Firepower威脅防禦IGMP和組播基礎知識故障排除

目錄

簡介

本檔案介紹多點傳送的基礎知識和Firepower威脅防禦(FTD)如何實施網際網路群組管理通訊協定(IGMP)。

必要條件

需求

基本IP路由知識。

採用元件

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。

本文內容也適用於自適應安全裝置(ASA)軟體。

本文中的資訊係根據以下軟體和硬體版本：

- Cisco Firepower 4125威脅防禦版本7.1.0。
- Firepower管理中心(FMC)版本7.1.0。
- ASA版本9.19.1。

背景資訊

定義

- 單播=從一台主機到另一台主機（一對一）。
- 廣播=從一台主機到所有可能的主機（一對全）。
- 組播=從一組主機的主機到一組主機（一對多或多對多）。
- 任播=從主機到組的最近主機（一對多對一）。

基礎知識

- 組播RFC 988由Steve Deering於1986年編寫。
- IPv4多點傳送使用範圍224.0.0.0/4（前4位1110） — 224.0.0.0 - 239.255.255.255。
- 對於IPv4，第2層MAC地址來自第3層組播IP: 01005e（24位）+ 25位(always 0 + 23位組播IPv4地址的更低位)。
- IPv6多點傳送使用FF00::/8範圍，比IPv4多點傳送更靈活，因為它可以嵌入集結點(RP)IP。
- 對於IPv6，第2層MAC地址來自第3層組播：3333 + 32位組播IPv6地址的更低位。
- 組播的優勢：由於源上的負載減少，效率提高。效能，因為它避免了流量重複或泛洪。
- 組播的缺點：傳輸不可靠（基於UDP）、無擁塞規避、傳送順序不當。
- 公共Internet不支援組播，因為它需要路徑中的所有裝置來啟用組播。通常在所有裝置都處於公共管理許可權下時使用。
- 典型組播應用：內部影片流、視訊會議。

多點傳送與複製的單點傳送

在複製單播中，源建立同一單播資料包（複製副本）的多個副本，並將它們傳送到多個目標主機。組播將負擔從源主機轉移到網路，而在複製單播中，所有工作都在源主機上完成。

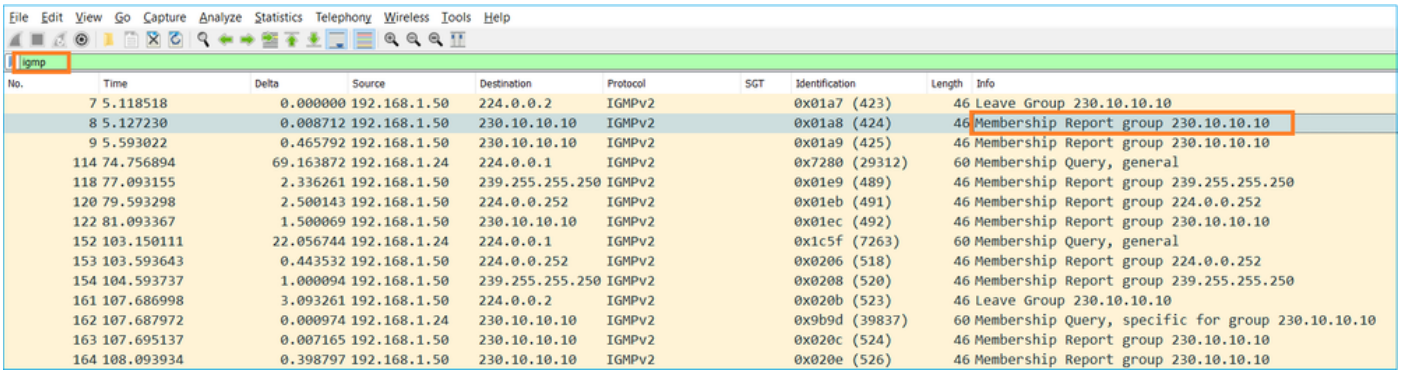
設定

IGMP基礎知識

- IGMP是組播接收器和本地L3裝置（通常為路由器）之間的「語言」。
- IGMP是第3層通訊協定（類似ICMP），並使用IP通訊協定編號2。
- 目前有3個IGMP版本。防火牆上的預設IGMP版本是版本2。目前僅支援版本1和2。
- IGMPv1和IGMPv2之間的主要差異如下：
    - IGMPv1沒有離開組消息。
    - IGMPv1沒有特定於組的查詢（當主機離開組播組時防火牆使用）。

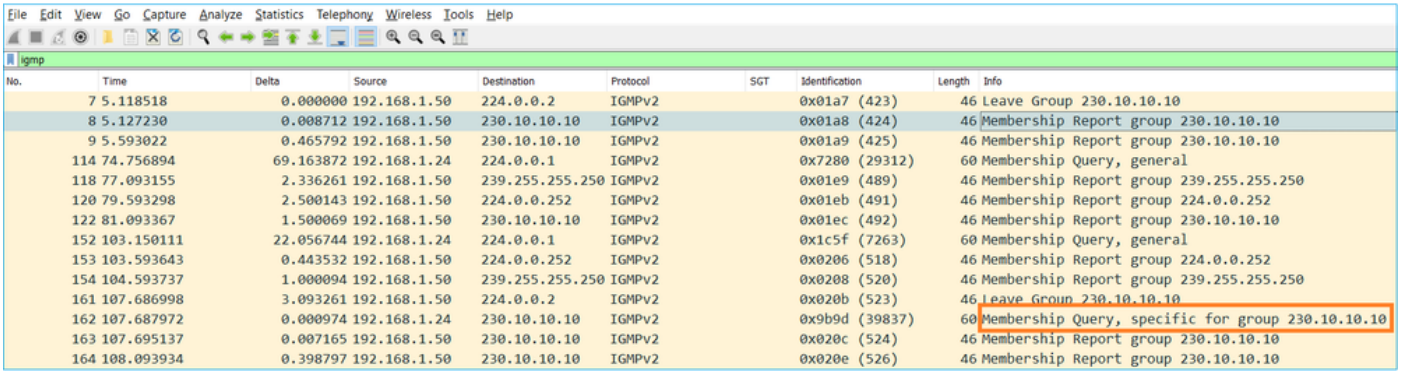
- IGMPv1沒有查詢器選擇過程。

- ASA/FTD目前不支援IGMPv3，但作為參考，IGMPv2和IGMPv3之間的重要區別在於在IGMPv3中包含一個源和組特定查詢，該查詢用於源特定多點傳送(SSM)。
- IGMPv1/IGMPv2/IGMPv3查詢= 224.0.0.1
  IGMPv2離開= 224.0.0.2
  IGMPv3成員報告= 224.0.0.22
- 如果主機要加入，可以傳送未經請求的IGMP成員報告消息：



No.	Time	Delta	Source	Destination	Protocol	SGT	Identification	Length	Info
7	5.118518	0.000000	192.168.1.50	224.0.0.2	IGMPv2		0x01a7 (423)	46	Leave Group 230.10.10.10
8	5.127230	0.008712	192.168.1.50	230.10.10.10	IGMPv2		0x01a8 (424)	46	Membership Report group 230.10.10.10
9	5.593022	0.465792	192.168.1.50	230.10.10.10	IGMPv2		0x01a9 (425)	46	Membership Report group 230.10.10.10
114	74.756894	69.163872	192.168.1.24	224.0.0.1	IGMPv2		0x7280 (29312)	60	Membership Query, general
118	77.093155	2.336261	192.168.1.50	239.255.255.250	IGMPv2		0x01e9 (489)	46	Membership Report group 239.255.255.250
120	79.593298	2.500143	192.168.1.50	224.0.0.252	IGMPv2		0x01eb (491)	46	Membership Report group 224.0.0.252
122	81.093367	1.500069	192.168.1.50	230.10.10.10	IGMPv2		0x01ec (492)	46	Membership Report group 230.10.10.10
152	103.150111	22.056744	192.168.1.24	224.0.0.1	IGMPv2		0x1c5f (7263)	60	Membership Query, general
153	103.593643	0.443532	192.168.1.50	224.0.0.252	IGMPv2		0x0206 (518)	46	Membership Report group 224.0.0.252
154	104.593737	1.000094	192.168.1.50	239.255.255.250	IGMPv2		0x0208 (520)	46	Membership Report group 239.255.255.250
161	107.686998	3.093261	192.168.1.50	224.0.0.2	IGMPv2		0x020b (523)	46	Leave Group 230.10.10.10
162	107.687972	0.000974	192.168.1.24	230.10.10.10	IGMPv2		0x9b9d (39837)	60	Membership Query, specific for group 230.10.10.10
163	107.695137	0.007165	192.168.1.50	230.10.10.10	IGMPv2		0x020c (524)	46	Membership Report group 230.10.10.10
164	108.093934	0.398797	192.168.1.50	230.10.10.10	IGMPv2		0x020e (526)	46	Membership Report group 230.10.10.10

- 從防火牆的角度來看，IGMP查詢有兩種型別：常規查詢和組特定查詢
- 當防火牆收到IGMP離開組消息時，它必須檢查該組在子網中是否有其他成員。因此，防火牆會傳送一個群組特定查詢：



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118	77.093155	2.336261	192.168.1.50	239.255.255.250	IGMPv2		0x01e9 (489)	46	Membership Report group 239.255.255.250
120	79.593298	2.500143	192.168.1.50	224.0.0.252	IGMPv2		0x01eb (491)	46	Membership Report group 224.0.0.252
122	81.093367	1.500069	192.168.1.50	230.10.10.10	IGMPv2		0x01ec (492)	46	Membership Report group 230.10.10.10
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- 在有多個路由器/防火牆的子網上，選擇querier（傳送所有IGMP查詢的裝置）：

<#root>

```
firepower#

show igmp interface INSIDE

INSIDE is up, line protocol is up
  Internet address is 192.168.1.97/24
  IGMP is enabled on interface
  Current IGMP version is 2
  IGMP query interval is 125 seconds
  IGMP querier timeout is 60 seconds
  IGMP max query response time is 10 seconds
  Last member query response interval is 1 seconds
  Inbound IGMP access group is:
  IGMP limit is 500, currently active joins: 2
```

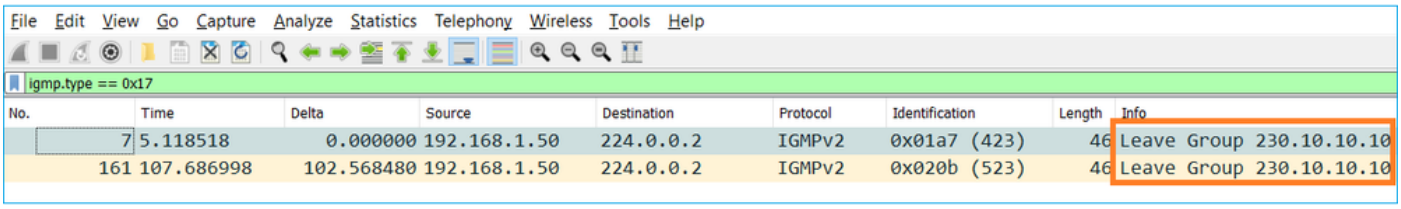
```
  Cumulative IGMP activity: 21 joins, 20 leaves

 IGMP querying router is 192.168.1.97 (this system)

<-- IGMP querier
```

- 在FTD上（類似於傳統ASA），您可以啟用debug igmp以檢視與IGMP相關的消息：

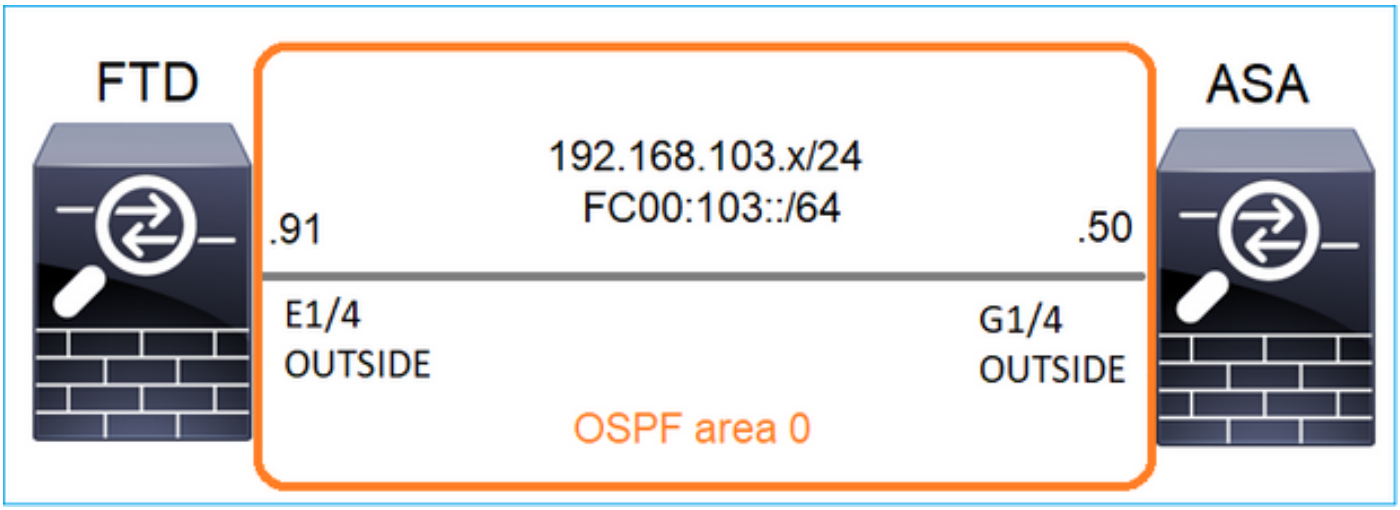
<#root>

```
firepower#

debug igmp

IGMP debugging is on
IGMP: Received v2 Query on DMZ from 192.168.6.1

IGMP: Received v2 Report on INSIDE from 192.168.1.50 for 239.255.255.250

<-- Received an IGMP packet
IGMP: group_db: add new group 239.255.255.250 on INSIDE
IGMP: MRIB updated (*,239.255.255.250) : Success
IGMP: Switching to EXCLUDE mode for 239.255.255.250 on INSIDE
IGMP: Updating EXCLUDE group timer for 239.255.255.250
IGMP: Received v2 Report on INSIDE from 192.168.1.50 for 230.10.10.10
IGMP: group_db: add new group 230.10.10.10 on INSIDE
IGMP: MRIB updated (*,230.10.10.10) : Success
IGMP: Switching to EXCLUDE mode for 230.10.10.10 on INSIDE
IGMP: Updating EXCLUDE group timer for 230.10.10.10
IGMP: Send v2 general Query on INSIDE
IGMP: Received v2 Query on INSIDE from 192.168.1.97
IGMP: Send v2 general Query on OUTSIDE
IGMP: Received v2 Query on OUTSIDE from 192.168.103.91
IGMP: Received v2 Report on INSIDE from 192.168.1.50 for 239.255.255.250
IGMP: Updating EXCLUDE group timer for 239.255.255.250
IGMP: Received v2 Report on INSIDE from 192.168.1.50 for 230.10.10.10
IGMP: Updating EXCLUDE group timer for 230.10.10.10
```

- 主機通常使用離開組消息(IGMPv2)離開組播組。



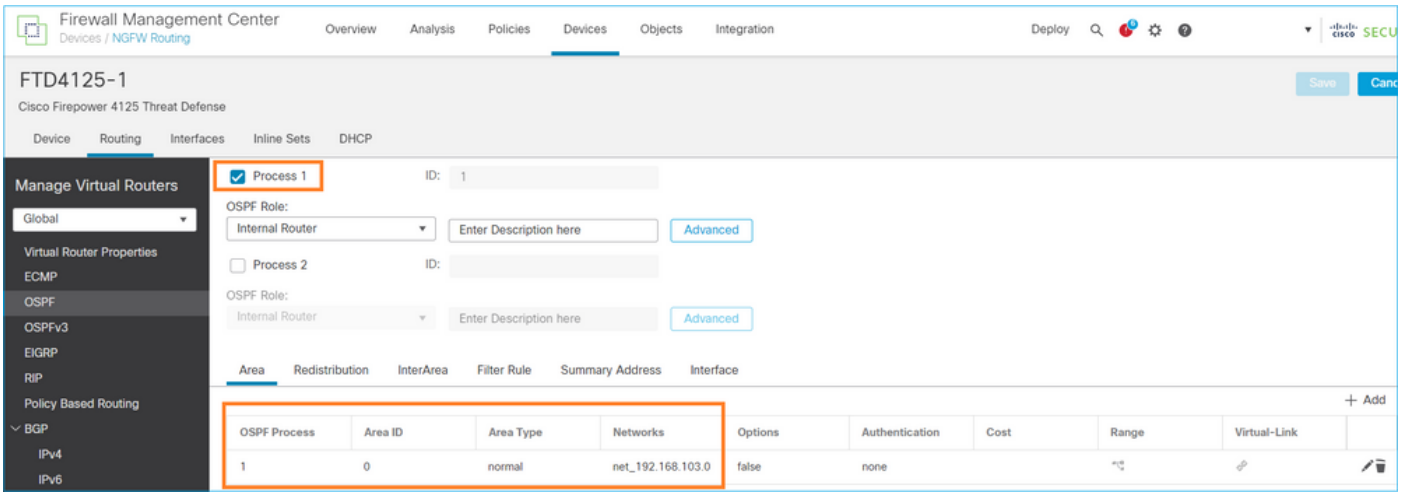
任務1 — 控制平面組播流量

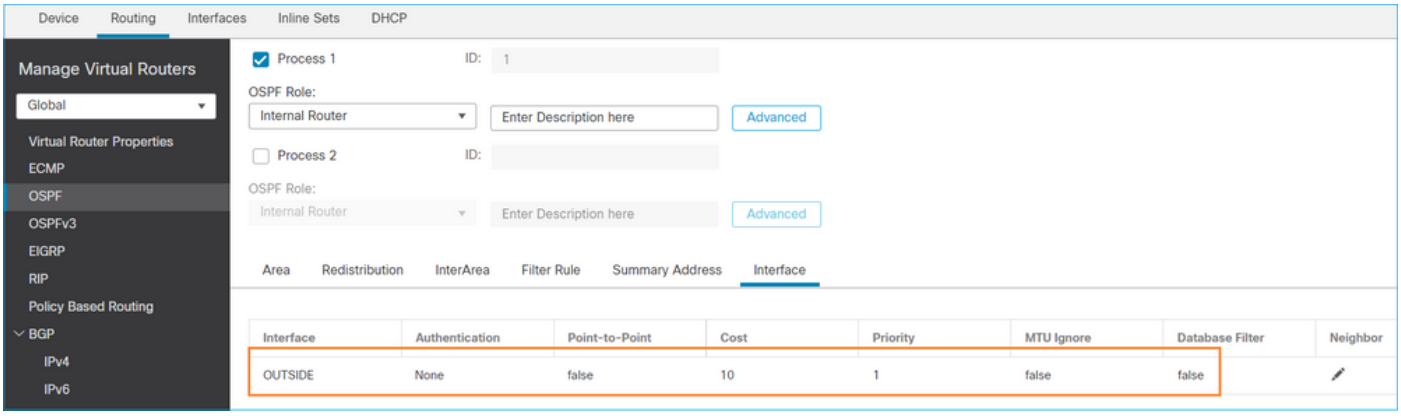


在FTD和ASA之間配置OSPFv2和OSPFv3。檢查2台裝置如何處理OSPF生成的L2和L3組播流量。

解決方案

OSPFv2配置





類似地，對於OSPFv3

FTD CLI上的組態：

<#root>

```
router ospf 1

 network 192.168.103.0 255.255.255.0 area 0

 log-adj-changes
!

ipv6 router ospf 1

 no graceful-restart helper
 log-adjacency-changes
!
interface Ethernet1/4
nameif OUTSIDE
security-level 0
ip address 192.168.103.91 255.255.255.0
ipv6 address fc00:103::91/64
ospf authentication null

ipv6 ospf 1 area 0
```

此組態在FTD加速安全路徑(ASP)允許表中建立這些專案，以便入口多點傳播流量不會受到封鎖：

<#root>

```
firepower#

show asp table classify domain permit

...
in id=0x14f922db85f0, priority=13,

domain=permit, deny=false

<-- permit the packets
        hits=1, user_data=0x0, cs_id=0x0, reverse, flags=0x0, protocol=89
        src ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any


dst ip/id=224.0.0.5, mask=255.255.255.255,

 port=0, tag=any, dscp=0x0, nsg_id=none     <-- OSPF for IPv4


input_ifc=OUTSIDE

(vrfid:0), output_ifc=identity(vrfid:0)     <-- ingress interface
in id=0x14f922db9350, priority=13,

domain=permit, deny=false

<-- permit the packets
        hits=0, user_data=0x0, cs_id=0x0, reverse, flags=0x0, protocol=89
        src ip/id=0.0.0.0, mask=0.0.0.0, port=0, tag=any


 dst ip/id=224.0.0.6, mask=255.255.255.255

, port=0, tag=any, dscp=0x0, nsg_id=none     <-- OSPF for IPv4


input_ifc=OUTSIDE
```

```
(vrfid:0), output_ifc=identity(vrfid:0)     <-- ingress interface
```

對於IPv6:

<#root>

```
...
in id=0x14f923fb16f0, priority=13,
```

domain=permit, deny=false

```
 <-- permit the packets
        hits=1, user_data=0x0, cs_id=0x0, reverse, flags=0x0, protocol=89
        src ip/id=::/0, port=0, tag=any
```

dst ip/id=ff02::5/128

```
, port=0, tag=any, , nsg_id=none     <-- OSPF for IPv6
```

input_ifc=OUTSIDE

```
(vrfid:0), output_ifc=identity(vrfid:0)  <-- ingress interface
in id=0x14f66e9d4780, priority=13,
```

domain=permit, deny=false

```
<-- permit the packets
        hits=0, user_data=0x0, cs_id=0x0, reverse, flags=0x0, protocol=89
        src ip/id=::/0, port=0, tag=any
```

dst ip/id=ff02::6/128

```
, port=0, tag=any, , nsg_id=none     <-- OSPF for IPv6
```

input_ifc=OUTSIDE

```
(vrfid:0), output_ifc=identity(vrfid:0)  <-- ingress interface
...
```

OSPFv2和OSPFv3鄰接關係已啟動：

<#root>

```
firepower#
```

show ospf neighbor

```
Neighbor ID Pri State Dead Time Address Interface
192.168.103.50 1
```

FULL/BDR

```
 0:00:35 192.168.103.50 OUTSIDE   <-- OSPF neighbor is up
```

```
firepower#
show ipv6 ospf neighbor

Neighbor ID Pri State Dead Time Interface ID Interface
192.168.103.50 1
FULL/BDR
 0:00:34 3267035482 OUTSIDE       <-- OSPF neighbor is up
```

以下是終止到該盒的組播OSPF會話：

<#root>

```
firepower#
show conn all | include OSPF

OSPF OUTSIDE fe80::2be:75ff:fef6:1d8e NP Identity Ifc ff02::5, idle 0:00:09, bytes 5924, flags
OSPF OUTSIDE 192.168.103.50 NP Identity Ifc 224.0.0.5, idle 0:00:03, bytes 8904, flags
OSPF OUTSIDE ff02::5 NP Identity Ifc fe80::f6db:e6ff:fe33:442e, idle 0:00:01, bytes 6304, flags
OSPF OUTSIDE 224.0.0.5 NP Identity Ifc 192.168.103.91, idle 0:00:00, bytes 25220, flags
```

作為測試，啟用IPv4捕獲並清除與裝置的連線：

<#root>

```
firepower#
capture CAP interface OUTSIDE trace
firepower#
clear conn all
12 connection(s) deleted.
firepower#
clear capture CAP
firepower# !
```

⚠ 警告：這將導致中斷！展示的範例僅作演示之用！

捕獲的OSPF資料包：

<#root>

```
firepower# show capture CAP | include proto-89
```

```
1: 12:25:33.142189 192.168.103.50 > 224.0.0.5 ip-proto-89, length 60
2: 12:25:33.702691 192.168.103.91 > 224.0.0.5 ip-proto-89, length 60
7: 12:25:36.317000 192.168.206.100 > 224.0.0.5 ip-proto-89, length 56
8: 12:25:36.952587 fe80::2be:75ff:fef6:1d8e > ff02::5 ip-proto-89 40 [flowlabel 0xe] [hlim 1]
12: 12:25:41.282608 fe80::f6db:e6ff:fe33:442e > ff02::5 ip-proto-89 40 [flowlabel 0xe] [hlim 1]
```

以下是防火牆處理OSPFv2多點傳送封包的方式：

<#root>

```
firepower#
```

show capture CAP packet-number 1 trace

```
115 packets captured
```

1: 12:25:33.142189 192.168.103.50 > 224.0.0.5 ip-proto-89, length 60

```
<-- The first packet of the flow
Phase: 1
Type: CAPTURE
Subtype:
Result: ALLOW
Elapsed time: 6344 ns
Config:
Additional Information:
MAC Access list

Phase: 2
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 6344 ns
Config:
Implicit Rule
Additional Information:
MAC Access list

Phase: 3
Type: ROUTE-LOOKUP
Subtype: No ECMP load balancing
Result: ALLOW
Elapsed time: 10736 ns
Config:
Additional Information:
Destination is locally connected. No ECMP load balancing.
Found next-hop 192.168.103.50 using egress ifc OUTSIDE(vrfid:0)

Phase: 4
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 5205 ns
Config:
Implicit Rule
Additional Information:

Phase: 5
```

```
Type: NAT
Subtype: per-session
Result: ALLOW
Elapsed time: 5205 ns
Config:
Additional Information:

Phase: 6
Type: IP-OPTIONS
Subtype:
Result: ALLOW
Elapsed time: 5205 ns
Config:
Additional Information:

Phase: 7
Type: CLUSTER-REDIRECT
Subtype: cluster-redirect
Result: ALLOW
Elapsed time: 29280 ns
Config:
Additional Information:

Phase: 8
Type: MULTICAST
Subtype:
Result: ALLOW
Elapsed time: 976 ns
Config:
Additional Information:

Phase: 9

Type: OSPF

<-- The OSPF process

Subtype: ospf

Result: ALLOW

Elapsed time: 488 ns

Config:

Additional Information:

Phase: 10
Type: FLOW-CREATION
Subtype:
Result: ALLOW
Elapsed time: 13176 ns
Config:
```

```
Additional Information:
New flow created with id 620, packet dispatched to next module

Result:
input-interface: OUTSIDE(vrfid:0)
input-status: up
input-line-status: up
output-interface: OUTSIDE(vrfid:0)
output-status: up
output-line-status: up
Action: allow
Time Taken: 82959 ns
```

以下是防火牆處理OSPFv3多點傳送封包的方式：

<#root>

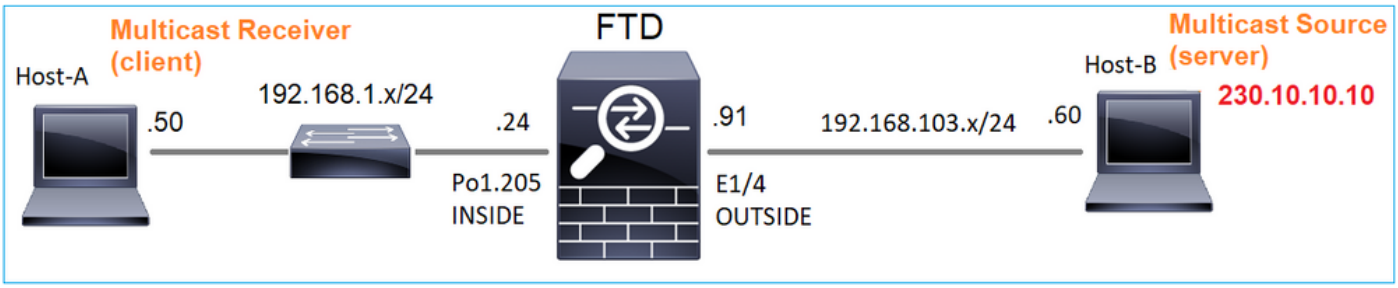
```
firepower#

show capture CAP packet-number 8 trace


274 packets captured


8: 12:25:36.952587 fe80::2be:75ff:fef6:1d8e > ff02::5 ip-proto-89 40 [flowlabel 0xe] [hlim 1]

<-- The first packet of the flow
Phase: 1
Type: CAPTURE
Subtype:
Result: ALLOW
Elapsed time: 7564 ns
Config:
Additional Information:
MAC Access list

Phase: 2
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 7564 ns
Config:
Implicit Rule
Additional Information:
MAC Access list

Phase: 3
Type: ROUTE-LOOKUP
Subtype: No ECMP load balancing
Result: ALLOW
Elapsed time: 8296 ns
Config:
Additional Information:
Destination is locally connected. No ECMP load balancing.
Found next-hop ff02::5 using egress ifc identity(vrfid:0)

Phase: 4
```

```
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 8784 ns
Config:
Implicit Rule
Additional Information:

Phase: 5
Type: NAT
Subtype: per-session
Result: ALLOW
Elapsed time: 8784 ns
Config:
Additional Information:

Phase: 6
Type: CLUSTER-REDIRECT
Subtype: cluster-redirect
Result: ALLOW
Elapsed time: 27816 ns
Config:
Additional Information:

Phase: 7

Type: OSPF

<-- The OSPF process

Subtype: ospf

Result: ALLOW

Elapsed time: 976 ns

Config:

Additional Information:

Phase: 8
Type: FLOW-CREATION
Subtype:
Result: ALLOW
Elapsed time: 13664 ns
Config:
Additional Information:
New flow created with id 624, packet dispatched to next module

Result:
input-interface: OUTSIDE(vrfid:0)
input-status: up
input-line-status: up
```

```
output-interface: NP Identity Ifc
Action: allow
Time Taken: 83448 ns
```

任務2 — 配置基本組播

拓撲



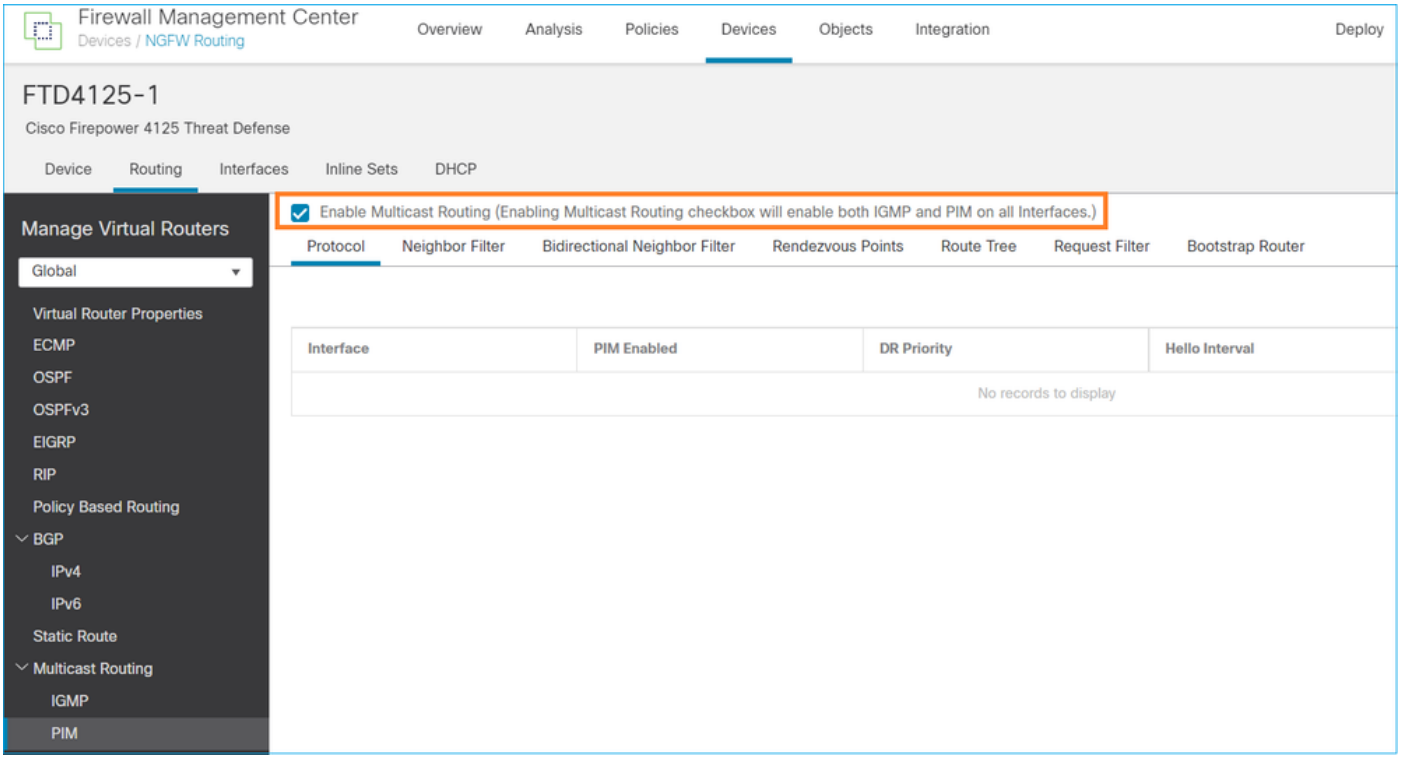
需求

配置防火牆，以便將來自伺服器的組播流量流傳輸到IP 230.10.10.10上的組播客戶端

解決方案

從防火牆的角度來看，最低配置是啟用全域性組播路由。這將在所有防火牆介面上啟用後台的IGMP和PIM。

在FMC UI上：



在防火牆CLI上，這是推送的配置：

<#root>

```
firepower#

show run multicast-routing

multicast-routing

<-- Multicast routing is enabled
```

IGMP驗證

<#root>

```
firepower#

 show igmp interface


diagnostic is up, line protocol is up
  Internet address is 0.0.0.0/0
  IGMP is disabled on interface

INSIDE is up, line protocol is up

<-- The interface is UP
  Internet address is 192.168.1.24/24

  IGMP is enabled on interface

<-- IGMP is enabled on the interface

  Current IGMP version is 2

<-- IGMP version
  IGMP query interval is 125 seconds
  IGMP querier timeout is 255 seconds
  IGMP max query response time is 10 seconds
  Last member query response interval is 1 seconds
  Inbound IGMP access group is:
  IGMP limit is 500, currently active joins: 1
  Cumulative IGMP activity: 4 joins, 3 leaves
  IGMP querying router is 192.168.1.24 (this system)

OUTSIDE is up, line protocol is up

<-- The interface is UP
  Internet address is 192.168.103.91/24

  IGMP is enabled on interface

<-- IGMP is enabled on the interface

  Current IGMP version is 2

<-- IGMP version
  IGMP query interval is 125 seconds
  IGMP querier timeout is 255 seconds
  IGMP max query response time is 10 seconds
  Last member query response interval is 1 seconds
  Inbound IGMP access group is:
  IGMP limit is 500, currently active joins: 1
  Cumulative IGMP activity: 1 joins, 0 leaves
```

```
  IGMP querying router is 192.168.103.91 (this system)
```

<#root>

```
firepower#
```

show igmp group

```
IGMP Connected Group Membership
Group Address Interface Uptime Expires Last Reporter
239.255.255.250 INSIDE 00:09:05 00:03:19 192.168.1.50
239.255.255.250 OUTSIDE 00:06:01 00:02:33 192.168.103.60
```

<#root>

```
firepower#
```

show igmp traffic

```
IGMP Traffic Counters
Elapsed time since counters cleared: 03:40:48 Received Sent

                              Received     Sent
Valid IGMP Packets            21           207
Queries                       0            207
Reports                       15           0       <-- IGMP Reports received and sent
Leaves                        6            0
Mtrace packets                0            0
DVMRP packets                 0            0
PIM packets                   0            0

Errors:
Malformed Packets             0
Martian source                0
Bad Checksums                 0
```

PIM驗證

<#root>

```
firepower#
```

show pim interface

```
Address          Interface          PIM  Nbr   Hello  DR         DR
                                       Count Intvl  Prior

0.0.0.0          diagnostic         off  0     30     1          not elected
192.168.1.24     INSIDE             on   0     30     1          this system
192.168.103.91   OUTSIDE            on   0     30     1          this system
```

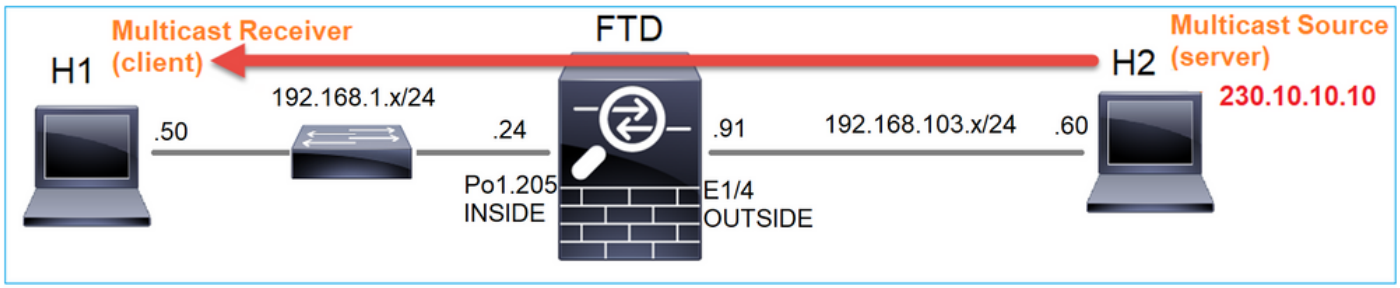
MFIB驗證

<#root>

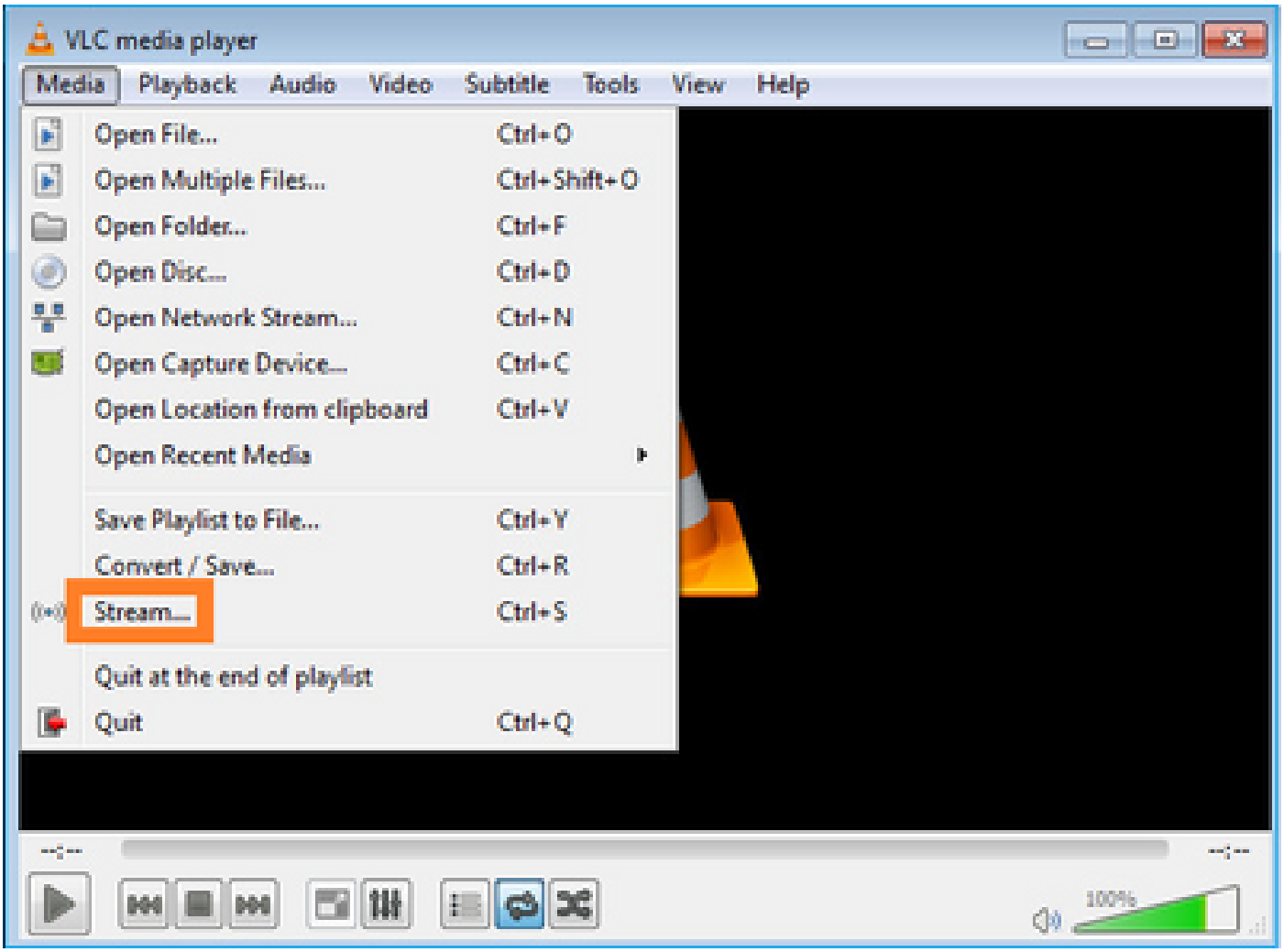
```
firepower#

show mfib

Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             AR - Activity Required, K - Keepalive
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
Interface Flags: A - Accept, F - Forward, NS - Negate Signalling
             IC - Internal Copy, NP - Not platform switched
             SP - Signal Present
Interface Counts: FS Pkt Count/PS Pkt Count

(*,224.0.1.39) Flags: S K


Forwarding: 0/0/0/0

, Other: 0/0/0   <-- The Forwarding counters are: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per seco
(*,224.0.1.40) Flags: S K
   Forwarding: 0/0/0/0,

Other: 8/8/0

   <-- The Other counters are: Total/RPF failed/Other drops
(*,232.0.0.0/8) Flags: K
   Forwarding: 0/0/0/0, Other: 0/0/0
```

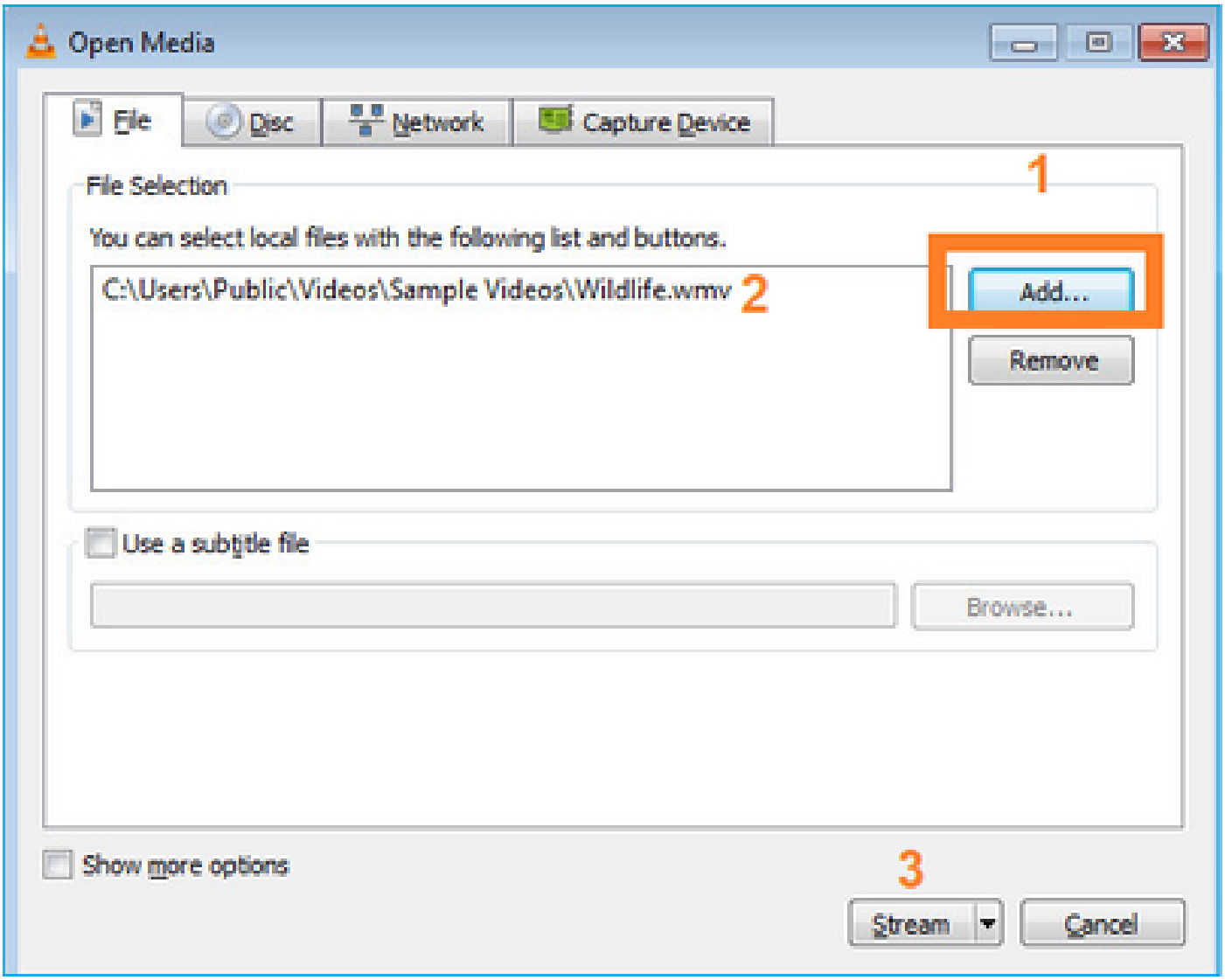
通過防火牆的組播流量

在此案例中，VLC媒體播放器應用程式用作多點傳送伺服器和使用者端，以測試多點傳送流量：



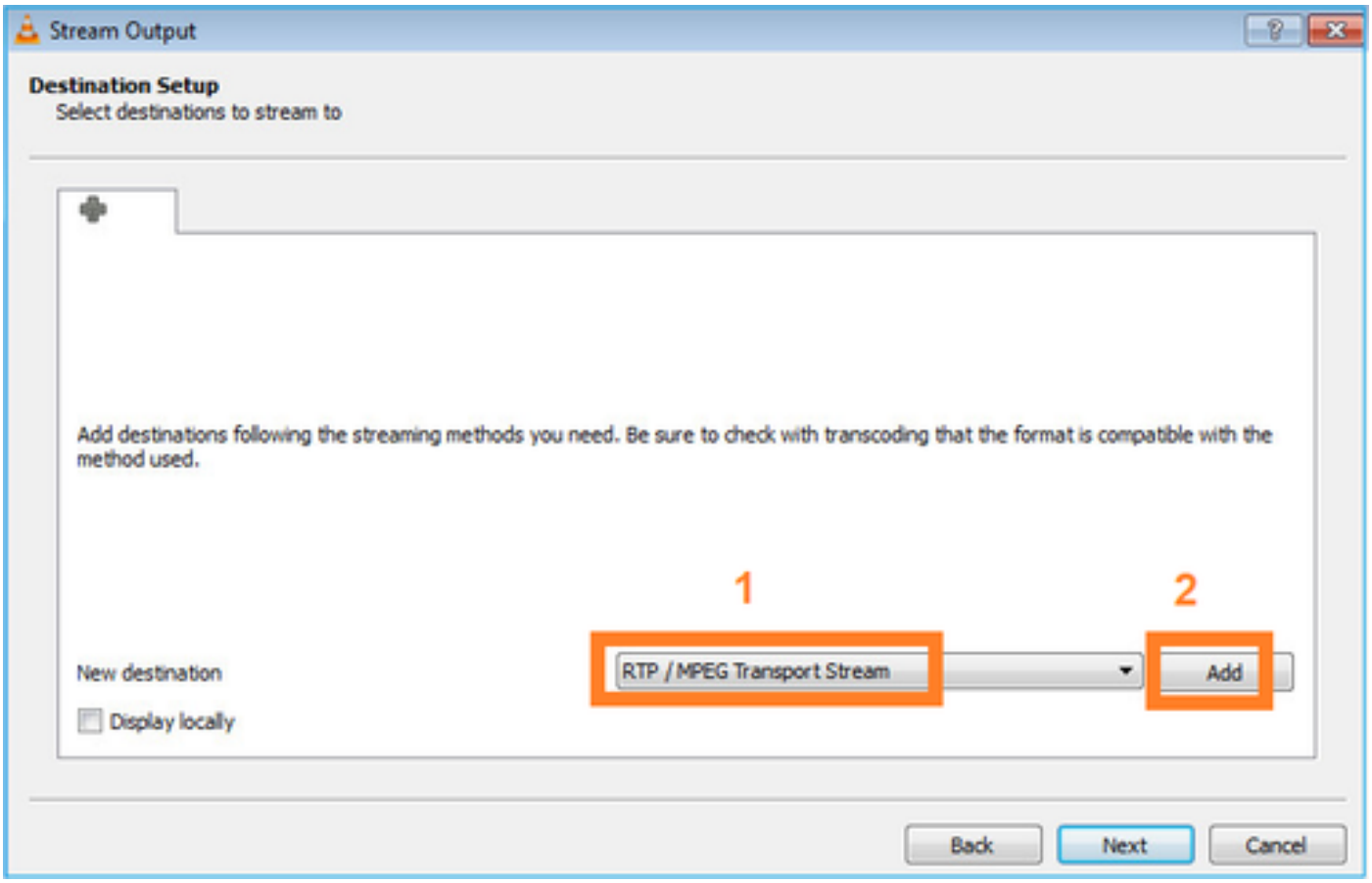
VLC多點傳送伺服器組態：


VLC media player
Media
Playback
Audio
Video
Subtitle
Tools
View
Help
Open File... Ctrl+O
Open Multiple Files... Ctrl+Shift+O
Open Folder... Ctrl+F
Open Disc... Ctrl+D
Open Network Stream... Ctrl+N
Open Capture Device... Ctrl+C
Open Location from clipboard Ctrl+V
Open Recent Media
Save Playlist to File... Ctrl+Y
Convert / Save... Ctrl+R
Stream... Ctrl+S
Quit at the end of playlist
Quit Ctrl+Q
100%

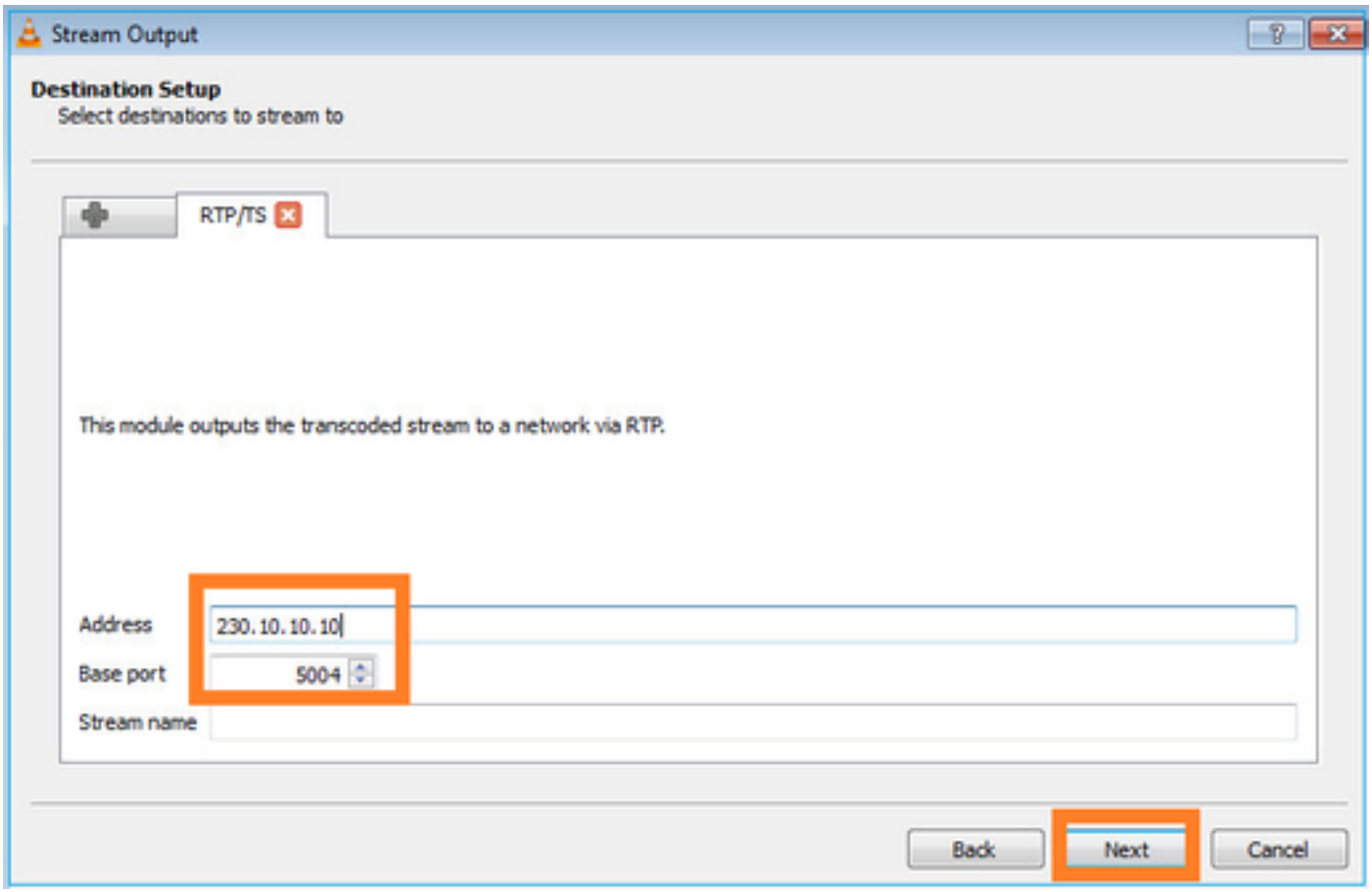


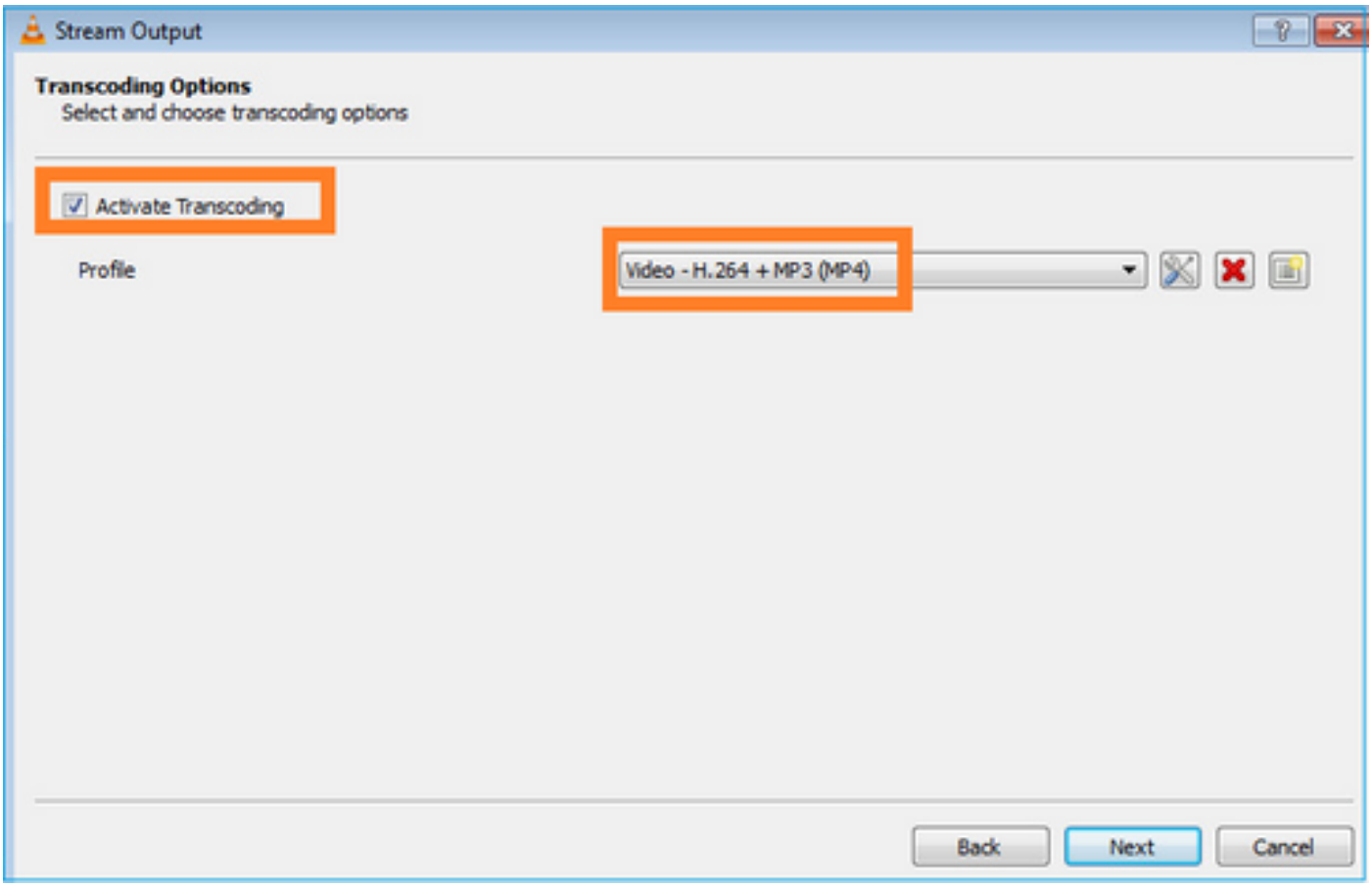
在下一個螢幕上，選擇Next。

選擇格式：


Stream Output
Destination Setup
Select destinations to stream to
Add destinations following the streaming methods you need. Be sure to check with transcoding that the format is compatible with the method used.
1
2
New destination
RTP / MPEG Transport Stream
Add
Display locally
Back
Next
Cancel

指定組播IP和埠：


Stream Output
Destination Setup
Select destinations to stream to
RTP/TS
This module outputs the transcoded stream to a network via RTP.
Address
230.10.10.10
Base port
5004
Stream name
Back
Next
Cancel

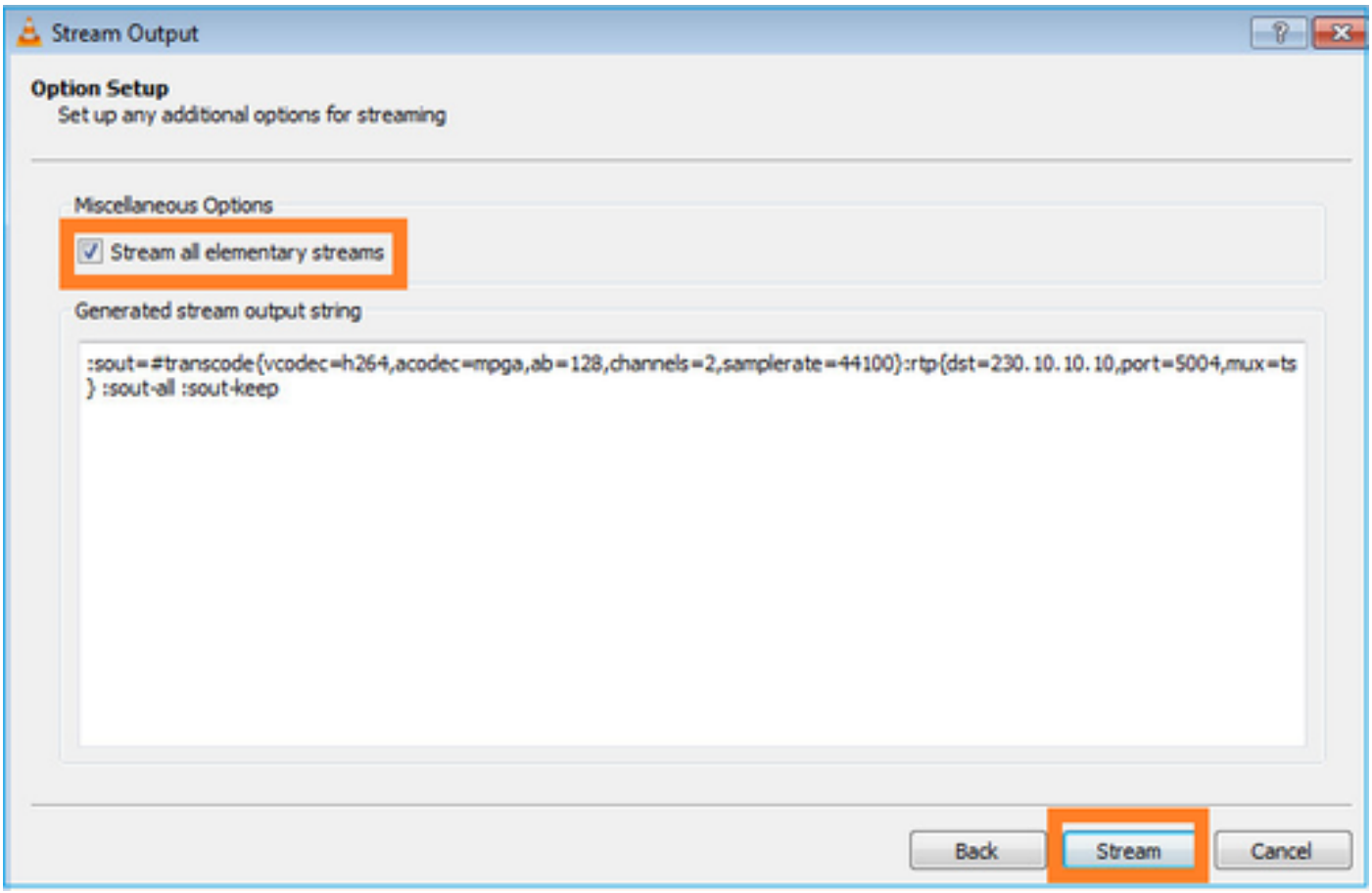


在FTD防火牆上啟用LINA擷取：

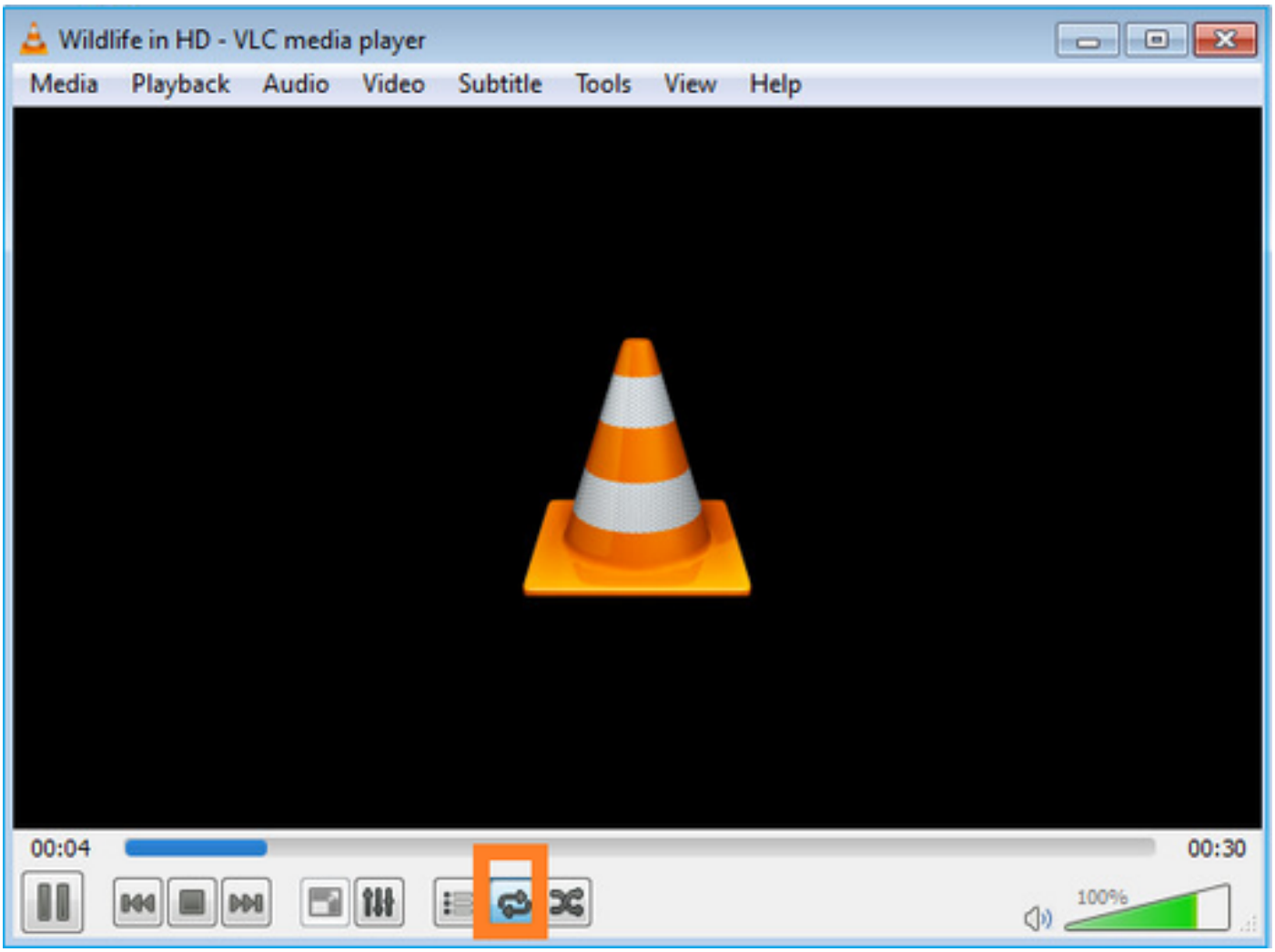
<#root>

```
firepower#
capture INSIDE interface INSIDE match ip host 192.168.103.60 host 230.10.10.10
firepower#
capture OUTSIDE interface OUTSIDE trace match ip host 192.168.103.60 host 230.10.10.10
```

為裝置選擇Stream按鈕以啟動組播流：



啟用「loop」選項，以便連續傳送流：



驗證（非操作方案）

此方案演示了一個非操作方案。目標是演示防火牆行為。

防火牆裝置會收到組播流，但不會轉發它：

<#root>

```
firepower#

show capture


capture INSIDE type raw-data interface INSIDE

[Capturing - 0 bytes]

<-- No packets sent or received
match ip host 192.168.103.60 host 230.10.10.10
capture OUTSIDE type raw-data trace interface OUTSIDE

[Buffer Full - 524030 bytes]

<-- The buffer is full
match ip host 192.168.103.60 host 230.10.10.10
```

防火牆LINA ASP丟棄顯示：

<#root>

```
firepower#

clear asp drop

firepower#

show asp drop


Frame drop:


Punt rate limit exceeded (punt-rate-limit)                          232

<-- The multicast packets were dropped
  Flow is denied by configured rule (acl-drop)                        2
  FP L2 rule drop (l2_acl)                                            2

Last clearing: 18:38:42 UTC Oct 12 2018 by enable_15

Flow drop:

Last clearing: 08:45:41 UTC May 17 2022 by enable_15
```

要跟蹤資料包，需要捕獲組播流的第一個資料包。因此，請清除當前流量：

<#root>

```
firepower#

clear capture OUTSIDE


firepower#

clear conn all addr 230.10.10.10

2 connection(s) deleted.

firepower#

show capture OUTSIDE



379 packets captured

1: 08:49:04.537875 192.168.103.60.54100 > 230.10.10.10.5005: udp 64
2: 08:49:04.537936 192.168.103.60.54099 > 230.10.10.10.5004: udp 1328
3: 08:49:04.538027 192.168.103.60.54099 > 230.10.10.10.5004: udp 1328
4: 08:49:04.538058 192.168.103.60.54099 > 230.10.10.10.5004: udp 1328
5: 08:49:04.538058 192.168.103.60.54099 > 230.10.10.10.5004: udp 1328
6: 08:49:04.538073 192.168.103.60.54099 > 230.10.10.10.5004: udp 1328
...
```

「detail」選項顯示組播MAC地址：

<#root>

```
firepower#

show capture OUTSIDE detail



379 packets captured

1: 08:49:04.537875 0050.569d.344a

0100.5e0a.0a0a

 0x0800 Length: 106
192.168.103.60.54100 > 230.10.10.10.5005: [udp sum ok] udp 64 (ttl 100, id 19759)
2: 08:49:04.537936 0050.569d.344a

0100.5e0a.0a0a

 0x0800 Length: 1370
192.168.103.60.54099 > 230.10.10.10.5004: [udp sum ok] udp 1328 (ttl 100, id 19760)
3: 08:49:04.538027 0050.569d.344a 0100.5e0a.0a0a 0x0800 Length: 1370
192.168.103.60.54099 > 230.10.10.10.5004: [udp sum ok] udp 1328 (ttl 100, id 19761)
...
```

實際封包的追蹤軌跡顯示封包允許通過，但實際發生的情況並非如此：

<#root>

```
firepower#

show capture OUTSIDE packet-number 1 trace


379 packets captured

1: 08:49:04.537875 192.168.103.60.54100 > 230.10.10.10.5005: udp 64
Phase: 1
Type: CAPTURE
Subtype:
Result: ALLOW
Elapsed time: 11712 ns
Config:
Additional Information:
MAC Access list

Phase: 2
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 11712 ns
Config:
Implicit Rule
Additional Information:
```

```
MAC Access list

Phase: 3
Type: ROUTE-LOOKUP
Subtype: No ECMP load balancing
Result: ALLOW
Elapsed time: 7808 ns
Config:
Additional Information:
Destination is locally connected. No ECMP load balancing.
Found next-hop 192.168.103.60 using egress ifc OUTSIDE(vrfid:0)

Phase: 4
Type: ACCESS-LIST
Subtype: log
Result: ALLOW
Elapsed time: 5246 ns
Config:
access-group CSM_FW_ACL_ global
access-list CSM_FW_ACL_ advanced permit ip any any rule-id 268434432
access-list CSM_FW_ACL_ remark rule-id 268434432: ACCESS POLICY: mzafeiro_empty - Default
access-list CSM_FW_ACL_ remark rule-id 268434432: L4 RULE: DEFAULT ACTION RULE
Additional Information:
This packet will be sent to snort for additional processing where a verdict will be reached

Phase: 5
Type: CONN-SETTINGS
Subtype:
Result: ALLOW
Elapsed time: 5246 ns
Config:
class-map class-default
match any
policy-map global_policy
class class-default
set connection advanced-options UM_STATIC_TCP_MAP
service-policy global_policy global
Additional Information:

Phase: 6
Type: NAT
Subtype: per-session
Result: ALLOW
Elapsed time: 5246 ns
Config:
Additional Information:

Phase: 7
Type: IP-OPTIONS
Subtype:
Result: ALLOW
Elapsed time: 5246 ns
Config:
Additional Information:

Phase: 8
Type: CLUSTER-REDIRECT
Subtype: cluster-redirect
Result: ALLOW
Elapsed time: 31232 ns
Config:
Additional Information:
```

```
Phase: 9

Type: MULTICAST

<-- multicast process
Subtype:
Result: ALLOW
Elapsed time: 976 ns
Config:
Additional Information:

Phase: 10

Type: FLOW-CREATION

<-- the packet belongs to a new flow
Subtype:
Result: ALLOW
Elapsed time: 20496 ns
Config:
Additional Information:
New flow created with id 3705, packet dispatched to next module

Result:
input-interface: OUTSIDE(vrfid:0)
input-status: up
input-line-status: up
output-interface: OUTSIDE(vrfid:0)
output-status: up
output-line-status: up

Action: allow

<-- The packet is allowed
Time Taken: 104920 ns
```

根據mroute和mfib計數器，由於傳出介面清單(OIL)為空，因此丟棄了資料包：

<#root>

```
firepower#

show mroute



Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
C - Connected, L - Local, I - Received Source Specific Host Report,
P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
J - Join SPT
Timers: Uptime/Expires
Interface state: Interface, State


(192.168.103.60, 230.10.10.10), 00:01:33/00:01:56, flags: SPF



Incoming interface: OUTSIDE
```

```
RPF nbr: 192.168.103.60

Outgoing interface list: Null

<-- The OIL is empty!

(*, 239.255.255.250), 00:01:50/never, RP 0.0.0.0, flags: SCJ
Incoming interface: Null
RPF nbr: 0.0.0.0
Immediate Outgoing interface list:
INSIDE, Forward, 00:01:50/never
```

MFIB計數器顯示RPF失敗，在這種情況下，並非實際發生的情況：

<#root>

```
firepower#

 show mfib 230.10.10.10

Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             AR - Activity Required, K - Keepalive
firepower# show mfib 230.10.10.10
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
AR - Activity Required, K - Keepalive

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second

<-- Multicast forwarding counters

Other counts: Total/RPF failed

/Other drops            <-- Multicast drop counters
Interface Flags: A - Accept, F - Forward, NS - Negate Signalling
             IC - Internal Copy, NP - Not platform switched
             SP - Signal Present
Interface Counts: FS Pkt Count/PS Pkt Count

(192.168.103.60,230.10.10.10) Flags: K


Forwarding: 0/0/0/0

,

Other: 650/650

/0       <-- Allowed and dropped multicast packets
```

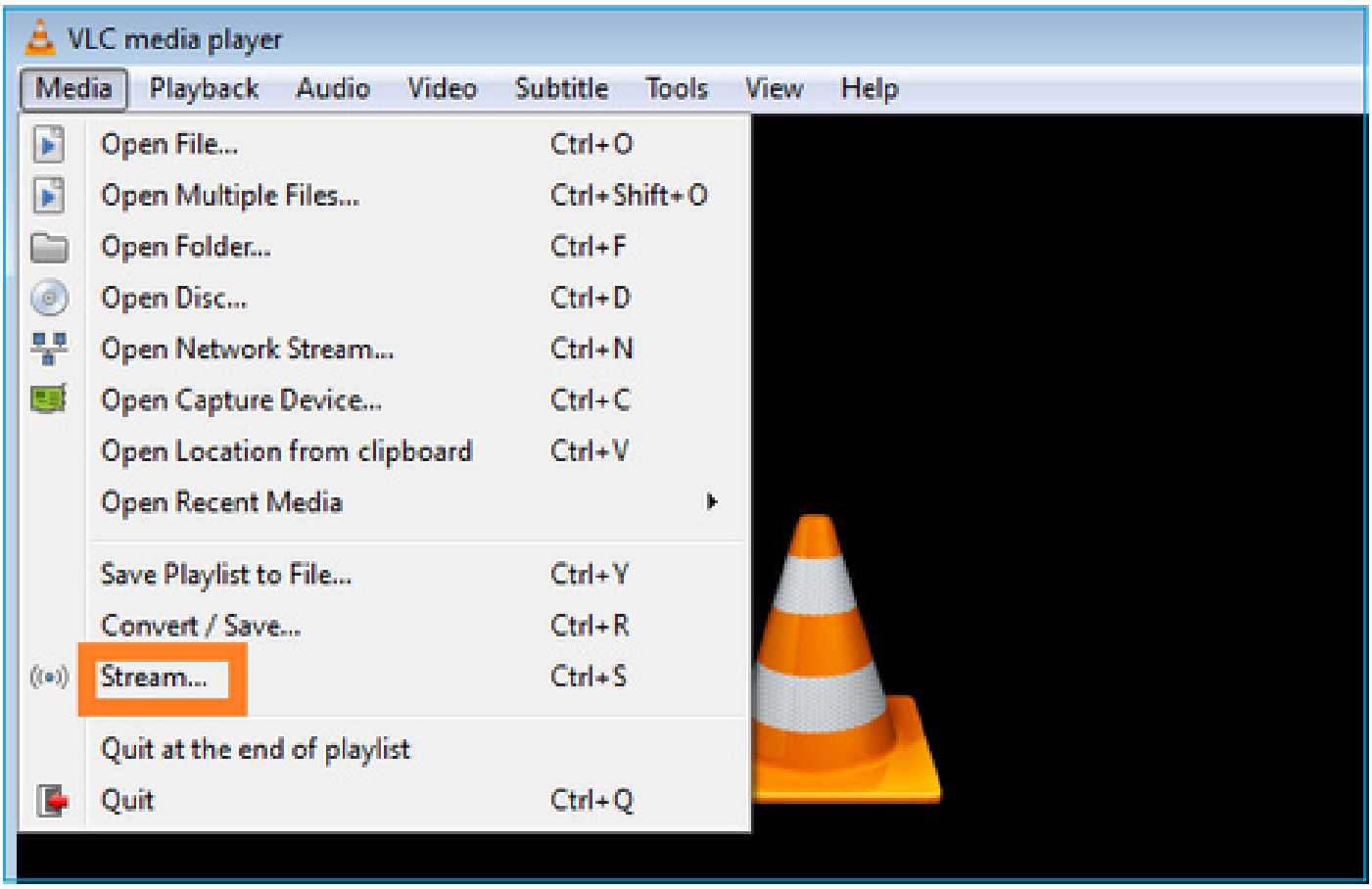
「show mfib count」輸出中的類似RPF失敗：

<#root>

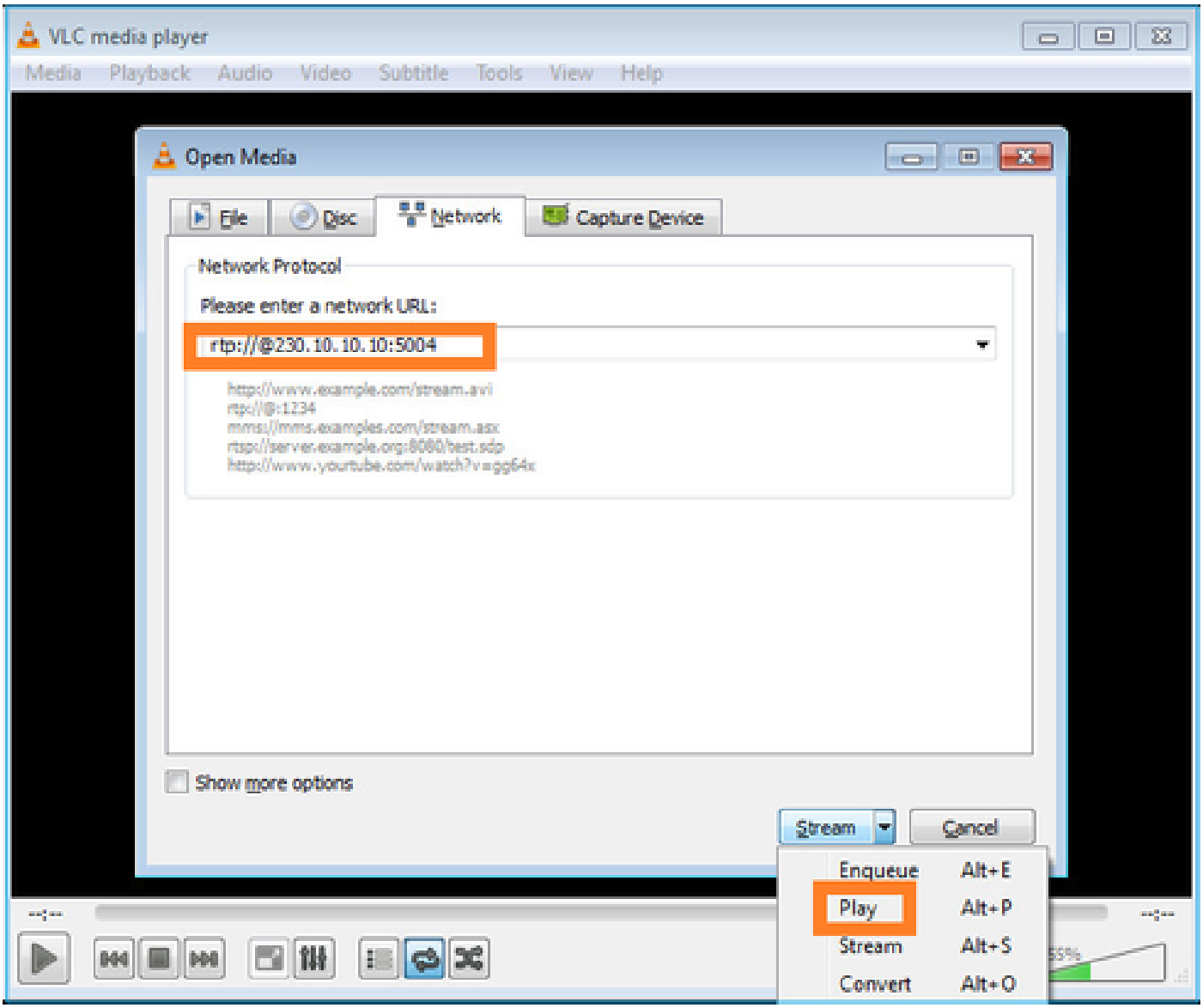
```
firepower#

show mfib count
```

```
IP Multicast Statistics
8 routes, 4 groups, 0.25 average sources per group
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kilobits per second
Other counts:

Total/RPF failed

/Other drops(OIF-null, rate-limit etc)
Group: 224.0.1.39
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0
Group: 224.0.1.40
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0

Group: 230.10.10.10


  Source: 192.168.103.60,
    Forwarding: 0/0/0/0,

Other: 1115/1115

/0   <-- Allowed and dropped multicast packets
  Tot. shown: Source count: 1, pkt count: 0
Group: 232.0.0.0/8
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0
Group: 239.255.255.250
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0
```

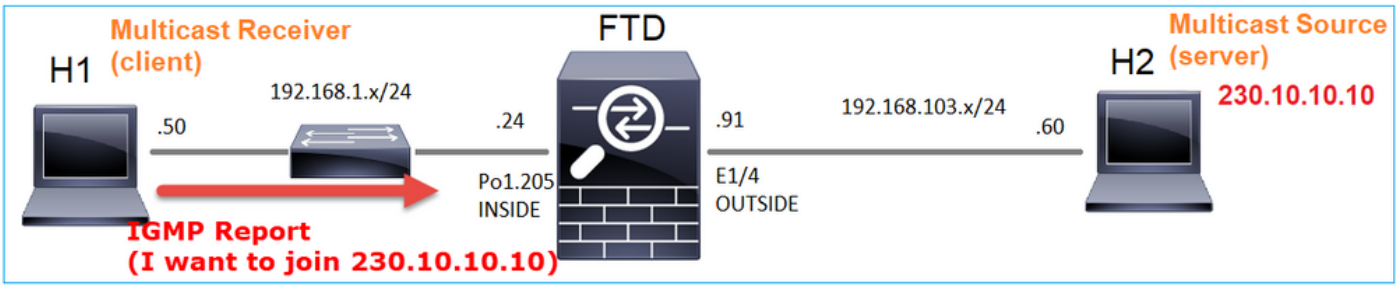
設定VLC多點傳送接收器：



指定組播源IP並選擇播放：



在後端中，只要選擇播放，主機就會宣佈願意加入特定組播組並傳送IGMP報告消息：



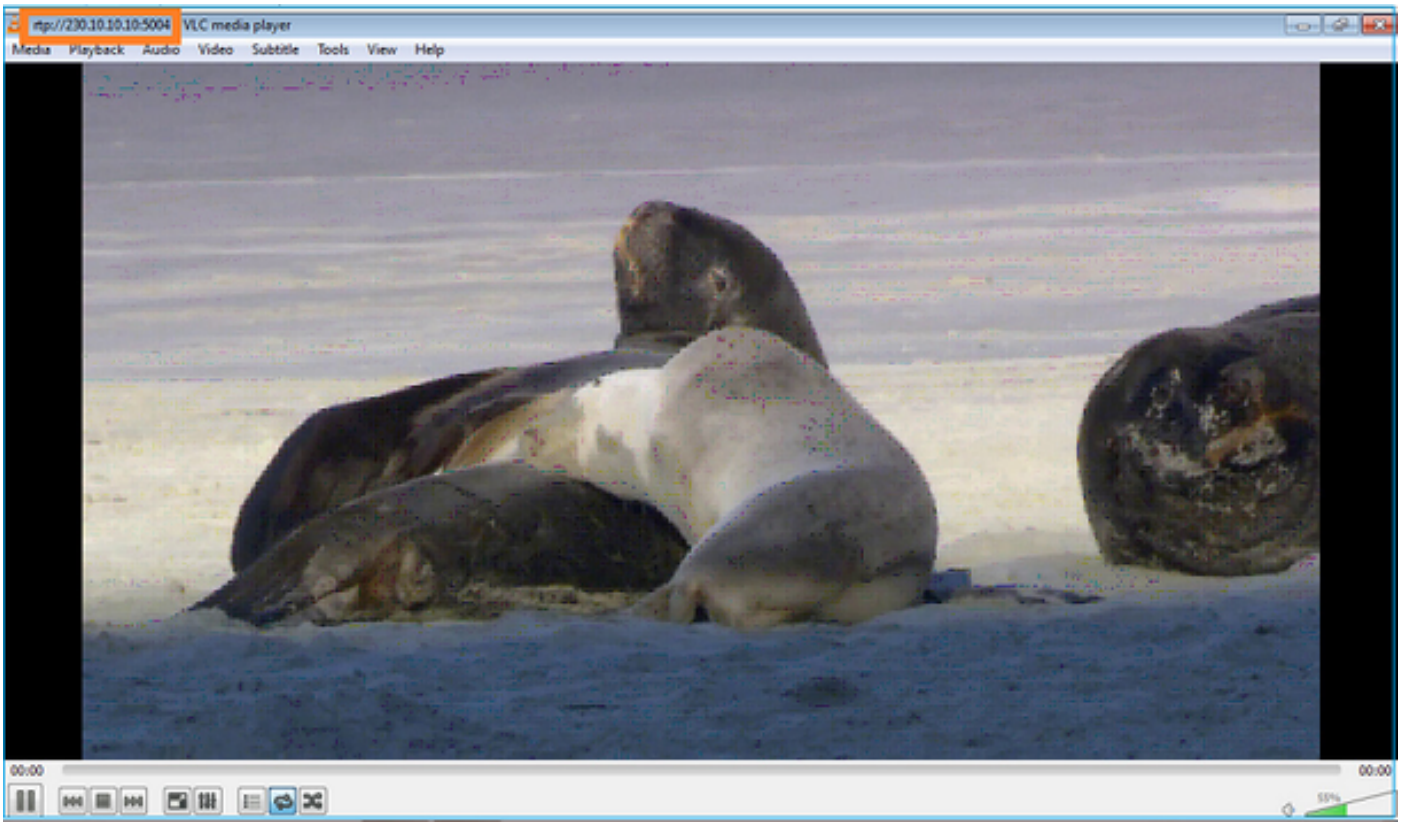
如果啟用調試，可以看到IGMP報告消息：

<#root>

```
firepower#

debug igmp group 230.10.10.10


IGMP: Received v2 Report on INSIDE from 192.168.1.50 for 230.10.10.10
```

```
<-- IGMPv2 Report received
IGMP: group_db: add new group 230.10.10.10 on INSIDE
IGMP: MRIB updated (*,230.10.10.10) : Success
IGMP: Switching to EXCLUDE mode for 230.10.10.10 on INSIDE
IGMP: Updating EXCLUDE group timer for 230.10.10.10
```

流開始：



驗證（操作方案）

<#root>

```
firepower#
```

show capture

```
capture INSIDE type raw-data interface INSIDE
```

[Buffer Full - 524156 bytes]

```
<-- Multicast packets on the egress interface
match ip host 192.168.103.60 host 230.10.10.10
capture OUTSIDE type raw-data trace interface OUTSIDE
```

[Buffer Full - 524030 bytes]

```
<-- Multicast packets on the ingress interface
match ip host 192.168.103.60 host 230.10.10.10
```

防火牆的mroute表：

<#root>

```
firepower#

show mroute


Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT
Timers: Uptime/Expires
Interface state: Interface, State

(*, 230.10.10.10), 00:00:34/never, RP 0.0.0.0, flags: SCJ
  Incoming interface: Null
  RPF nbr: 0.0.0.0
  Immediate Outgoing interface list:
    INSIDE, Forward, 00:00:34/never


(192.168.103.60, 230.10.10.10), 00:01:49/00:03:29, flags: SFJT



  Incoming interface: OUTSIDE



  RPF nbr: 192.168.103.60



  Inherited Outgoing interface list:



    INSIDE, Forward, 00:00:34/never

<-- The OIL shows an interface
```

<#root>

```
firepower#

show mfib 230.10.10.10


Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             AR - Activity Required, K - Keepalive

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second


Other counts: Total/RPF failed/Other drops
Interface Flags: A - Accept, F - Forward, NS - Negate Signalling
             IC - Internal Copy, NP - Not platform switched
```

```
            SP - Signal Present
Interface Counts: FS Pkt Count/PS Pkt Count

(*,230.10.10.10) Flags: C K
  Forwarding: 0/0/0/0, Other: 0/0/0
  INSIDE Flags: F NS
    Pkts: 0/0

(192.168.103.60,230.10.10.10) Flags: K



  Forwarding: 6373/0/1354/0,

Other: 548/548/0      <-- There are multicast packets forwarded

  OUTSIDE Flags: A



  INSIDE Flags: F NS



    Pkts: 6373/6
```

mfib計數器：

<#root>

```
firepower#

show mfib count


IP Multicast Statistics
10 routes, 5 groups, 0.40 average sources per group

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kilobits per second


Other counts: Total/RPF failed/Other drops(OIF-null, rate-limit etc)
Group: 224.0.1.39
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0
Group: 224.0.1.40
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0

Group: 230.10.10.10



  RP-tree:



    Forwarding: 0/0/0/0, Other: 0/0/0



  Source: 192.168.103.60,
```

```
    Forwarding: 7763/0/1354/0,

Other: 548/548/0   <-- There are multicast packets forwarded
  Tot. shown: Source count: 1, pkt count: 0
Group: 232.0.0.0/8
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0
Group: 239.255.255.250
  RP-tree:
    Forwarding: 0/0/0/0, Other: 0/0/0
  Source: 192.168.1.50,
    Forwarding: 7/0/500/0, Other: 0/0/0
  Tot. shown: Source count: 1, pkt count: 0
```

IGMP窺探

- IGMP監聽是交換器上使用的一種機制，用於防止多點傳播泛濫。
- 交換機監控IGMP報告，以確定主機（接收器）的位置。
- 交換機監控IGMP查詢，以確定路由器/防火牆（發件人）的位置。
- 大多數思科交換機預設啟用IGMP監聽。有關詳細資訊，請參閱相關交換指南。以下是L3 Catalyst交換器的輸出範例：

<#root>

```
switch#

show ip igmp snooping statistics


  Current number of Statistics entries    : 15
  Configured Statistics database limit    : 32000
  Configured Statistics database threshold: 25600
  Configured Statistics database limit    : Not exceeded
  Configured Statistics database threshold: Not exceeded

Snooping statistics for Vlan204
#channels: 3
#hosts   : 5

Source/Group                    Interface       Reporter        Uptime   Last-Join Last-Leave
0.0.0.0/230.10.10.10            Vl204:Gi1/48    192.168.1.50    2d13h        -     2d12h
0.0.0.0/230.10.10.10            Vl204:Gi1/48    192.168.1.97    2d13h    2d12h         -
0.0.0.0/230.10.10.10            Vl204:Gi2/1     192.168.1.50    2d10h    02:20:05  02:20:00
0.0.0.0/239.255.255.250         Vl204:Gi2/1     192.168.1.50    2d11h    02:20:05  02:20:00
0.0.0.0/239.255.255.250         Vl204:Gi2/1     192.168.2.50    2d14h    2d13h         -
0.0.0.0/239.255.255.250         Vl204:Gi2/1     192.168.6.50    2d13h        -     2d13h
0.0.0.0/224.0.1.40              Vl204:Gi2/26    192.168.2.1     2d14h    00:00:39  2d13h

Snooping statistics for Vlan206
#channels: 4
#hosts   : 3

Source/Group                    Interface       Reporter        Uptime   Last-Join Last-Leave
0.0.0.0/230.10.10.10            Vl206:Gi1/48    192.168.6.91    00:30:15 2d13h     2d13h
0.0.0.0/239.10.10.10            Vl206:Gi1/48    192.168.6.91    2d14h    2d13h         -
0.0.0.0/239.255.255.250         Vl206:Gi2/1     192.168.6.50    2d12h    00:52:49  00:52:45
```

```
0.0.0.0/224.0.1.40              Vl206:Gi2/26    192.168.6.1     00:20:10 2d13h     2d13h
0.0.0.0/230.10.10.10            Vl206:Gi2/26    192.168.6.1     2d13h    2d13h         -
0.0.0.0/230.10.10.10            Vl206:Gi2/26    192.168.6.91    2d13h        -     2d13h
0.0.0.0/239.10.10.10            Vl206:Gi2/26    192.168.6.1     2d14h    2d14h         -
0.0.0.0/239.10.10.10            Vl206:Gi2/26    192.168.6.91    2d14h        -     2d14h
```

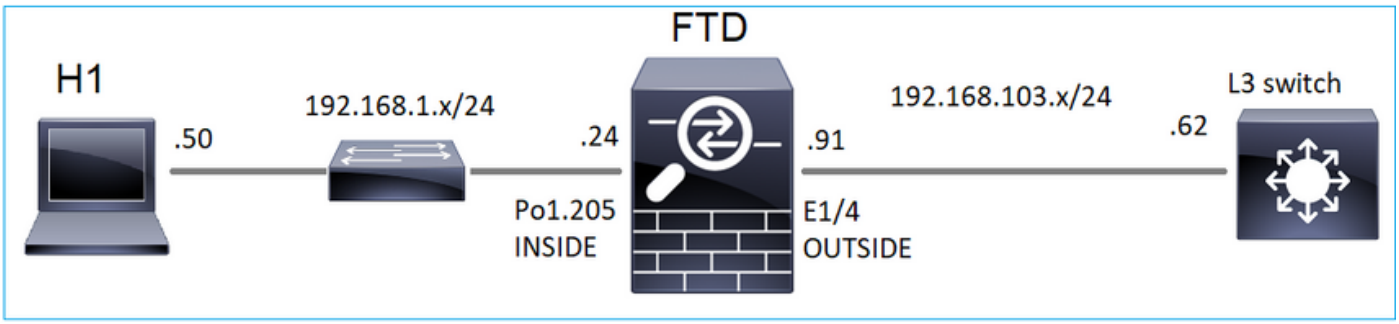
任務3 - IGMP靜態組與IGMP加入組

概觀

	ip igmp static-group	ip igmp join-group
是否應用於FTD介面？	是	是
FTD是否會吸引多點傳播流？	是，將PIM加入傳送到上游裝置。源裝置或到集結點(RP)。僅當使用此命令的FTD是該介面上的PIM指定路由器(DR)時，才會發生這種情況。	是，將PIM加入傳送到上游裝置。源裝置或到集結點(RP)。僅當使用此命令的FTD是該介面上的PIM指定路由器(DR)時，才會發生這種情況。
FTD是否將多點傳播流量轉送出介面？	是	是
FTD會消耗並回覆多點傳播流量嗎	否	是，FTD將多點傳播流傳送到CPU、使用它，然後回覆來源。
CPU影響	最小，因為資料包未傳送到CPU。	可影響FTD CPU，因為屬於該組的每個多點傳送封包都會被傳送到FTD CPU。

任務要求

請考慮使用此拓樸：



在防火牆上啟用以下擷取：

<#root>

```
firepower#
```

```
 capture CAPI interface OUTSIDE trace match icmp host 192.168.103.62 any
```

```
firepower#
```

```
 capture CAPO interface INSIDE match icmp host 192.168.103.62 any
```

1. 使用來自第3層交換器的ICMP ping將多點傳播流量傳送到IP 230.11.11.11，並檢查防火牆處理此問題的方式。
2. 在防火牆INSIDE介面上啟用igmp static-group命令，並檢查防火牆如何處理組播流(IP 230.11.11.11)。
3. 在防火牆INSIDE介面上啟用igmp static-group命令，並檢查防火牆如何處理組播流(IP 230.11.11.11)。

解決方案

防火牆沒有IP 230.11.11.11的任何路由：

<#root>

```
firepower#
```

```
show mroute
```

```
Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
       C - Connected, L - Local, I - Received Source Specific Host Report,
       P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
       J - Join SPT
Timers: Uptime/Expires
Interface state: Interface, State

(*, 239.255.255.250), 00:43:21/never, RP 0.0.0.0, flags: SCJ
  Incoming interface: Null
  RPF nbr: 0.0.0.0
  Immediate Outgoing interface list:
    OUTSIDE, Forward, 00:05:41/never
    INSIDE, Forward, 00:43:21/never
```

測試多點傳送的簡單方法是使用ICMP ping工具。在這種情況下，從R2對組播IP地址230.11.11.11發起ping:

<#root>

```
L3-Switch#
```

```
ping 230.11.11.11 re 100
```

```
Type escape sequence to abort.
Sending 100, 100-byte ICMP Echos to 230.11.11.11, timeout is 2 seconds:
.................................
```

在防火牆上，動態建立mroute且OIL為空：

<#root>

```
firepower#

show mroute


Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group,
C - Connected, L - Local, I - Received Source Specific Host Report,
P - Pruned, R - RP-bit set, F - Register flag, T - SPT-bit set,
J - Join SPT
Timers: Uptime/Expires
Interface state: Interface, State


(192.168.103.62, 230.11.11.11), 00:02:33/00:00:56, flags: SPF

<-- The mroute is added

  Incoming interface: OUTSIDE



  RPF nbr: 192.168.103.62



 Outgoing interface list: Null

<-- The OIL is empty
```

防火牆上的擷取顯示：

<#root>

```
firepower# show capture

capture CAPI type raw-data trace interface OUTSIDE

[Capturing - 1040 bytes]

<-- There are ICMP packets captured on ingress interface
match icmp host 192.168.103.62 any
capture CAPO type raw-data interface INSIDE

[Capturing - 0 bytes]

<-- There are no ICMP packets on egress
match icmp host 192.168.103.62 any
```

防火牆會為每個ping建立連線，但會以靜默方式捨棄封包：

<#root>

```
firepower#

show log | include 230.11.11.11


May 17 2022 11:05:47: %FTD-7-609001:

Built local-host identity:230.11.11.11

<-- A new connection is created
May 17 2022 11:05:47: %FTD-6-302020: Built inbound ICMP connection for faddr 192.168.1.99/6 gaddr 230.1
May 17 2022 11:05:47: %FTD-6-302020: Built inbound ICMP connection for faddr 192.168.103.62/6 gaddr 230
May 17 2022 11:05:49: %FTD-6-302021: Teardown ICMP connection for faddr 192.168.1.99/6 gaddr 230.11.11.
May 17 2022 11:05:49: %FTD-6-302021: Teardown ICMP connection for faddr 192.168.103.62/6 gaddr 230.11.1
May 17 2022 11:05:49: %FTD-7-609002:

Teardown local-host identity:230.11.11.11 duration 0:00:02

<-- The connection is closed
May 17 2022 11:05:51: %FTD-7-609001:

Built local-host identity:230.11.11.11

<

--

A new connection is created
May 17 2022 11:05:51: %FTD-6-302020: Built inbound ICMP connection for faddr 192.168.1.99/6 gaddr 230.1
May 17 2022 11:05:51: %FTD-6-302020: Built inbound ICMP connection for faddr 192.168.103.62/6 gaddr 230
May 17 2022 11:05:53: %FTD-6-302021: Teardown ICMP connection for faddr 192.168.1.99/6 gaddr 230.11.11.
May 17 2022 11:05:53: %FTD-6-302021: Teardown ICMP connection for faddr 192.168.103.62/6 gaddr 230.11.1
May 17 2022 11:05:53: %FTD-7-609002:

Teardown local-host identity:230.11.11.11 duration 0:00:02

<-- The connection is closed
```

注意：LINA ASP丟棄捕獲不會顯示丟棄的資料包

組播資料包丟棄的主要指示是：

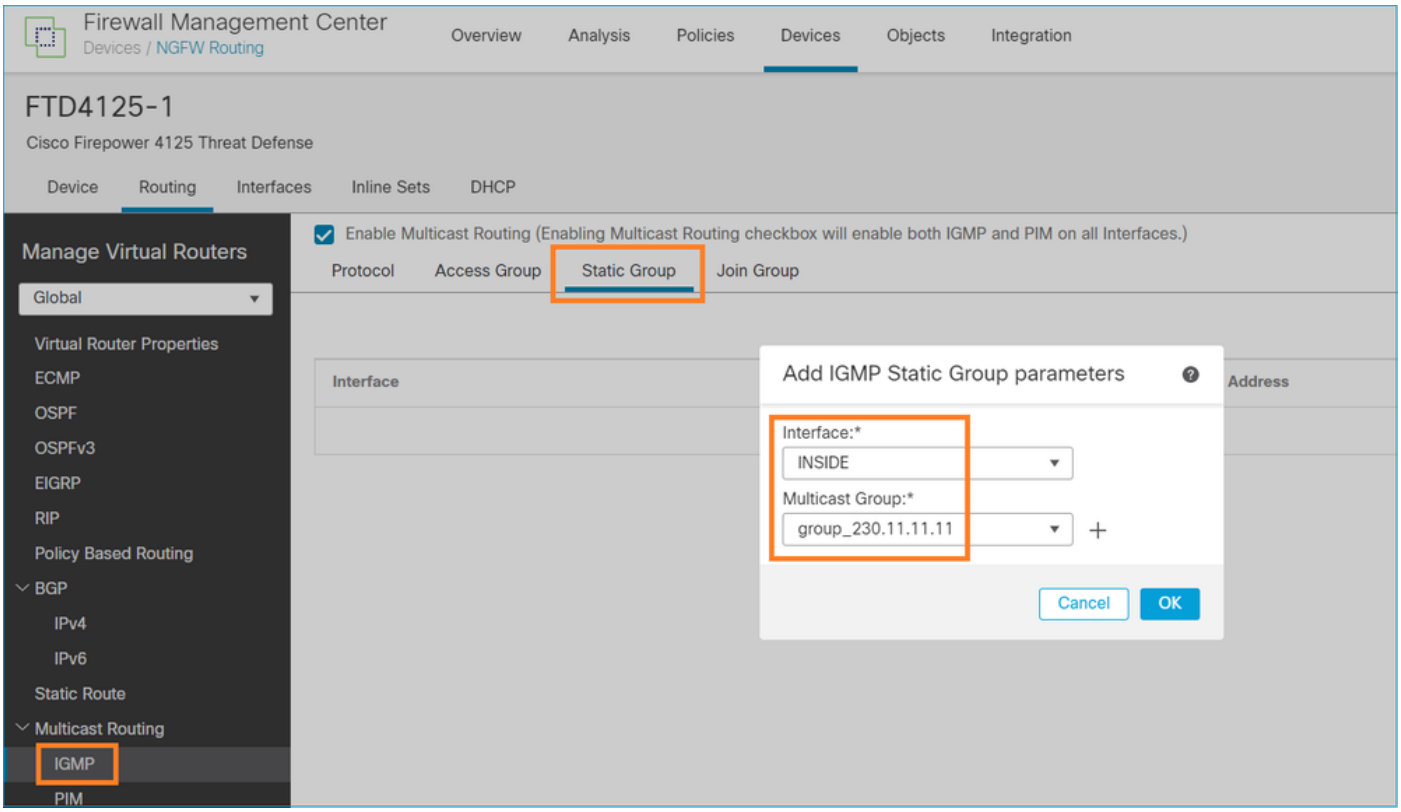
<#root>

```
firepower#

show mfib

Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
             AR - Activity Required, K - Keepalive
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second

Other counts: Total/RPF failed/Other drops

Interface Flags: A - Accept, F - Forward, NS - Negate Signalling
             IC - Internal Copy, NP - Not platform switched
             SP - Signal Present
Interface Counts: FS Pkt Count/PS Pkt Count

(*,224.0.1.39) Flags: S K
  Forwarding: 0/0/0/0, Other: 0/0/0
```

```
(*,224.0.1.40) Flags: S K
  Forwarding: 0/0/0/0, Other: 0/0/0

(192.168.103.62,230.11.11.11)

 Flags: K          <-- The multicast stream
  Forwarding: 0/0/0/0,

Other: 27/27/0

<-- The packets are dropped
```

igmp static-group

在FMC上配置靜態IGMP組：



下面是後台部署的內容：

<#root>

```
interface Port-channel1.205
 vlan 205
 nameif INSIDE
 cts manual
  propagate sgt preserve-untag
  policy static sgt disabled trusted
 security-level 0
 ip address 192.168.1.24 255.255.255.0

 igmp static-group 230.11.11.11
```

```
<-- IGMP static group is enabled on the interface
```

ping失敗，但ICMP多點傳播流量現在通過防火牆轉送：

<#root>

```
L3-Switch#

ping 230.11.11.11 re 10000

Type escape sequence to abort.
Sending 10000, 100-byte ICMP Echos to 230.11.11.11, timeout is 2 seconds:
.............................
```

<#root>

```
firepower#

show capture


capture CAPI type raw-data trace interface OUTSIDE

[Capturing - 650 bytes]

<-- ICMP packets are captured on ingress interface
match icmp host 192.168.103.62 any
capture CAPO type raw-data interface INSIDE

[Capturing - 670 bytes]

<-- ICMP packets are captured on egress interface
match icmp host 192.168.103.62 any
```

<#root>

```
firepower#

show capture CAPI

8 packets captured

1: 11:31:32.470541 192.168.103.62 > 230.11.11.11 icmp: echo request
2: 11:31:34.470358 192.168.103.62 > 230.11.11.11 icmp: echo request
3: 11:31:36.470831 192.168.103.62 > 230.11.11.11 icmp: echo request
4: 11:31:38.470785 192.168.103.62 > 230.11.11.11 icmp: echo request
...

firepower#

show capture CAPO


11 packets captured

1: 11:31:32.470587 802.1Q vlan#205 P0 192.168.103.62 > 230.11.11.11 icmp: echo request
```

```
2: 11:31:34.470404 802.1Q vlan#205 P0 192.168.103.62 > 230.11.11.11 icmp: echo request
3: 11:31:36.470861 802.1Q vlan#205 P0 192.168.103.62 > 230.11.11.11 icmp: echo request
4: 11:31:38.470816 802.1Q vlan#205 P0 192.168.103.62 > 230.11.11.11 icmp: echo request
```

注意：資料包的跟蹤顯示不正確的輸出（輸入介面與輸出相同）。如需更多詳細資訊，請檢查Cisco錯誤ID CSCvm89673。

<#root>

```
firepower#

show capture CAPI packet-number 1 trace


1: 11:39:33.553987 192.168.103.62 > 230.11.11.11 icmp: echo request


Phase: 1
Type: CAPTURE
Subtype:
Result: ALLOW
Elapsed time: 3172 ns
Config:
Additional Information:
MAC Access list

Phase: 2
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 3172 ns
Config:
Implicit Rule
Additional Information:
MAC Access list

Phase: 3
Type: ROUTE-LOOKUP
Subtype: No ECMP load balancing
Result: ALLOW
Elapsed time: 9760 ns
Config:
Additional Information:
Destination is locally connected. No ECMP load balancing.
Found next-hop 192.168.103.62 using egress ifc OUTSIDE(vrfid:0)

Phase: 4
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 5368 ns
Config:
Implicit Rule
Additional Information:

Phase: 5
Type: CONN-SETTINGS
```

```
Subtype:
Result: ALLOW
Elapsed time: 5368 ns
Config:
class-map class-default
match any
policy-map global_policy
class class-default
set connection advanced-options UM_STATIC_TCP_MAP
service-policy global_policy global
Additional Information:

Phase: 6
Type: NAT
Subtype: per-session
Result: ALLOW
Elapsed time: 5368 ns
Config:
Additional Information:

Phase: 7
Type: IP-OPTIONS
Subtype:
Result: ALLOW
Elapsed time: 5368 ns
Config:
Additional Information:

Phase: 8
Type: CLUSTER-REDIRECT
Subtype: cluster-redirect
Result: ALLOW
Elapsed time: 31720 ns
Config:
Additional Information:

Phase: 9
Type: INSPECT
Subtype: np-inspect
Result: ALLOW
Elapsed time: 488 ns
Config:
class-map inspection_default
match default-inspection-traffic
policy-map global_policy
class inspection_default
inspect icmp
service-policy global_policy global
Additional Information:

Phase: 10
Type: INSPECT
Subtype: np-inspect
Result: ALLOW
Elapsed time: 2440 ns
Config:
Additional Information:
```

Phase: 11

Type: MULTICAST

<-- The packet is multicast

Subtype:

Result: ALLOW

Elapsed time: 976 ns

Config:

Additional Information:

Phase: 12

Type: FLOW-CREATION

<-- A new flow is created
Subtype:
Result: ALLOW
Elapsed time: 56120 ns
Config:
Additional Information:
New flow created with id 5690, packet dispatched to next module

Phase: 13
Type: CAPTURE
Subtype:
Result: ALLOW
Elapsed time: 10248 ns
Config:
Additional Information:
MAC Access list

Result:

input-interface: OUTSIDE(vrfid:0)

input-status: up
input-line-status: up

output-interface: OUTSIDE(vrfid:0)

output-status: up
output-line-status: up

Action: allow

<-- The packet is allowed
Time Taken: 139568 ns

提示：可以從源主機使用超時0執行ping，也可以檢查防火牆mfib計數器：

<#root>

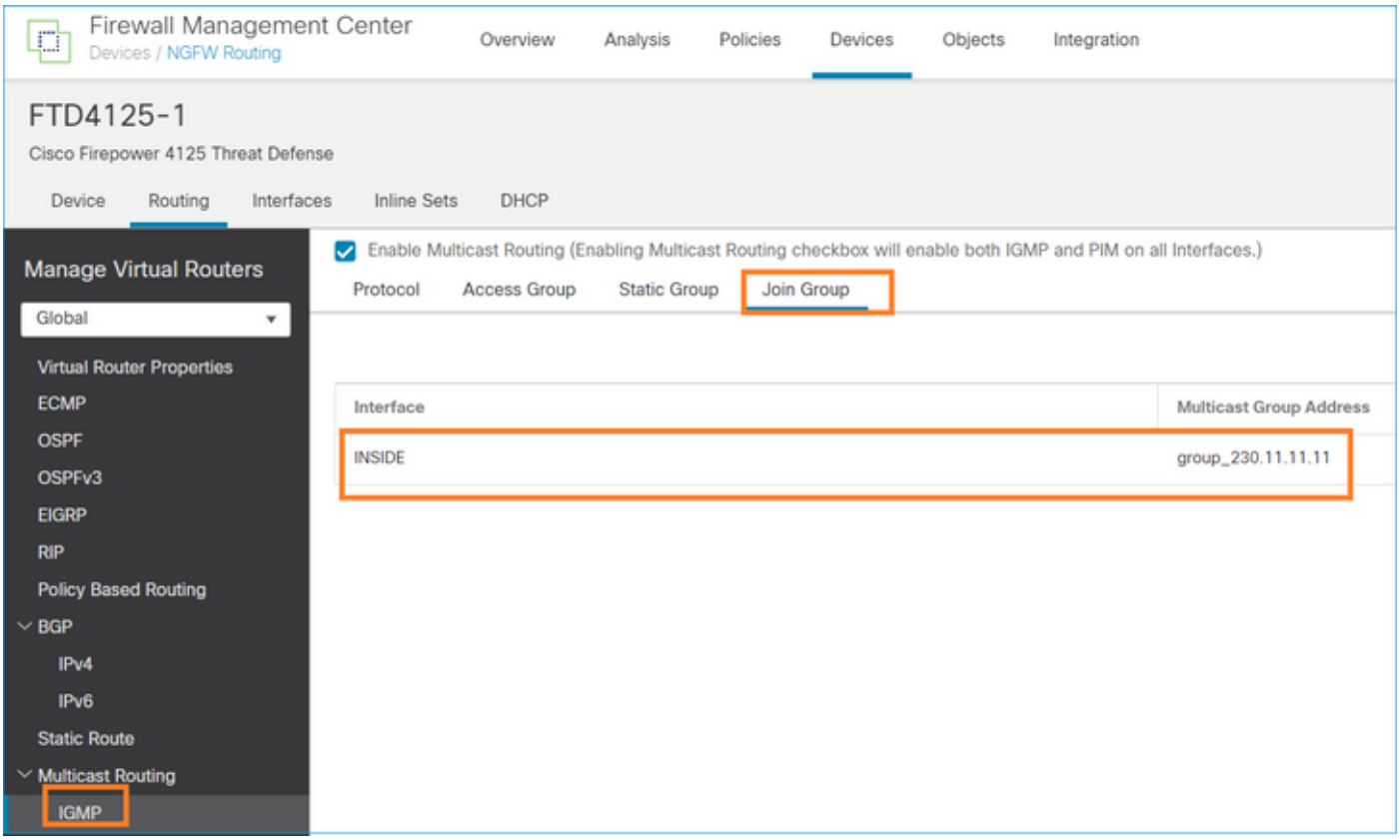
```
L3-Switch#

ping 230.11.11.11 re 500 timeout 0

Type escape sequence to abort.
Sending 1000, 100-byte ICMP Echos to 230.11.11.11, timeout is 0 seconds:
.....................................................................
.....................................................................
.....................................................................
....................
```

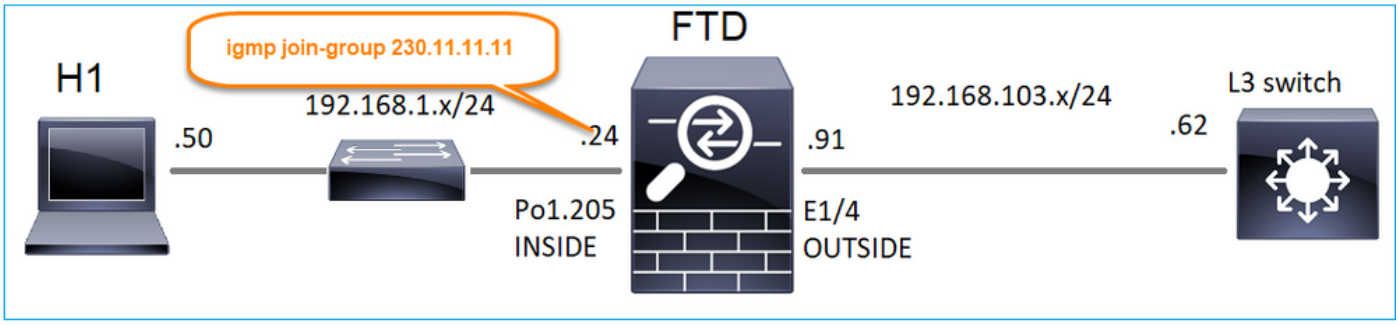
<#root>

```
firepower# clear mfib counters

firepower# !ping from the source host.

firepower#

show mfib 230.11.11.11


Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
AR - Activity Required, K - Keepalive

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second


Other counts: Total/RPF failed/Other drops
Interface Flags: A - Accept, F - Forward, NS - Negate Signalling
IC - Internal Copy, NP - Not platform switched
SP - Signal Present
Interface Counts: FS Pkt Count/PS Pkt Count

(*,230.11.11.11) Flags: C K
  Forwarding: 0/0/0/0, Other: 0/0/0
  INSIDE Flags: F NS
    Pkts: 0/0
(192.168.103.62,230.11.11.11) Flags: K


Forwarding: 500/0/100/0, Other: 0/0/0

<-- 500 multicast packets forwarded. The average size of each packet is 100 Bytes
  OUTSIDE Flags: A
  INSIDE Flags: F NS
    Pkts: 500/0
```

igmp join-group

在FMC遠端交換機上，配置先前配置的靜態組配置並配置IGMP加入組：





部署的配置：

<#root>

```
firepower#

show run interface Port-channel1.205


!
interface Port-channel1.205
vlan 205
nameif INSIDE
cts manual
propagate sgt preserve-untag
policy static sgt disabled trusted
security-level 0
ip address 192.168.1.24 255.255.255.0

igmp join-group 230.11.11.11

<-- The interface joined the multicast group
```

IGMP組：

<#root>

```
firepower#

show igmp group


IGMP Connected Group Membership
Group Address Interface Uptime Expires Last Reporter

230.11.11.11 INSIDE 00:30:43 never 192.168.1.24

<-- The group is enabled on the interface
```

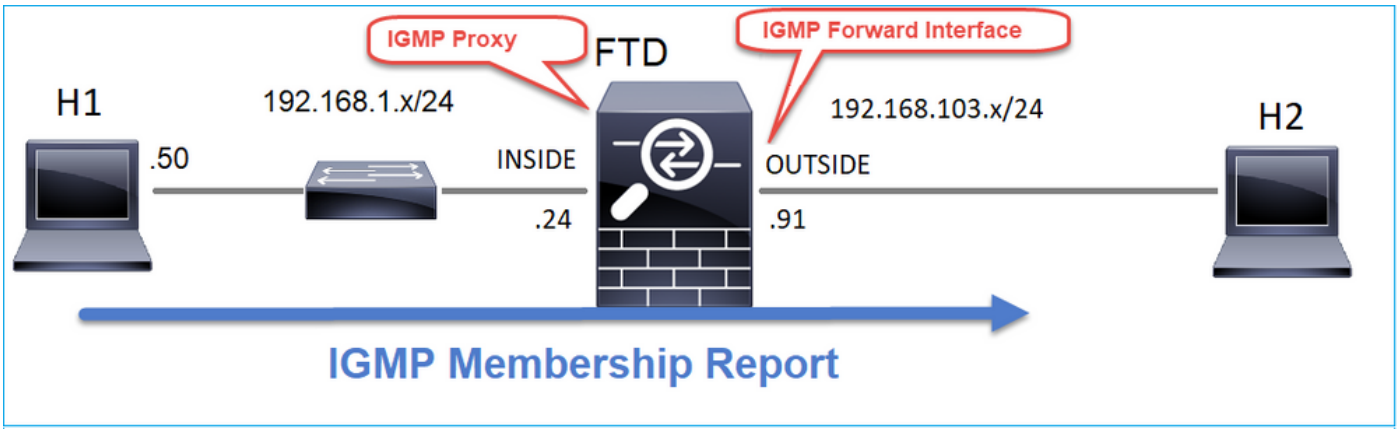
在來源主機中，嘗試對230.11.11.11 IP進行第一個ICMP多點傳送測試：

<#root>

```
L3-Switch#

ping 230.11.11.11 repeat 10


Type escape sequence to abort.
Sending 10, 100-byte ICMP Echos to 230.11.11.11, timeout is 2 seconds:

Reply to request 0 from 192.168.1.24, 12 ms
Reply to request 1 from 192.168.1.24, 8 ms
Reply to request 2 from 192.168.1.24, 8 ms
Reply to request 3 from 192.168.1.24, 8 ms
Reply to request 4 from 192.168.1.24, 8 ms
Reply to request 5 from 192.168.1.24, 12 ms
Reply to request 6 from 192.168.1.24, 8 ms
Reply to request 7 from 192.168.1.24, 8 ms
Reply to request 8 from 192.168.1.24, 8 ms
Reply to request 9 from 192.168.1.24, 8 ms
```

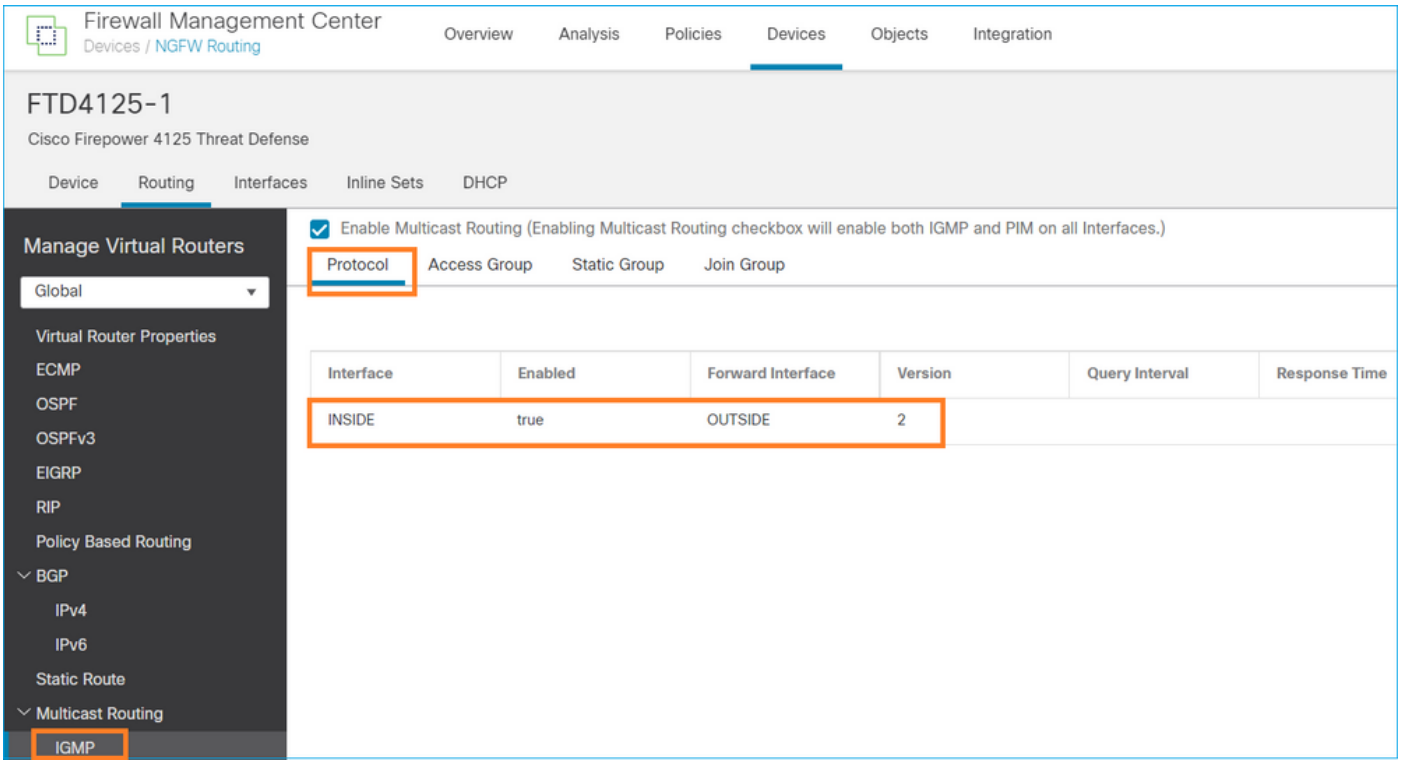
✎ 註：如果您沒有看到所有回覆，請檢查Cisco錯誤ID CSCvm90069。

任務4 — 配置IGMP Stub組播路由



在FTD上設定存根多點傳送路由，以便將INSIDE介面上收到的IGMP成員身份報告訊息轉送到OUTSIDE介面。

解決方案



部署的配置：

<#root>

```
firepower#

show run multicast-routing


multicast-routing

<-- Multicast routing is enabled
firepower#

show run interface Port-channel1.205
```

```
!
interface Port-channel1.205
 vlan 205
 nameif INSIDE
 cts manual
  propagate sgt preserve-untag
  policy static sgt disabled trusted
 security-level 0
 ip address 192.168.1.24 255.255.255.0
```

igmp forward interface OUTSIDE

```
<-- The interface does stub multicast routing
```

驗證

在FTD上啟用擷取：

<#root>

```
firepower#
```

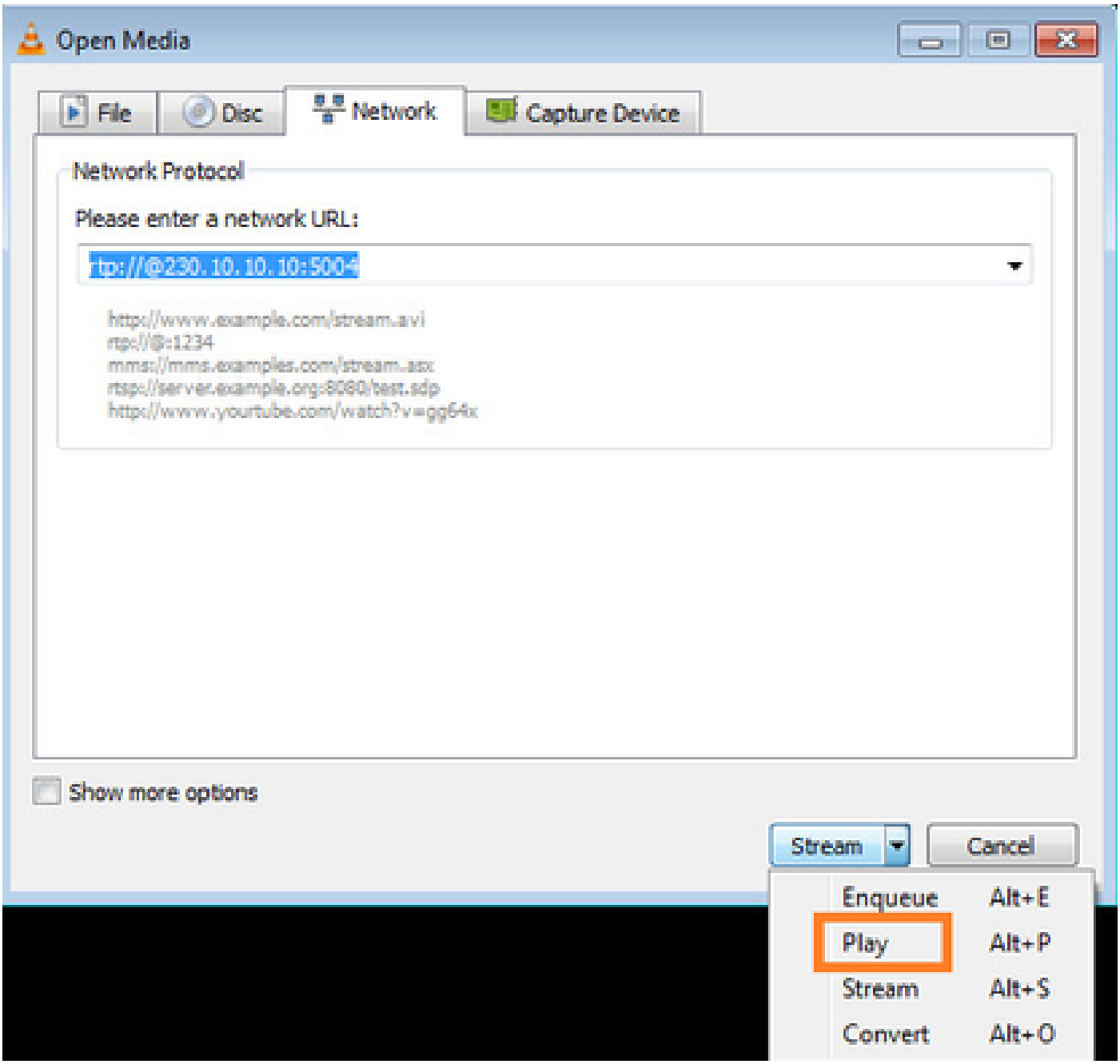
capture CAPI interface INSIDE trace match igmp any host 230.10.10.10

```
firepower#
```

capture CAPO interface OUTSIDE match igmp any host 230.10.10.10

驗證

要強制IGMP成員報告，您可以使用類似VLC的應用程式：



FTD代理IGMP封包：

<#root>

```
firepower#

show capture


capture CAPI type raw-data trace interface INSIDE

[Capturing - 66 bytes]

<-- IGMP packets captured on ingress
match igmp any host 230.10.10.10
capture CAPO type raw-data interface OUTSIDE

[Capturing - 62 bytes]
```

```
<-- IGMP packets captured on egress
match igmp any host 230.10.10.10
```

FTD會變更來源IP:

<#root>

```
firepower#

show capture CAPI



1 packet captured

   1: 12:21:12.820483 802.1Q vlan#205 P6

192.168.1.50

 > 230.10.10.10 ip-proto-2, length 8    <-- The source IP of the packet on ingress interface
1 packet shown
firepower#

show capture CAPO



1 packet captured

   1: 12:21:12.820743

192.168.103.91

 > 230.10.10.10 ip-proto-2, length 8  <-- The source IP of the packet on egress interface
1 packet shown
```

如果您在Wireshark中檢查pcap，可以看到該資料包完全由防火牆重新生成（IP標識更改）。

在FTD上建立一個組專案：

<#root>

```
firepower#

show igmp group

IGMP Connected Group Membership
Group Address    Interface            Uptime    Expires   Last Reporter

230.10.10.10     INSIDE               00:15:22  00:03:28  192.168.1.50

<-- IGMP group is enabled on the ingress interface
239.255.255.250  INSIDE               00:15:27  00:03:29  192.168.1.50
```

FTD防火牆建立2個控制平面連線：

<#root>

```
firepower#

show conn all address 230.10.10.10


9 in use, 28 most used
Inspect Snort:
preserve-connection: 0 enabled, 0 in effect, 0 most enabled, 0 most in effect

IGMP INSIDE 192.168.1.50 NP Identity Ifc 230.10.10.10, idle 0:00:09, bytes 8, flags

<-- Connection terminated on the ingress interface

IGMP OUTSIDE 230.10.10.10 NP Identity Ifc 192.168.103.91, idle 0:00:09, bytes 8, flags

<-- Connection terminated on the egress interface
```

第一個封包的追蹤軌跡：

<#root>

```
firepower#

show capture CAPI packet-number 1 trace


6 packets captured


1: 12:21:12.820483 802.1Q vlan#205 P6 192.168.1.50 > 230.10.10.10 ip-proto-2, length 8

<-- The first packet of the flow
Phase: 1
Type: CAPTURE
Subtype:
Result: ALLOW
Elapsed time: 5124 ns
Config:
Additional Information:
MAC Access list

Phase: 2
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 5124 ns
Config:
Implicit Rule
Additional Information:
MAC Access list

Phase: 3
Type: ROUTE-LOOKUP
Subtype: No ECMP load balancing
```

```
Result: ALLOW
Elapsed time: 7808 ns
Config:
Additional Information:
Destination is locally connected. No ECMP load balancing.
Found next-hop 192.168.1.50 using egress ifc INSIDE(vrfid:0)

Phase: 4
Type: CLUSTER-DROP-ON-SLAVE
Subtype: cluster-drop-on-slave
Result: ALLOW
Elapsed time: 5368 ns
Config:
Additional Information:

Phase: 5
Type: ACCESS-LIST
Subtype:
Result: ALLOW
Elapsed time: 5368 ns
Config:
Implicit Rule
Additional Information:

Phase: 6
Type: IP-OPTIONS
Subtype:
Result: ALLOW
Elapsed time: 5368 ns
Config:
Additional Information:

Phase: 7
Type: NAT
Subtype: per-session
Result: ALLOW
Elapsed time: 5368 ns
Config:
Additional Information:

Phase: 8
Type: CLUSTER-REDIRECT
Subtype: cluster-redirect
Result: ALLOW
Elapsed time: 40504 ns
Config:
Additional Information:
```

Phase: 9

Type: MULTICAST

<-- The packet is multicast

Subtype:

Result: ALLOW

Elapsed time: 976 ns

Config:

Additional Information:

Phase: 10

Type: FLOW-CREATION

<-- A new flow is created

Subtype:

Result: ALLOW

Elapsed time: 17568 ns

Config:

Additional Information:

New flow created with id 5945, packet dispatched to next module

Phase: 11

Type: FLOW-CREATION

<-- A second flow is created

Subtype:

Result: ALLOW

Elapsed time: 39528 ns

Config:

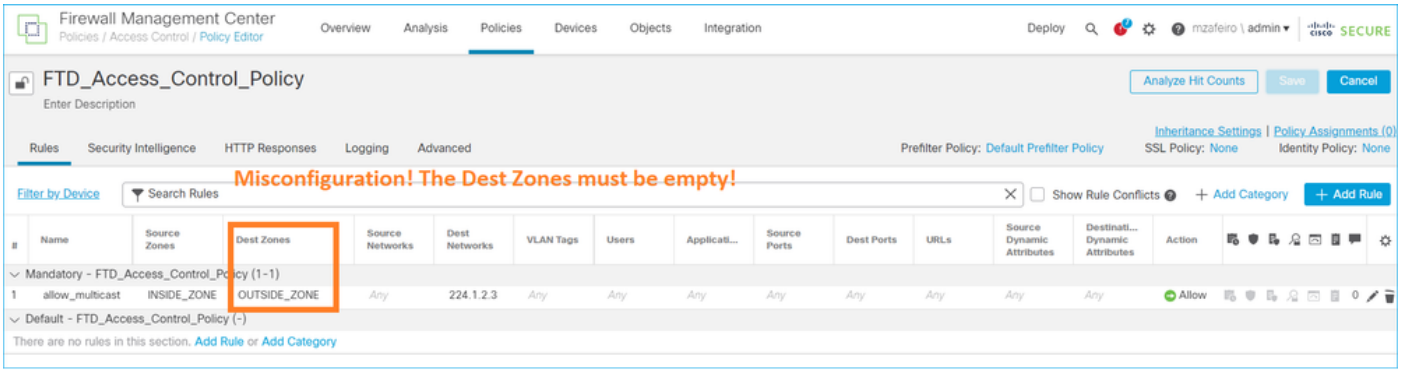
Additional Information:

```
New flow created with id 5946, packet dispatched to next module


Phase: 12
Type: NEXTHOP-LOOKUP-FROM-OUTPUT-ROUTE-LOOKUP
Subtype: Lookup Nexthop on interface
Result: ALLOW
Elapsed time: 6344 ns
Config:
Additional Information:
Found next-hop 230.10.10.10 using egress ifc OUTSIDE(vrfid:0)

Phase: 13
Type: CAPTURE
Subtype:
Result: ALLOW
Elapsed time: 9760 ns
Config:
Additional Information:
MAC Access list

Result:
input-interface: INSIDE(vrfid:0)
input-status: up
input-line-status: up
output-interface: INSIDE(vrfid:0)
output-status: up
output-line-status: up
Action: allow
Time Taken: 154208 ns
```

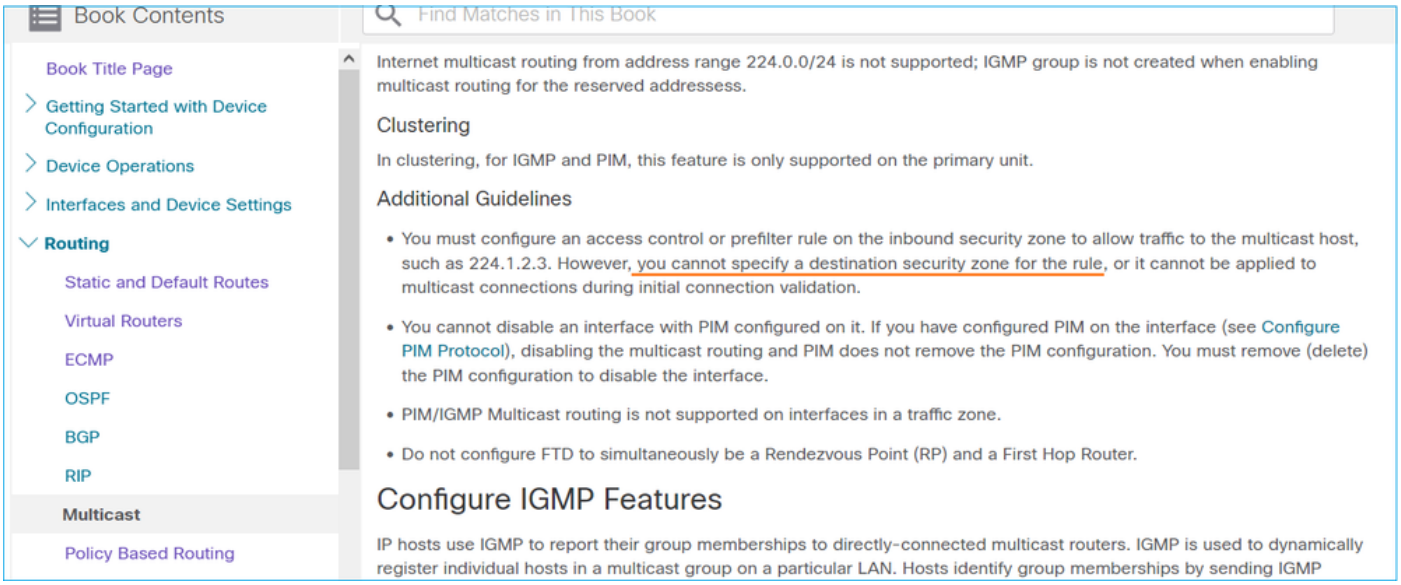
已知的問題

在目的地區域過濾多點傳送流量

無法為與組播流量匹配的訪問控制策略規則指定目標安全區域：



FMC使用手冊中也有相關說明：



超過IGMP介面限制時，防火牆會拒絕IGMP報告

預設情況下，防火牆允許介面上最多有500個當前活動聯接（報告）。如果超出此閾值，防火牆將忽略來自組播接收器的其他傳入IGMP報告。

要檢查IGMP限制和活動聯接，請運行命令show igmp interface nameif:

<#root>

```
asa#

show igmp interface inside

inside is up, line protocol is up
  Internet address is 10.10.10.1/24
  IGMP is enabled on interface
  Current IGMP version is 2
  IGMP query interval is 125 seconds
  IGMP querier timeout is 255 seconds
  IGMP max query response time is 10 seconds
  Last member query response interval is 1 seconds
  Inbound IGMP access group is:

  IGMP limit is 500, currently active joins: 500

  Cumulative IGMP activity: 0 joins, 0 leaves
  IGMP querying router is 10.10.10.1 (this system)
```

IGMP debug指令debug igmp 顯示以下輸出：

<#root>

```
asa#

debug igmp
```

```
Apr 20 2023 09:37:10: %ASA-7-711001: IGMP: Group 230.1.2.3 limit denied on inside
```

修正了思科錯誤ID [CSCvw60976的軟體版本](#)
允許使用者為每個介面配置最多5000個組。

防火牆忽略232.x.x.x/8地址範圍的IGMP報告

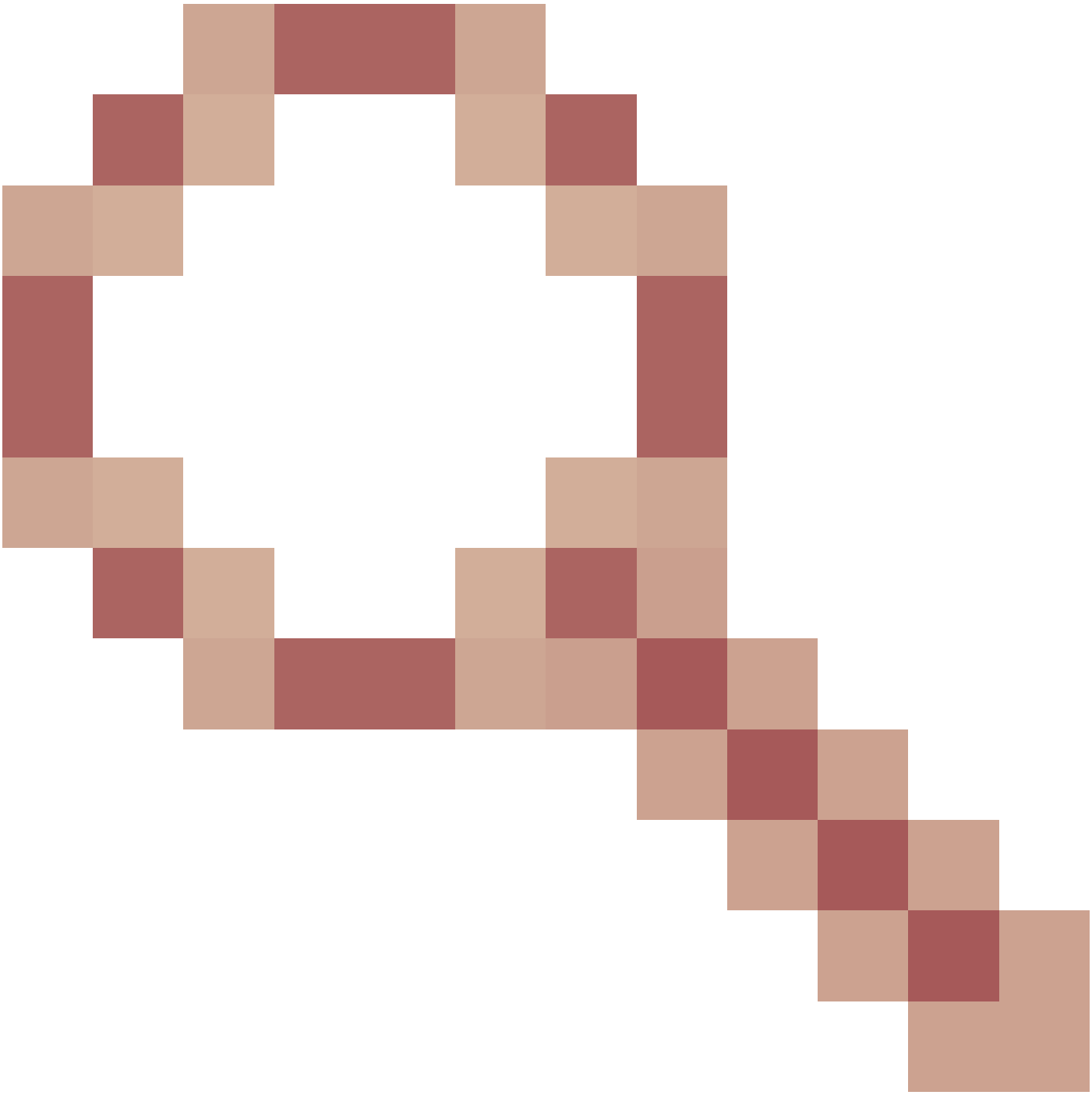
232.x.x.x/8位址範圍用於來源特定多點傳送(SSM)。防火牆不支援PIM源特定組播(SSM)功能和相關配置。

IGMP debug指令debug igmp 顯示以下輸出：

<#root>

```
asa#
debug igmp

Apr 20 2023 09:37:10: %ASA-7-711001: IGMP: Received v2 Report on inside from 10.10.10.11 for 232.179.89
Apr 20 2023 09:37:10: %ASA-7-711001: IGMP: group_db: add new group 232.179.89.253 on inside
Apr 20 2023 09:37:10: %ASA-7-711001: IGMP: Exclude report on inside ignored for SSM group 232.179.89.253
```

思科錯誤[ID CSCsr53916](#)



跟蹤增強功能以支援SSM範圍。

相關資訊

- 適用於Firepower威脅防禦的多點傳送路由
- 排除Firepower威脅防禦和ASA組播PIM故障