map: CSM_outside_map sa timing: remaining key lifetime (kB/sec): (4008945/21713) IV size: 8 bytes replay detection support: Y Anti replay bitmap: 0xFFFFFFFF 0xFFFFFFFF outbound esp sas: spi: 0xD8BA0545 (3636069701) SA State: active transform: esp-des esp-sha-hmac no compression in use settings ={L2L, Tunnel, IKEv2, } slot: 0, conn_id: 1516, crypto-map: CSM_outside_map sa timing: remaining key lifetime (kB/sec): (4239345/21713) IV size: 8 bytes replay detection support: Y Anti replay bitmap: 0x00000000 0x00000001 !--- Check the BGP router summary ---! ftd2# show bgp summary BGP router identifier 10.127.248.36, local AS number 100 BGP table version is 44, main

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routing table version 44 3 network entries using 600 bytes of memory 3 path entries using 240 bytes of memory 2/2 BGP path/bestpath attribute entries using 416 bytes of memory 0 BGP route-map cache entries using 0 bytes of memory 0 BGP filter-list cache entries using 0 bytes of memory BGP using 1256 total bytes of memory BGP activity 20/17 prefixes, 26/23 paths, scan interval 60 secs Neighbor V AS MsgRcvd MsgSent TblVer InQ OutQ Up/Down State/PfxRcd 192.0.2.1 4 100 486 492 44 0 0 08:59:40 2 !--- Check the BGP neighborship ---! ftd2# show bgp neighbors BGP neighbor is 192.0.2.1, context single_vf, remote AS 100, internal link BGP version 4, remote router ID 10.127.248.35 BGP state = Established, up for 08:59:42 Last read 00:00:53, last write 00:00:38, hold time is 180, keepalive interval is 60 seconds Neighbor sessions: 1 active, is not multisession capable (disabled) Neighbor capabilities: Route refresh: advertised and received(new) Four-octets ASN Capability: advertised and received Address family IPv4 Unicast: advertised and received Multisession Capability: Message statistics: InQ depth is 0 OutQ depth is 0 Sent Rcvd Opens: 1 1 Notifications: 0 0 Updates: 2 3 Keepalives: 489 482 Route Refresh: 0 0 Total: 492 486 Default minimum time between advertisement runs is 0 seconds For address family: IPv4 Unicast Session: 192.0.2.1 BGP table version 44, neighbor version 44/0 Output queue size : 0 Index 19 19 update-group member Sent Rcvd Prefix activity: ---- ---- Prefixes Current: 1 2 (Consumes 160 bytes) Prefixes Total: 1 2 Implicit Withdraw: 0 0 Explicit Withdraw: 0 0 Used as bestpath: n/a 2 Used as multipath: n/a 0 Outbound Inbound Local Policy Denied Prefixes: ---------- ------- Bestpath from this peer: 2 n/a Invalid Path: 2 n/a Total: 4 0 Number of NLRIs in the update sent: max 1, min 0 Address tracking is enabled, the RIB does have a route to 192.0.2.1 Connections established 2; dropped 1 Last reset 08:59:57, due to Peer closed the session of session 1 Transport(tcp) path-mtu-discovery is disabled Graceful-Restart is disabled !--- Check the routes learned from BGP ---! ftd2# show route bgp 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 Gateway of last resort is 209.165.201.100 to network 0.0.0.0 B 10.1.1.0 255.255.255.0 [200/0] via 192.0.2.1, 08:59:46 B 10.1.2.0 255.255.255.0 [200/0] via 10.1.1.100, 08:59:46
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Troubleshoot

There is currently no specific troubleshooting information available for this configuration.