在FMC管理的FTD上，使用备用ISP链路配置IPSec站点到站点隧道的故障切换

目录

简介

本文档介绍如何使用FMC管理的FTD上的IP SLA跟踪功能为ISP链路配置基于加密映射的故障切换。

作者：Amanda Nava，思科TAC工程师。

先决条件

要求

Cisco 建议您了解以下主题：

- 基本了解虚拟专用网络(VPN)
- 使用FTD的经验
- 使用FMC的经验
- 使用自适应安全设备(ASA)命令行的体验

使用的组件

本文档中的信息基于以下软件版本：

- FMC版本6.6.0
- FTD版本6.6.0
- ASA 9.14.1 版

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

背景信息

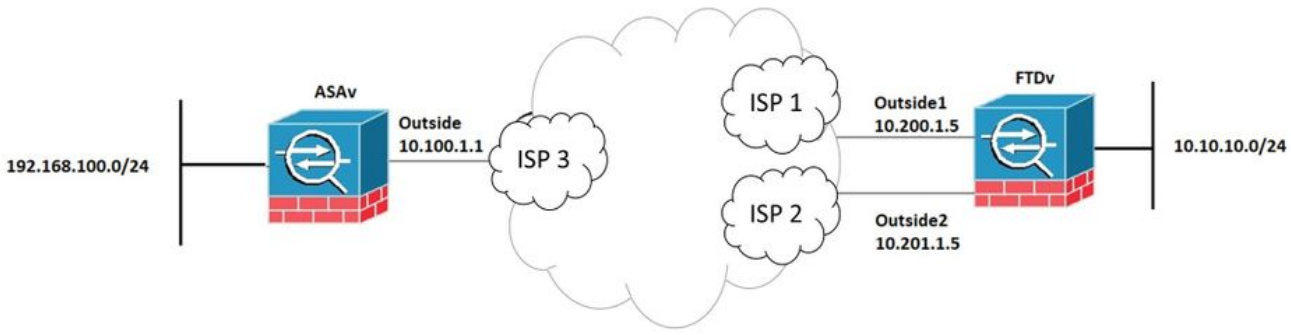
本文档介绍如何使用Firepower威胁防御(FTD)上的Internet协议服务级别协议(IP SLA)跟踪功能，为Internet服务提供商(ISP)备用链路配置基于加密映射的故障切换，由Firepower管理中心(FMC)管理。它还解释了当存在两个ISP且需要无缝故障切换时，如何为VPN流量配置网络地址转换(NAT)免除。

在此场景中，VPN从FTD建立到ASA，作为仅具有一个ISP接口的VPN对等体。FTD当时使用一个ISP链路来建立VPN。当主ISP链路断开时，FTD通过SLA Monitor接管辅助ISP链路，并建立VPN。

配置

网络图

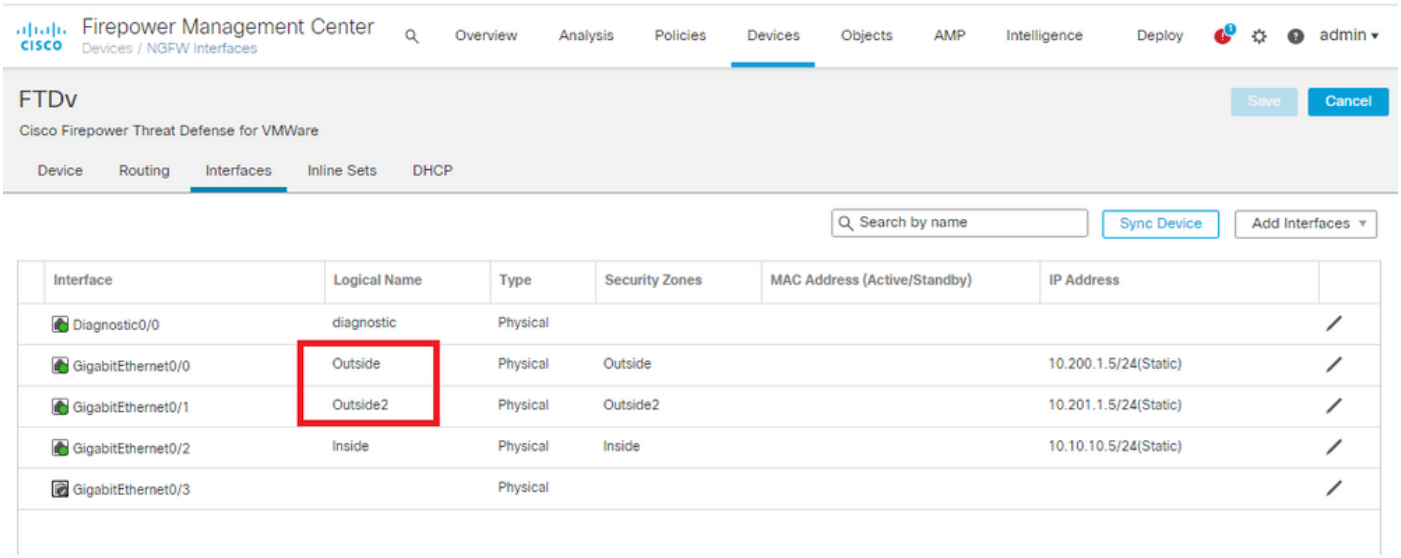
这是本文档中示例使用的拓扑：



配置FTD

步骤1:定义主要ISP接口和辅助ISP接口

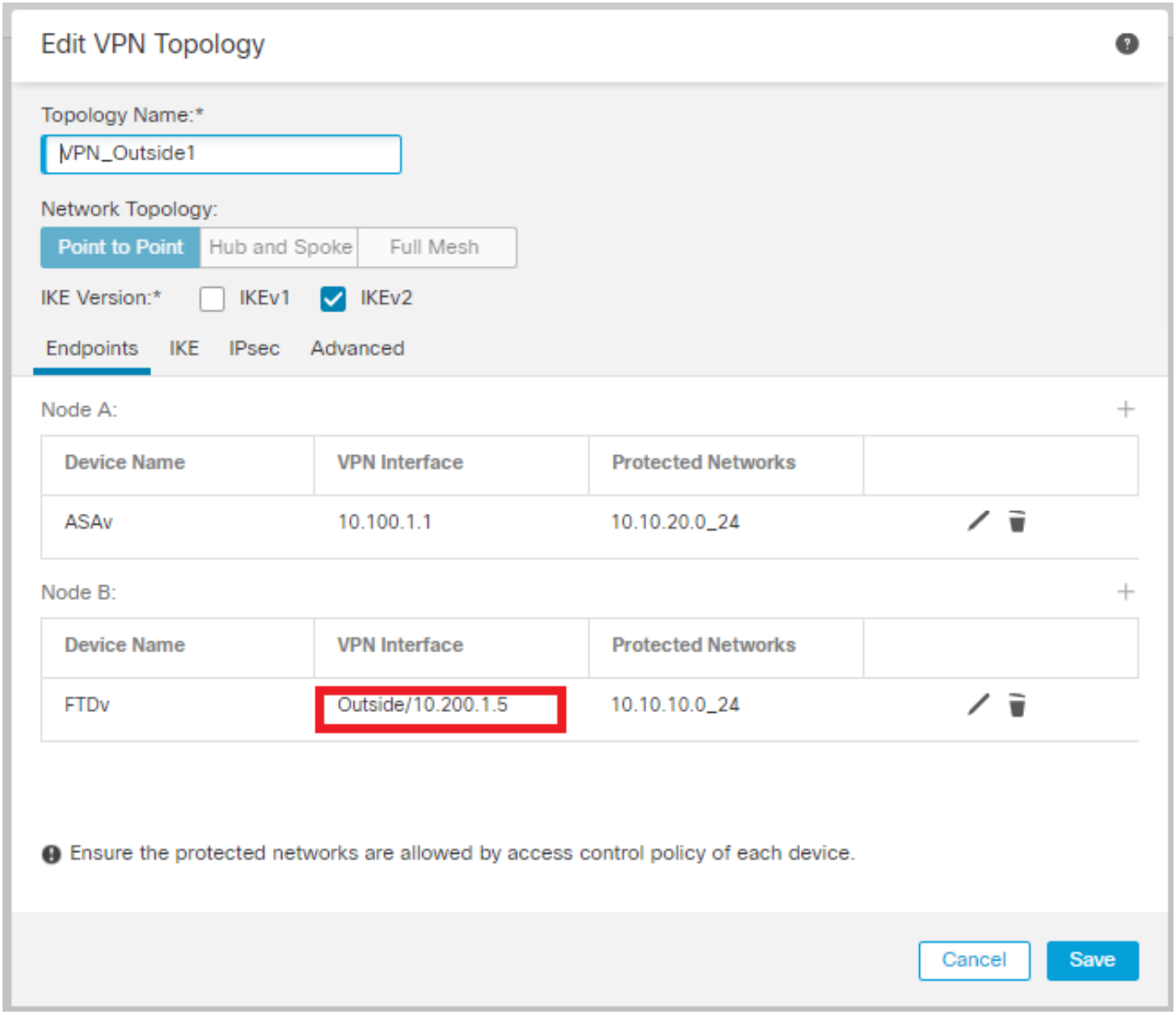
1.导航到设备>设备管理>接口，如图所示。



第二步：定义主ISP接口的VPN拓扑

1.导航到设备> VPN >站点到站点。 在添加VPN下，单击Firepower威胁防御设备，创建VPN并选择外部接口。

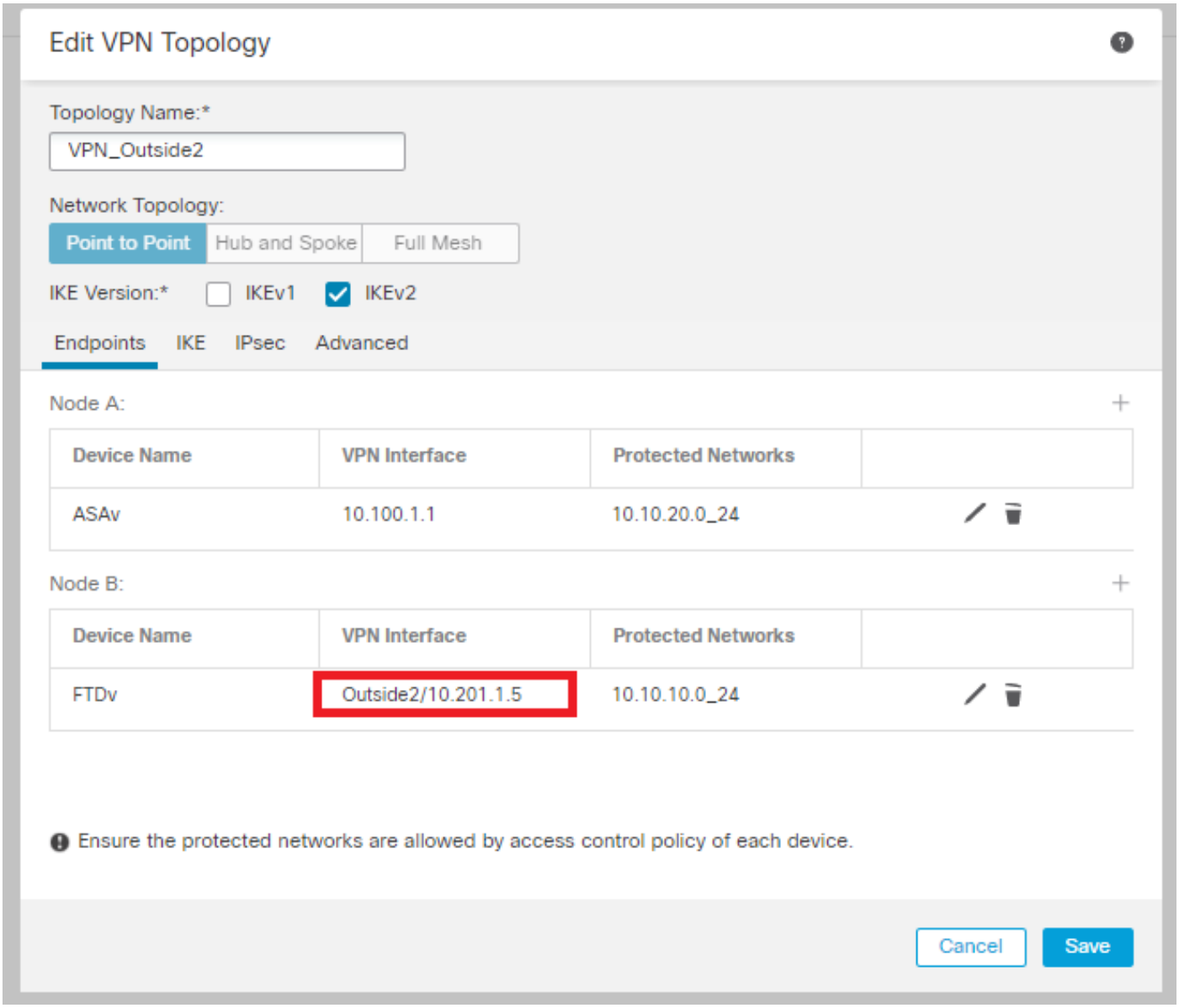
注意：本文档不介绍如何从头开始配置S2S VPN。有关FTD上S2S VPN配置的更多参考，请访问https://www.cisco.com/c/en/us/support/docs/security-vpn/ipsec-negotiation-ike-protocols/215470-site-to-site-vpn-configuration-on-ftd-ma.html



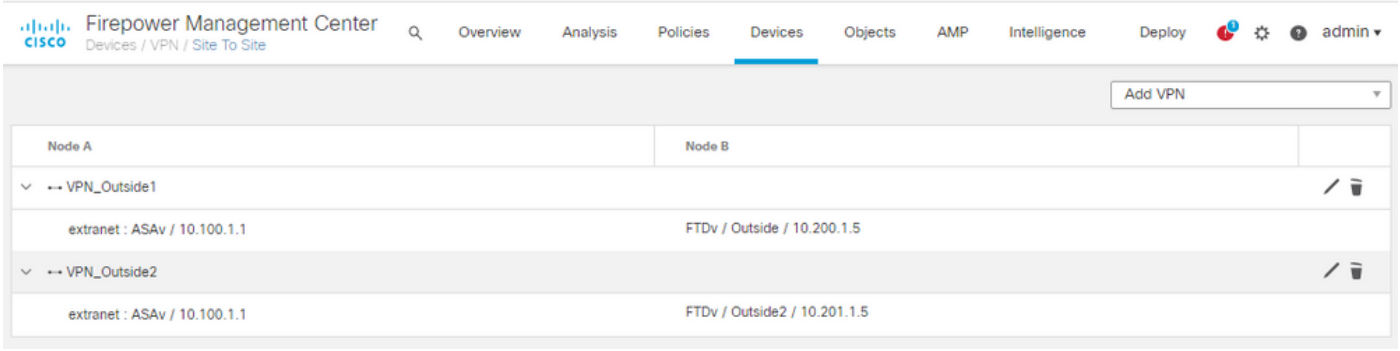
第三步：定义辅助ISP接口的VPN拓扑

1.导航到设备> VPN >站点到站点。 在Add VPN下，单击Firepower Threat Defense Device，创建VPN并选择Outside2接口。

注意：使用Outside2接口的VPN配置必须与Outside VPN拓扑完全相同，VPN接口除外。

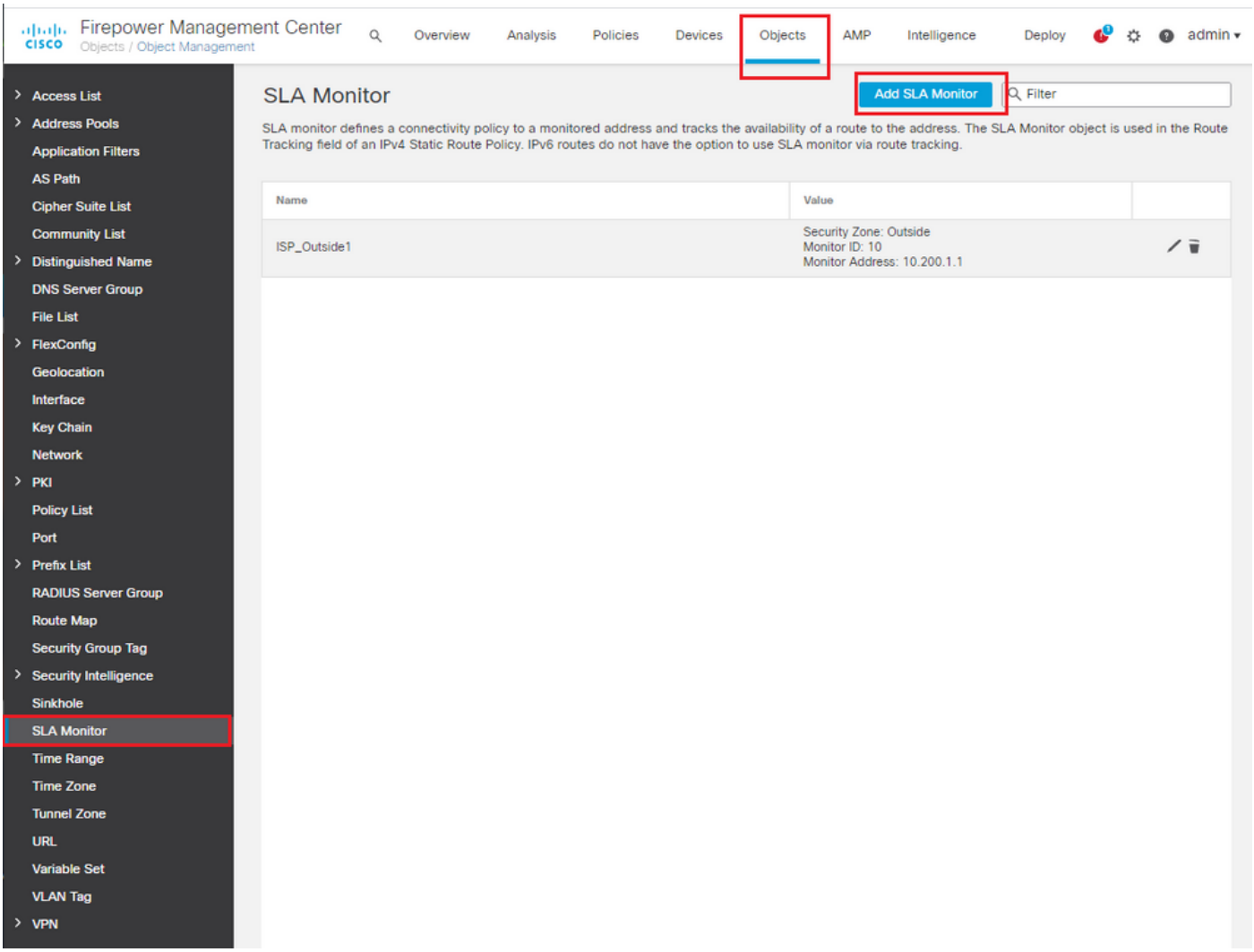


必须如图所示配置VPN拓扑。

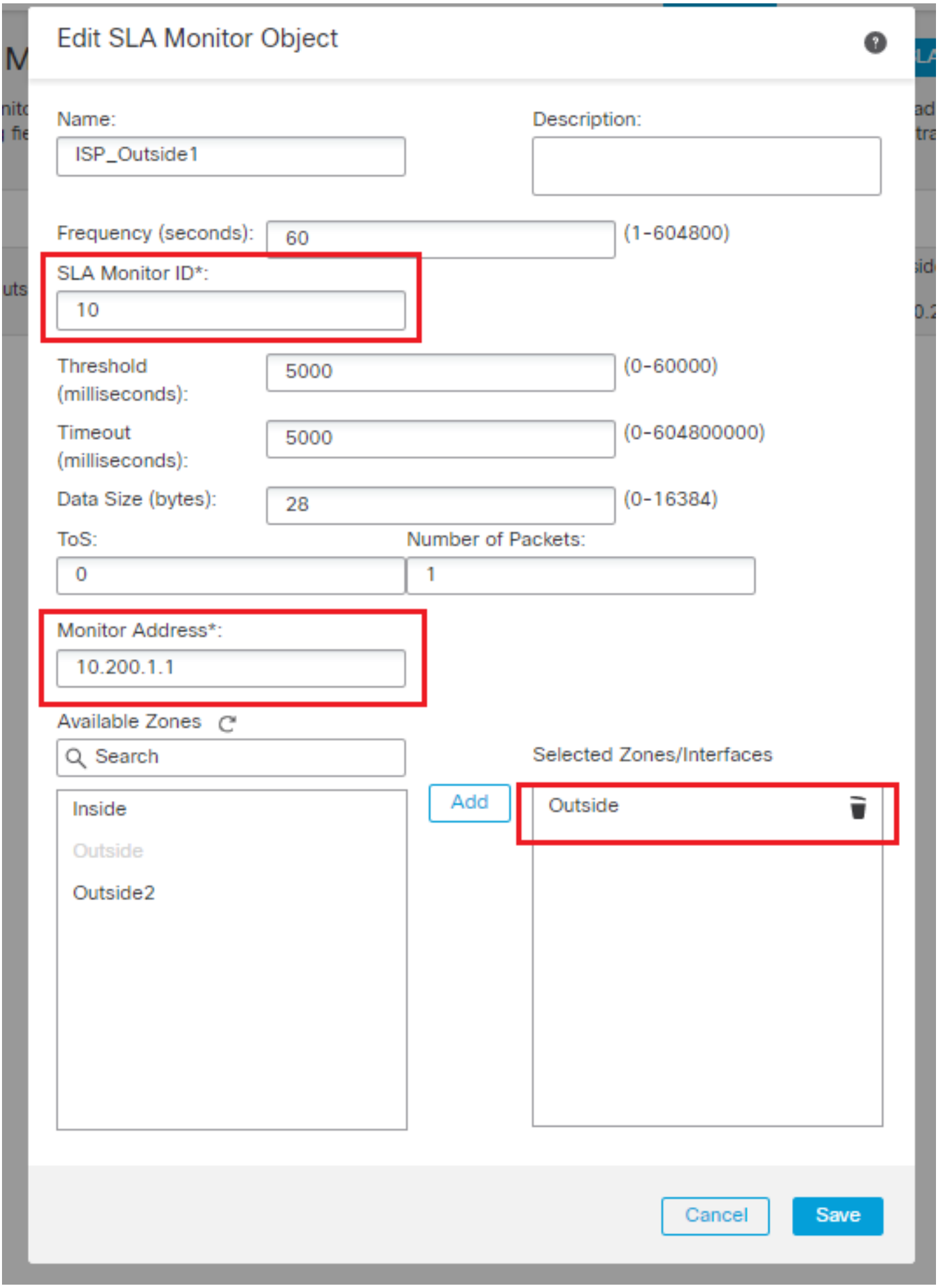


第四步：配置SLA监控器

1.导航到对象> SLA监控>添加SLA监控。 在添加VPN下，单击Firepower威胁防御设备，然后配置SLA监控器，如图所示。

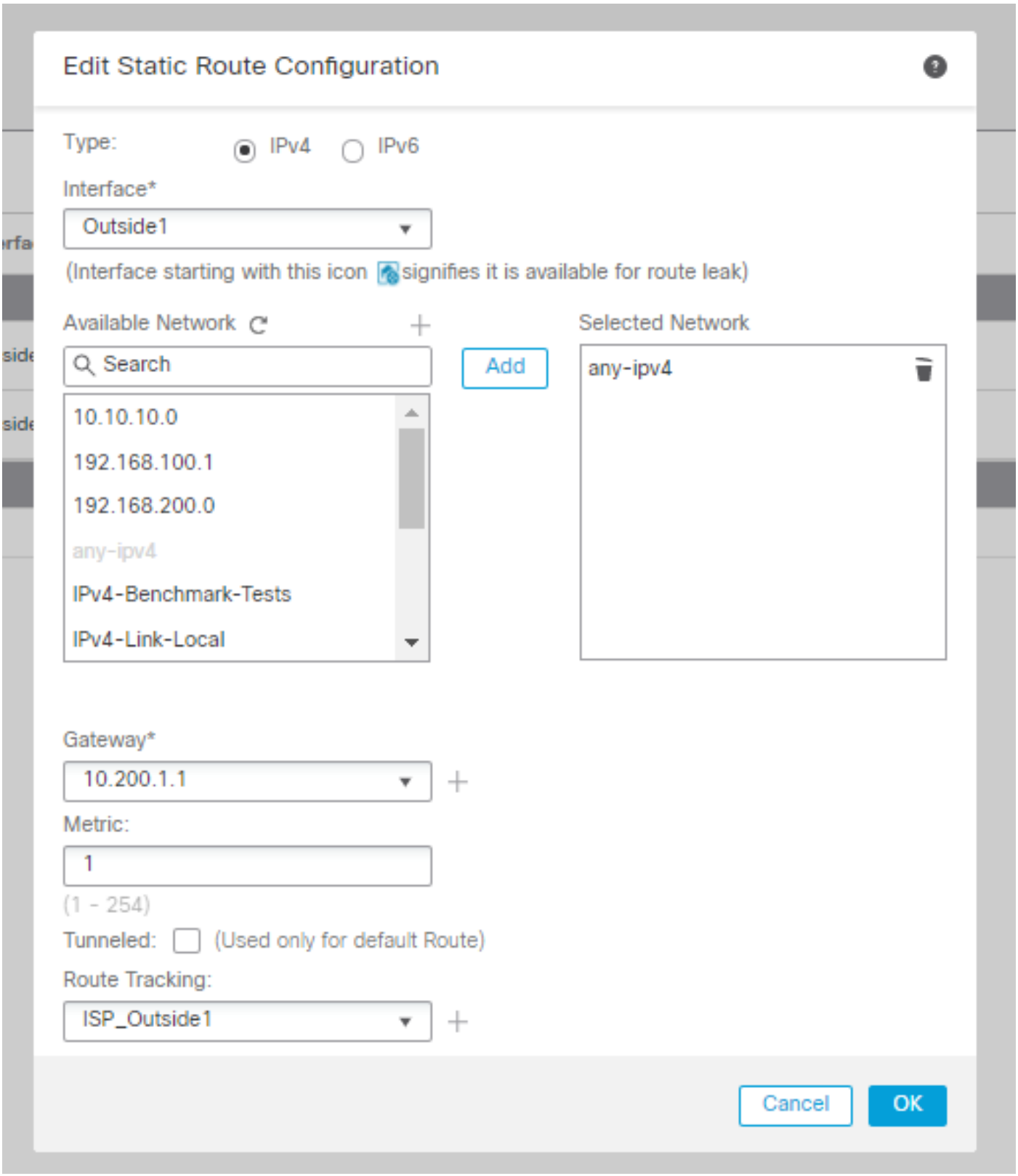


2.对于SLA Monitor ID*字段，请使用Outside next-hop IP address。

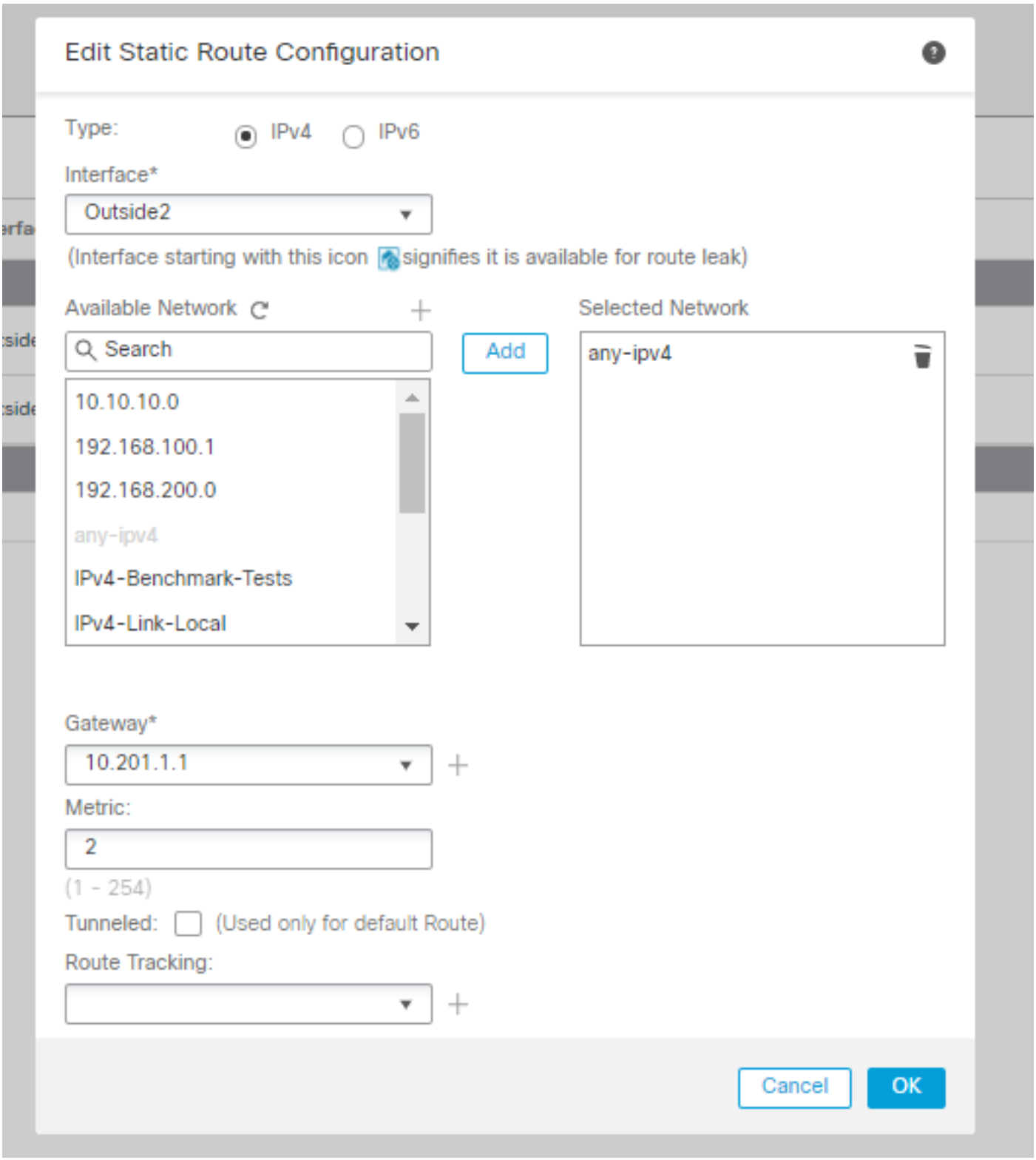

Edit SLA Monitor Object
Name:
ISP_Outside1
Description:
Frequency (seconds):
60
(1-604800)
SLA Monitor ID*:
10
Threshold (milliseconds):
5000
(0-60000)
Timeout (milliseconds):
5000
(0-604800000)
Data Size (bytes):
28
(0-16384)
ToS:
0
Number of Packets:
1
Monitor Address*:
10.200.1.1
Available Zones
Search
Inside
Outside
Outside2
Add
Selected Zones/Interfaces
Outside
Cancel
Save

第五步：使用SLA监控器配置静态路由

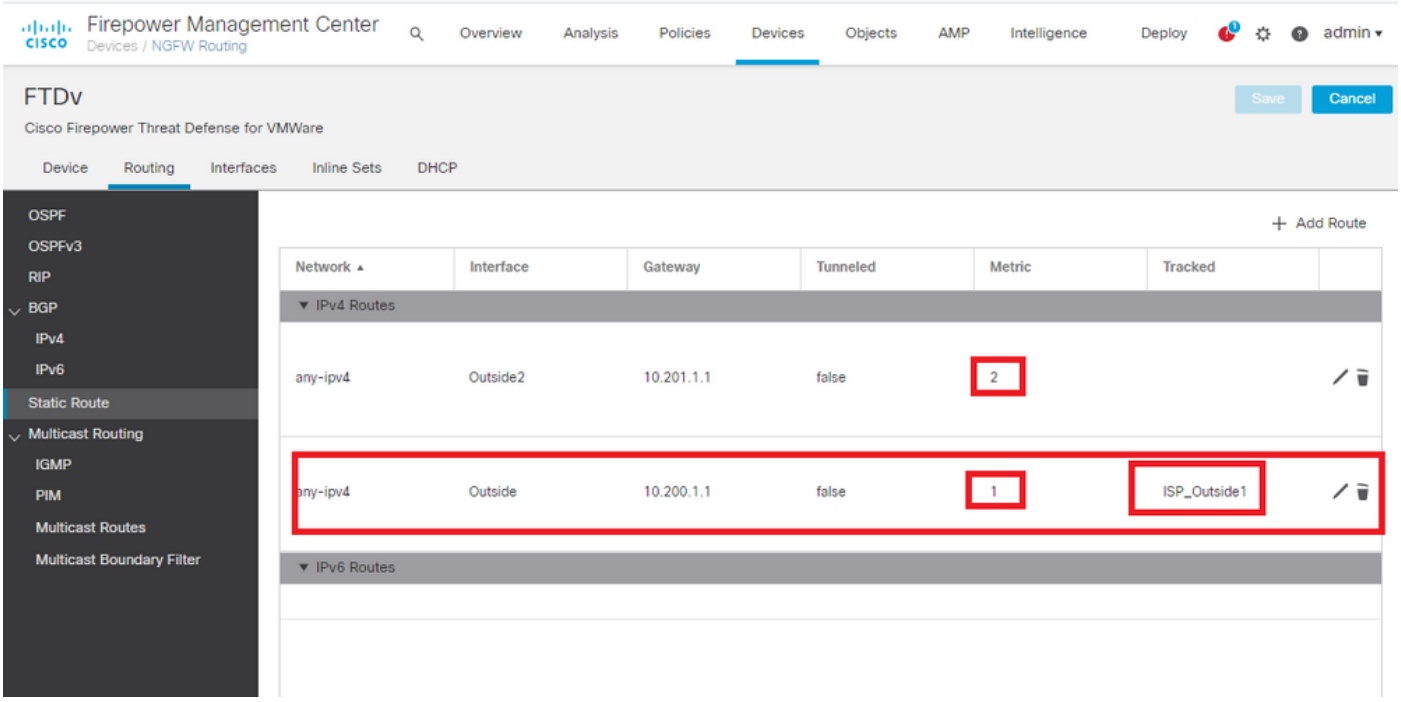
1.导航到设备>路由>静态路由。选择Add Route，并使用Route tracking字段中的SLA Monitor信息（步骤4中创建）配置外部（主）接口的默认路由。



2.配置Outside2（辅助）接口的默认路由。Metric值必须高于主默认路由。本部分不需要路由跟踪字段。

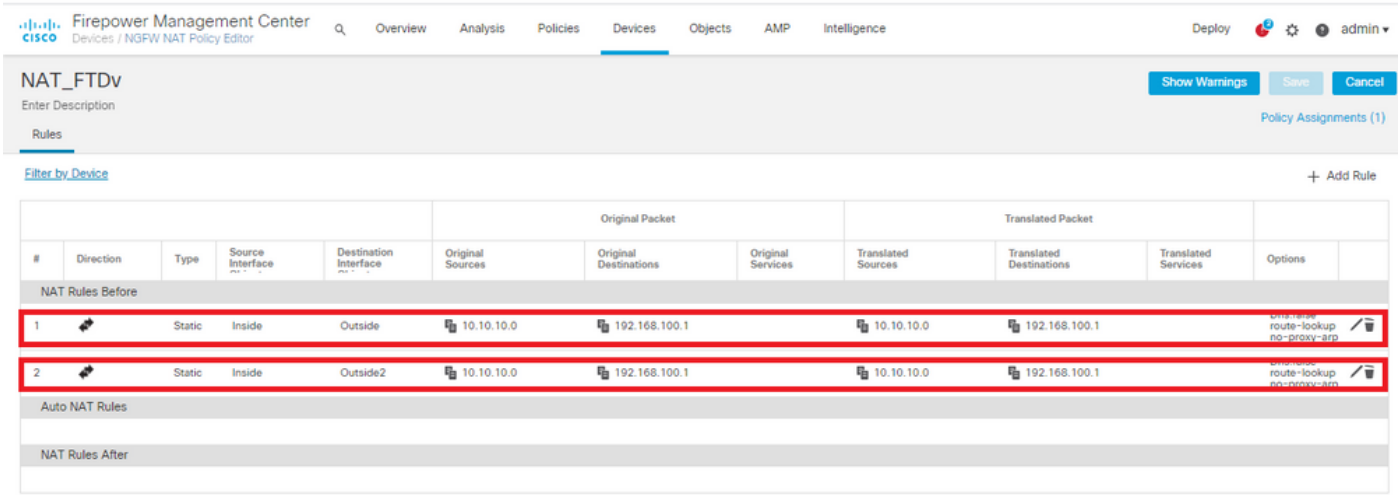

Edit Static Route Configuration
Type:
IPv4
IPv6
Interface*
Outside2
(Interface starting with this icon signifies it is available for route leak)
Available Network
Search
Add
Selected Network
any-ipv4
10.10.10.0
192.168.100.1
192.168.200.0
any-ipv4
IPv4-Benchmark-Tests
IPv4-Link-Local
Gateway*
10.201.1.1
Metric:
2
(1 - 254)
Tunneled:
(Used only for default Route)
Route Tracking:
Cancel
OK

必须如图所示配置路由。



第六步：配置NAT免除

1.导航到设备> NAT > NAT策略，然后选择以FTD设备为目标的策略。选择Add Rule并配置每个ISP接口（Outside和Outside2）的NAT免除。除目标接口外，NAT规则必须相同。



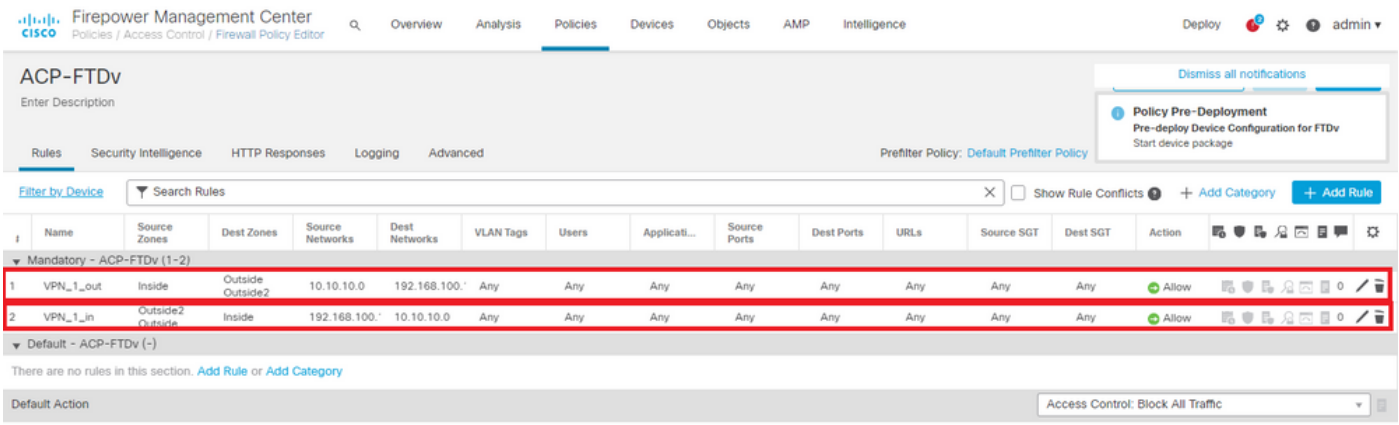
注意：对于此场景，两个NAT规则都要求启用路由查找。否则，流量将到达第一条规则，并且不会保留至故障切换路由。如果未启用路由查找，流量将始终使用（第一个NAT规则）外部接口发送。启用Route-lookup后，流量始终保持到通过SLA监控器控制的路由表。

步骤 7.为相关流量配置访问控制策略

1.定位至策略>访问控制>选择访问控制策略。 要添加规则，请点击Add Rule，如图所示。

配置一条从Inside到Outside区域（Outside1和Outside2）的规则，允许从10.10.10.0/24到192.168.100/24的相关流量。

配置从Outside zones（Outside1和Outside 2）到Inside的另一个规则，允许从192.168.100/24到10.10.10.0/24的相关流量。



配置 ASA

注意：对于此特定场景，在IKEv2加密映射上配置备份对等体，此功能要求ASA在9.14.1或更高版本上。如果您的ASA运行的是较旧版本，请使用IKEv1作为解决方法。有关详细信息，请参阅Cisco Bug ID CSCud22276。

1. 在ASA的外部接口上启用IKEv2:

```
Crypto ikev2 enable Outside
```

2.创建定义在FTD上配置的相同参数的IKEv2策略：

```
crypto ikev2 policy 1
encryption aes-256
integrity sha256
group 14
prf sha256
lifetime seconds 86400
```

3.创建允许ikev2协议的组策略：

```
group-policy IKEV2 internal
group-policy IKEV2 attributes
 vpn-tunnel-protocol ikev2
```

4.为每个外部FTD IP地址（Outside1和Outside2）创建一个隧道组。引用组策略并指定预共享密钥：

```
tunnel-group 10.200.1.5 type ipsec-l2l
tunnel-group 10.200.1.5 general-attributes
 default-group-policy IKEV2
tunnel-group 10.200.1.5 ipsec-attributes
 ikev2 remote-authentication pre-shared-key Cisco123
 ikev2 local-authentication pre-shared-key Cisco123

tunnel-group 10.201.1.5 type ipsec-l2l
tunnel-group 10.201.1.5 general-attributes
 default-group-policy IKEV2
tunnel-group 10.201.1.5 ipsec-attributes
 ikev2 remote-authentication pre-shared-key Cisco123
 ikev2 local-authentication pre-shared-key Cisco123
```

5.创建定义要加密的流量的访问列表：(FTD — 子网10.10.10.0/24)(ASA子网192.168.100.0/24):

```
Object network FTD-Subnet
 Subnet 10.10.10.0 255.255.255.0
Object network ASA-Subnet
 Subnet 192.168.100.0 255.255.255.0
access-list VPN_1 extended permit ip 192.168.100.0 255.255.255.0 10.10.10.0 255.255.255.0
```

6.创建ikev2 ipsec-proposal以引用FTD上指定的算法：

```
crypto ipsec ikev2 ipsec-proposal CSM_IP_1
 protocol esp encryption aes-256
 protocol esp integrity sha-256
```

7.创建将配置关联在一起的加密映射条目，并添加Outside1和Outside2 FTD IP地址：

```
crypto map CSM_Outside_map 1 match address VPN_1
crypto map CSM_Outside_map 1 set peer 10.200.1.5 10.201.1.5
crypto map CSM_Outside_map 1 set ikev2 ipsec-proposal CSM_IP_1
crypto map CSM_Outside_map 1 set reverse-route
crypto map CSM_Outside_map interface Outside
```

8.创建NAT免除语句，防止防火墙对VPN流量进行NAT:

```
Nat (inside,Outside) 1 source static ASA-Subnet ASA-Subnet destination static FTD-Subnet FTD-Subnet
```

验证

使用本部分可确认配置能否正常运行。

FTD

在命令行中，使用show crypto ikev2 sa命令验证VPN状态。

注意：已建立VPN，其中Outside1的IP地址(10.200.1.5)为本地地址。

```
firepower# sh crypto  ikev2 sa

IKEv2 SAs:

Session-id:24, Status:UP-ACTIVE, IKE count:1, CHILD count:1

Tunnel-id Local                                                 Remote
373101057 10.200.1.5/500                                        10.100.1.1/500
      Encr: AES-CBC, keysize: 256, Hash: SHA256, DH Grp:14, Auth sign: PSK, Auth verify: PSK
      Life/Active Time: 86400/37 sec
Child sa: local selector  10.10.10.0/0 - 10.10.10.255/65535
          remote selector 192.168.100.0/0 - 192.168.100.255/65535
          ESP spi in/out: 0x829ed58d/0x2051ccc9
```

路由

默认路由显示Outside1的下一跳IP地址。

```
firepower# sh 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
Gateway of last resort is 10.200.1.1 to network 0.0.0.0
```

```
S*       0.0.0.0 0.0.0.0 [1/0] via 10.200.1.1, Outside1
C        10.10.10.0 255.255.255.0 is directly connected, Inside
L        10.10.10.5 255.255.255.255 is directly connected, Inside
C        10.200.1.0 255.255.255.0 is directly connected, Outside1
L        10.200.1.5 255.255.255.255 is directly connected, Outside1
C        10.201.1.0 255.255.255.0 is directly connected, Outside2
L        10.201.1.5 255.255.255.255 is directly connected, Outside2
```

跟踪

如show track 1输出所示，“Reachability is Up”。

```
firepower#   sh track 1
Track 1
  Response Time Reporter 10 reachability
  Reachability is Up                        <-----
  36 changes, last change 00:00:04
  Latest operation return code: OK
  Latest RTT (millisecs) 1
  Tracked by:
    STATIC-IP-ROUTING 0
```

NAT

需要确认相关流量通过Outside1接口到达NAT免除规则。

使用“packet-tracer input Inside icmp 10.10.1 8 0 192.168.100.10 detail”命令验证应用于相关流量的NAT规则。

```
firepower# packet-tracer input inside icmp 10.10.10.1 8 0 192.168.100.1 det

---------------OMITTED OUTPUT -----------------
Phase: 4
Type: UN-NAT
Subtype: static
Result: ALLOW
Config:
nat (Inside,Outside1) source static 10.10.10.0 10.10.10.0 destination static 192.168.100.1 192.168.100.
Additional Information:
NAT divert to egress interface Outside1(vrfid:0)
Untranslate 192.168.100.1/0 to 192.168.100.1/0

---------------OMITTED OUTPUT -----------------

Phase: 7
Type: NAT
Subtype:
Result: ALLOW
Config:
nat (Inside,Outside1) source static 10.10.10.0 10.10.10.0 destination static 192.168.100.1 192.168.100.
Additional Information:
```

```
Static translate 10.10.10.1/0 to 10.10.10.1/0
 Forward Flow based lookup yields rule:
 in  id=0x2b3e09576290, priority=6, domain=nat, deny=false
        hits=19, user_data=0x2b3e0c341370, cs_id=0x0, flags=0x0, protocol=0
        src ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=Inside(vrfid:0), output_ifc=Outside1(vrfid:0)

Phase: 8
Type: NAT
Subtype: per-session
Result: ALLOW
Config:
Additional Information:
 Forward Flow based lookup yields rule:
 in  id=0x2b3e0a482330, priority=0, domain=nat-per-session, deny=true
        hits=3596, user_data=0x0, cs_id=0x0, reverse, use_real_addr, flags=0x0, protocol=0
        src ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any
        dst ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any, dscp=0x0
        input_ifc=any, output_ifc=any

---------------OMITTED OUTPUT -----------------
Phase: 12
Type: VPN
Subtype: encrypt
Result: ALLOW
Config:
Additional Information:
 Forward Flow based lookup yields rule:
 out id=0x2b3e0c8d0250, priority=70, domain=encrypt, deny=false
        hits=5, user_data=0x16794, cs_id=0x2b3e0b633c60, reverse, flags=0x0, protocol=0
        src ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=any(vrfid:65535), output_ifc=Outside1

Phase: 13
Type: NAT
Subtype: rpf-check
Result: ALLOW
Config:
nat (Inside,Outside1) source static 10.10.10.0 10.10.10.0 destination static 192.168.100.1 192.168.100.
Additional Information:
 Forward Flow based lookup yields rule:
 out id=0x2b3e095d49a0, priority=6, domain=nat-reverse, deny=false
        hits=1, user_data=0x2b3e0c3544f0, cs_id=0x0, use_real_addr, flags=0x0, protocol=0
        src ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=Inside(vrfid:0), output_ifc=Outside1(vrfid:0)

Phase: 14
Type: VPN
Subtype: ipsec-tunnel-flow
Result: ALLOW
Config:
Additional Information:
 Reverse Flow based lookup yields rule:
 in  id=0x2b3e0c8ad890, priority=70, domain=ipsec-tunnel-flow, deny=false
        hits=5, user_data=0x192ec, cs_id=0x2b3e0b633c60, reverse, flags=0x0, protocol=0
        src ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=Outside1(vrfid:0), output_ifc=any
```

```
Phase: 15
Type: NAT
Subtype: per-session
Result: ALLOW
Config:
Additional Information:
 Reverse Flow based lookup yields rule:
 in  id=0x2b3e0a482330, priority=0, domain=nat-per-session, deny=true
        hits=3598, user_data=0x0, cs_id=0x0, reverse, use_real_addr, flags=0x0, protocol=0
        src ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any
        dst ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any, dscp=0x0
        input_ifc=any, output_ifc=any

---------------OMITTED OUTPUT -----------------

Result:
input-interface: Inside(vrfid:0)
input-status: up
input-line-status: up
output-interface: Outside1(vrfid:0)
output-status: up
output-line-status: up
Action: allow
```

执行故障转移

在本示例中，故障切换是通过在IP SLA监控器配置中使用的Outside1的下一跳上关闭来执行的。

```
firepower# sh sla monitor configuration 10
IP SLA Monitor, Infrastructure Engine-II.
Entry number: 10
Owner:
Tag:
Type of operation to perform: echo
Target address: 10.200.1.1
Interface: Outside1
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:
```

路由

默认路由现在使用Outside2的下一跳IP地址，可达性为Down。

```
firepower# sh 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
Gateway of last resort is 10.201.1.1 to network 0.0.0.0

S*       0.0.0.0 0.0.0.0 [2/0] via 10.201.1.1, Outside2
C        10.10.10.0 255.255.255.0 is directly connected, Inside
L        10.10.10.5 255.255.255.255 is directly connected, Inside
C        10.200.1.0 255.255.255.0 is directly connected, Outside1
L        10.200.1.5 255.255.255.255 is directly connected, Outside1
C        10.201.1.0 255.255.255.0 is directly connected, Outside2
L        10.201.1.5 255.255.255.255 is directly connected, Outside2
```

跟踪

如show track 1输出所示，此时“Reachability is Down”。

```
firepower# sh track 1
Track 1
Response Time Reporter 10 reachability
Reachability is Down <----
37 changes, last change 00:17:02
Latest operation return code: Timeout
Tracked by:
STATIC-IP-ROUTING 0
```

NAT

```
firepower# packet-tracer input inside icmp 10.10.10.1 8 0 192.168.100.1 det
---------------OMITTED OUTPUT -----------------

Phase: 4
Type: NAT
Subtype:
Result: ALLOW
Config:
nat (Inside,Outside2) source static 10.10.10.0 10.10.10.0 destination static 192.168.100.1 192.168.100.
Additional Information:
Static translate 10.10.10.1/0 to 10.10.10.1/0
 Forward Flow based lookup yields rule:
```

```
 in  id=0x2b3e0c67d470, priority=6, domain=nat, deny=false
        hits=44, user_data=0x2b3e0c3170e0, cs_id=0x0, flags=0x0, protocol=0
        src ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=Inside(vrfid:0), output_ifc=Outside2(vrfid:0)

---------------OMITTED OUTPUT -----------------
Phase: 9
Type: VPN
Subtype: encrypt
Result: ALLOW
Config:
Additional Information:
 Forward Flow based lookup yields rule:
 out id=0x2b3e0c67bdb0, priority=70, domain=encrypt, deny=false
        hits=1, user_data=0x1d4cfb24, cs_id=0x2b3e0c273db0, reverse, flags=0x0, protocol=0
        src ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=any(vrfid:65535), output_ifc=Outside2

Phase: 10
Type: NAT
Subtype: rpf-check
Result: ALLOW
Config:
nat (Inside,Outside2) source static 10.10.10.0 10.10.10.0 destination static 192.168.100.1 192.168.100.
Additional Information:
 Forward Flow based lookup yields rule:
 out id=0x2b3e0c6d5bb0, priority=6, domain=nat-reverse, deny=false
        hits=1, user_data=0x2b3e0b81bc00, cs_id=0x0, use_real_addr, flags=0x0, protocol=0
        src ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=Inside(vrfid:0), output_ifc=Outside2(vrfid:0)

Phase: 11
Type: VPN
Subtype: ipsec-tunnel-flow
Result: ALLOW
Config:
Additional Information:
 Reverse Flow based lookup yields rule:
 in  id=0x2b3e0c8a14f0, priority=70, domain=ipsec-tunnel-flow, deny=false
        hits=1, user_data=0x1d4d073c, cs_id=0x2b3e0c273db0, reverse, flags=0x0, protocol=0
        src ip/id=192.168.100.0, mask=255.255.255.0, port=0, tag=any
        dst ip/id=10.10.10.0, mask=255.255.255.0, port=0, tag=any, dscp=0x0
        input_ifc=Outside2(vrfid:0), output_ifc=any

Phase: 12
Type: NAT
Subtype: per-session
Result: ALLOW
Config:
Additional Information:
 Reverse Flow based lookup yields rule:
 in  id=0x2b3e0a482330, priority=0, domain=nat-per-session, deny=true
        hits=3669, user_data=0x0, cs_id=0x0, reverse, use_real_addr, flags=0x0, protocol=0
        src ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any
        dst ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any, dscp=0x0
        input_ifc=any, output_ifc=any

---------------OMITTED OUTPUT -----------------
```

```
Result:
input-interface: Inside(vrfid:0)
input-status: up
input-line-status: up
output-interface: Outside2(vrfid:0)
output-status: up
output-line-status: up
Action: allow
```

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