了解FTD集群7.0的动态PAT上的端口分配

目录

简介

本文档介绍在版本7.0及更高版本之后，基于端口块的分发如何在防火墙集群的动态PAT中运行。

先决条件

要求

Cisco 建议您了解以下主题：

- 思科安全防火墙上的网络地址转换(NAT)

使用的组件

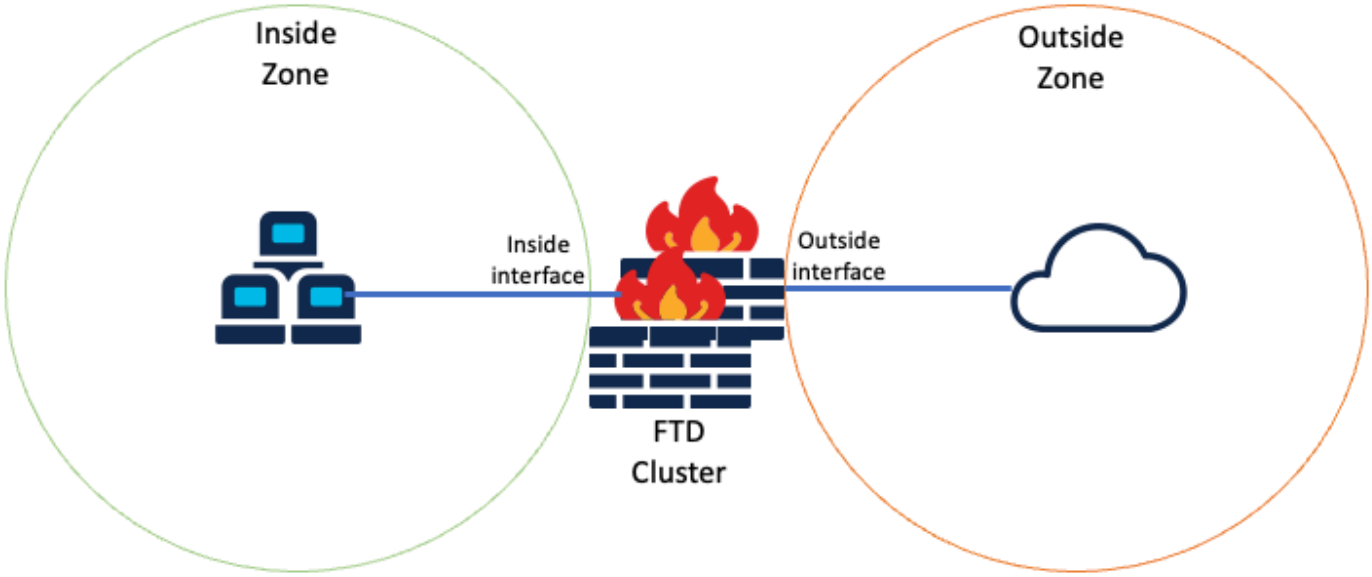
本文档中的信息基于以下软件和硬件版本：

- Firepower管理中心7.3.0
- Firepower威胁防御7.2.0

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。

配置

网络图

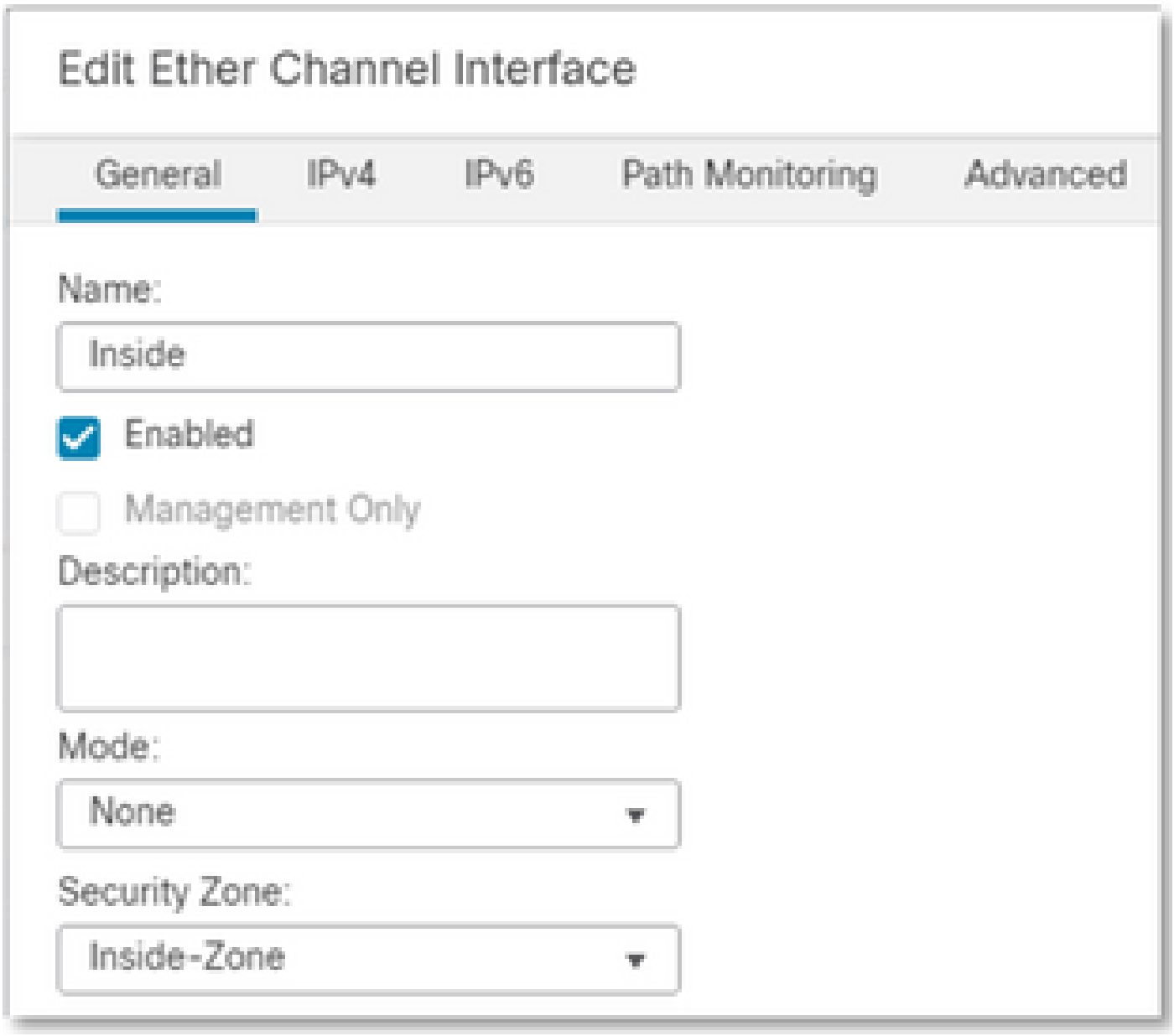


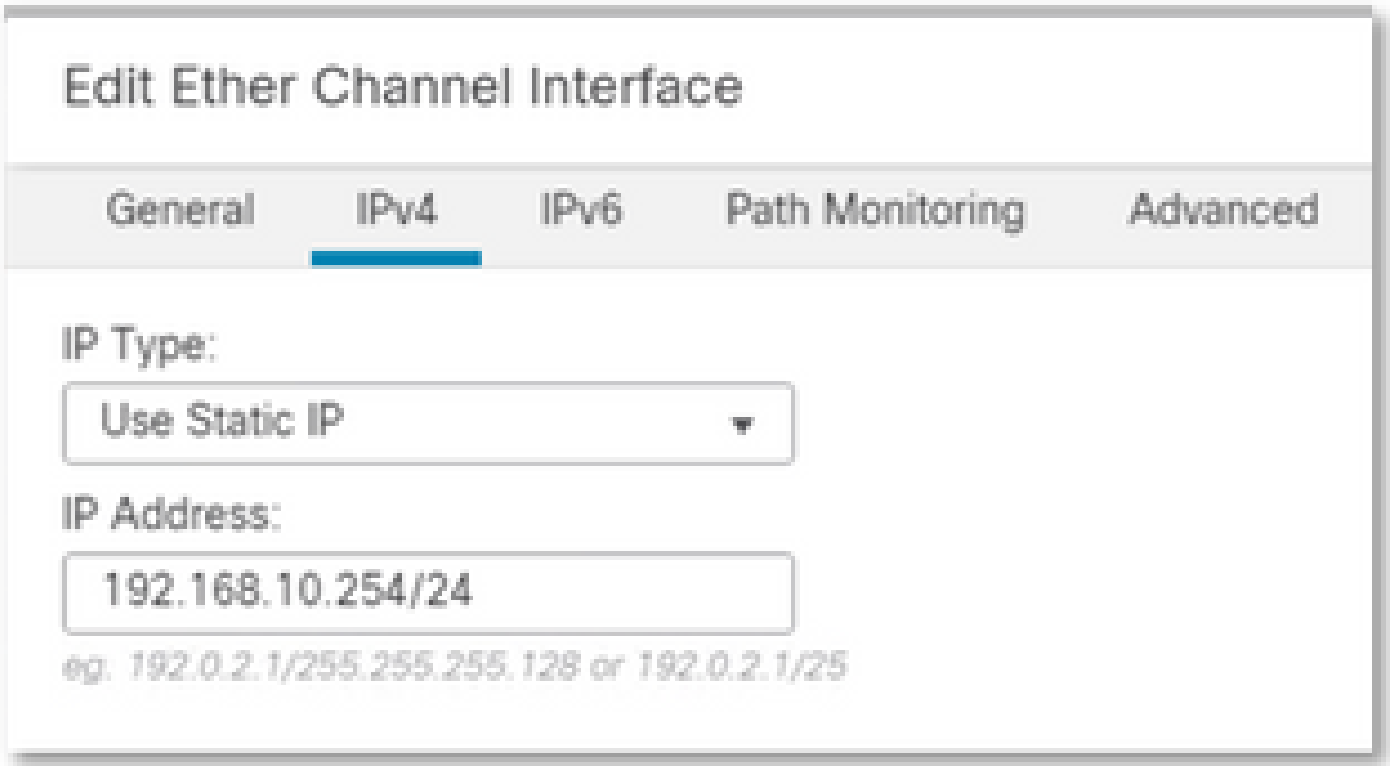
逻辑拓扑

接口配置

- 配置内部区域的内部接口成员。

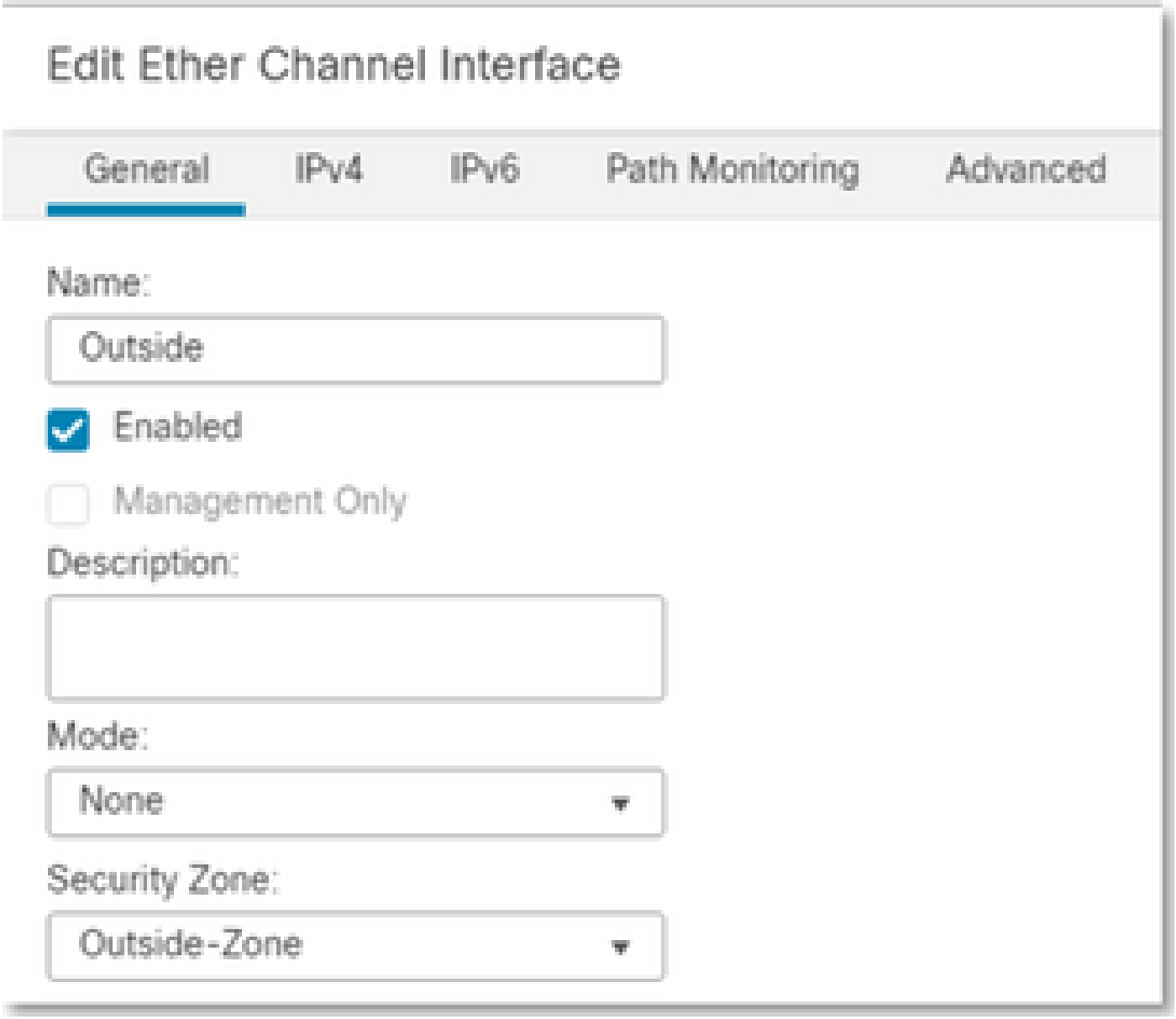
例如，使用IP地址192.168.10.254配置接口并将其命名为Inside。此内部接口是内部网络192.168.10.0/24的网关。

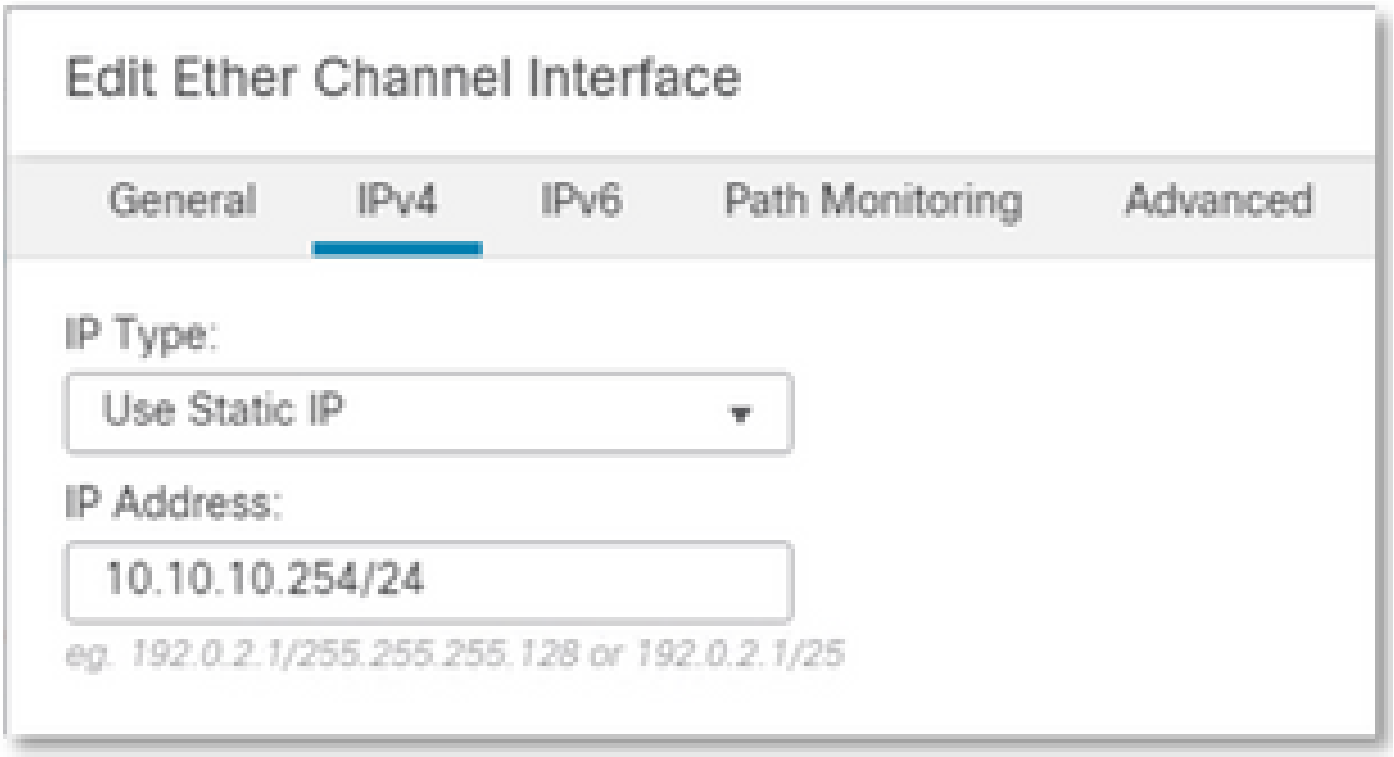

Edit Ether Channel Interface
General
IPv4
IPv6
Path Monitoring
Advanced
Name:
Inside
Enabled
Management Only
Description:
Mode:
None
Security Zone:
Inside-Zone



- 配置外部区域的外部接口成员。

例如，使用IP地址10.10.10.254配置接口并将其命名为Outside。此外部接口面向外部网络。


Edit Ether Channel Interface
General
IPv4
IPv6
Path Monitoring
Advanced
Name:
Outside
Enabled
Management Only
Description:
Mode:
None
Security Zone:
Outside-Zone

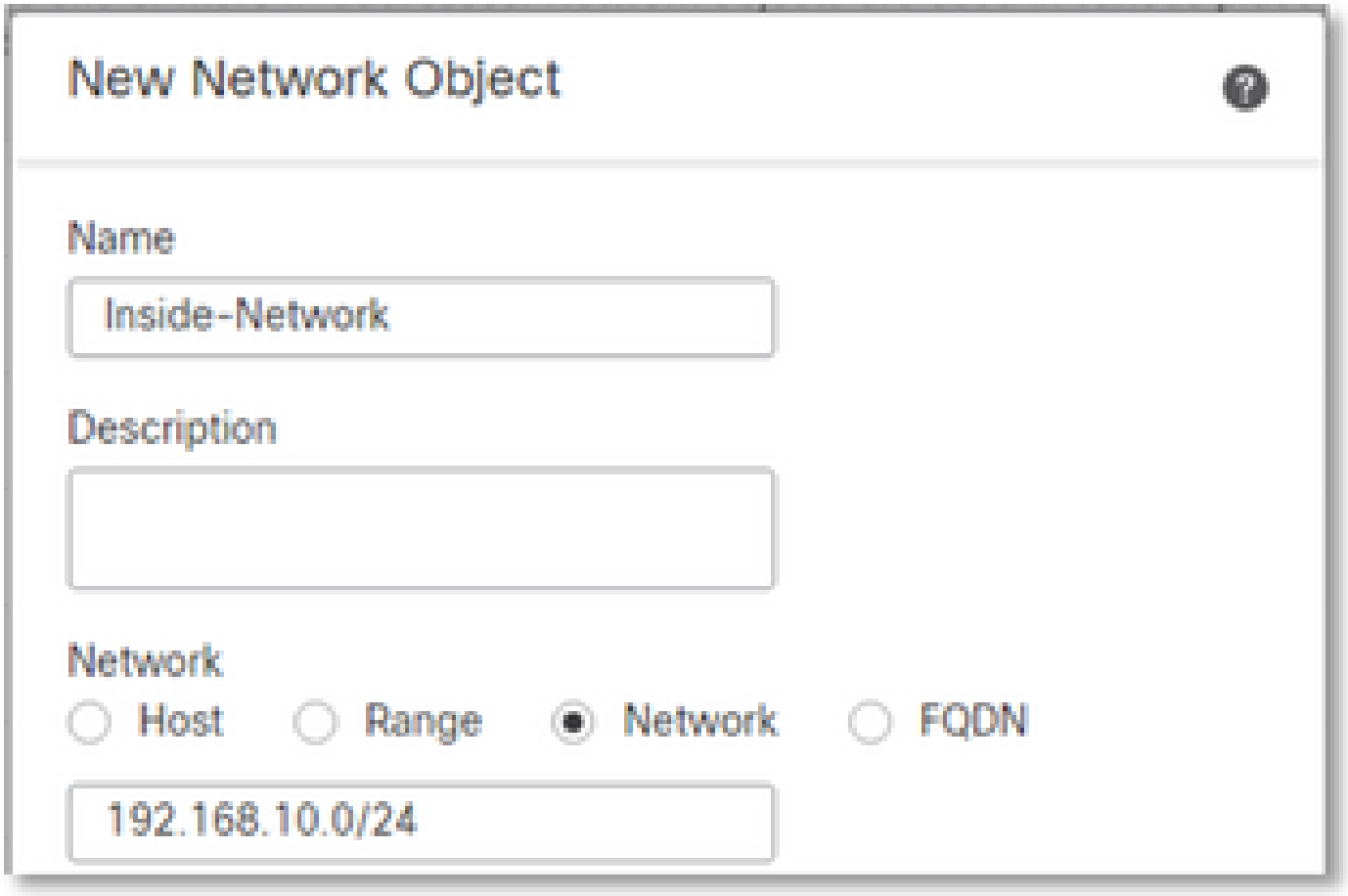


网络对象配置

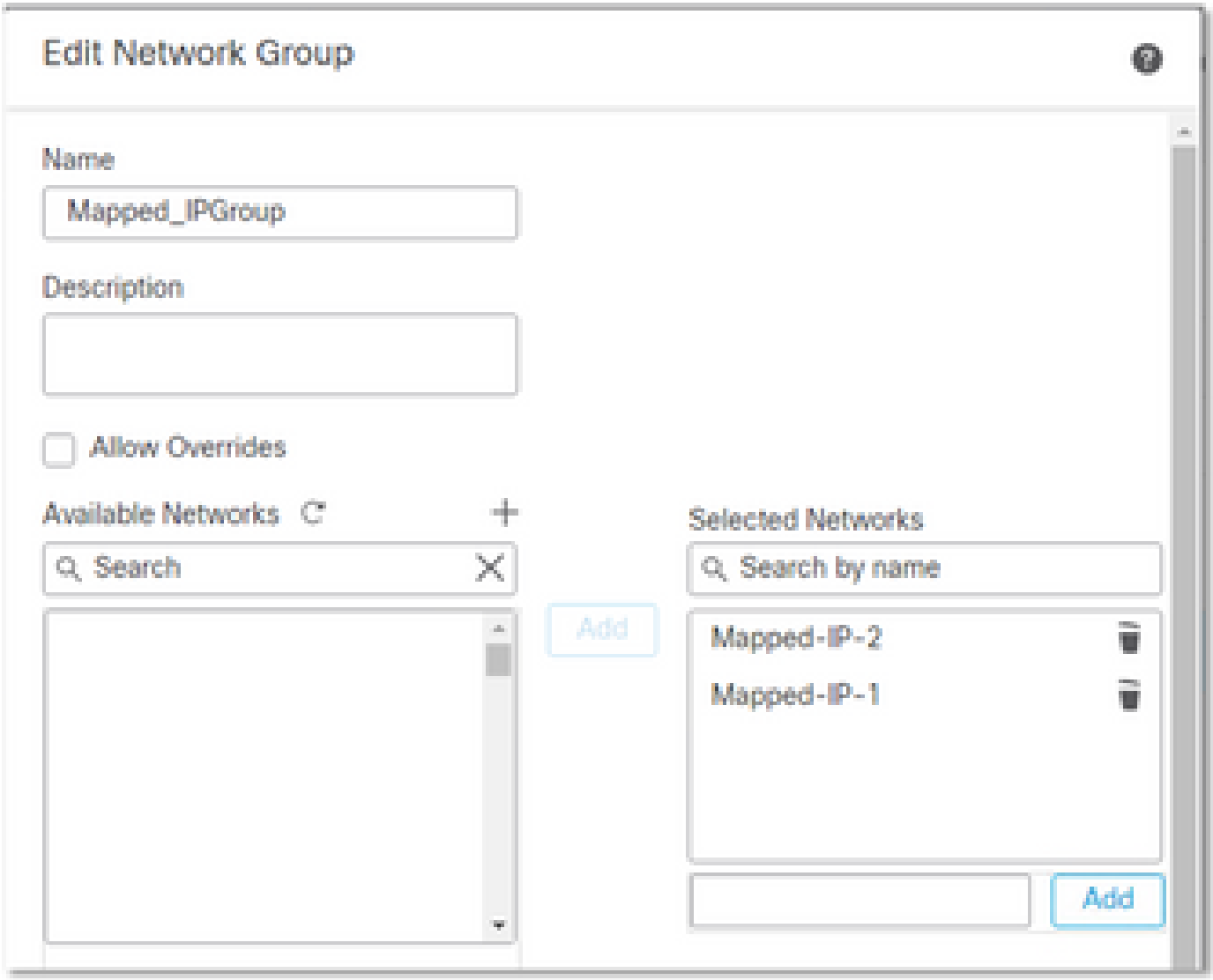
即使集群PAT可以与出口接口或单个IP配合使用以映射所有流量，最佳实践是使用一个IP地址池，该IP地址池的IP地址数量至少与集群中的FTD设备数量相同。

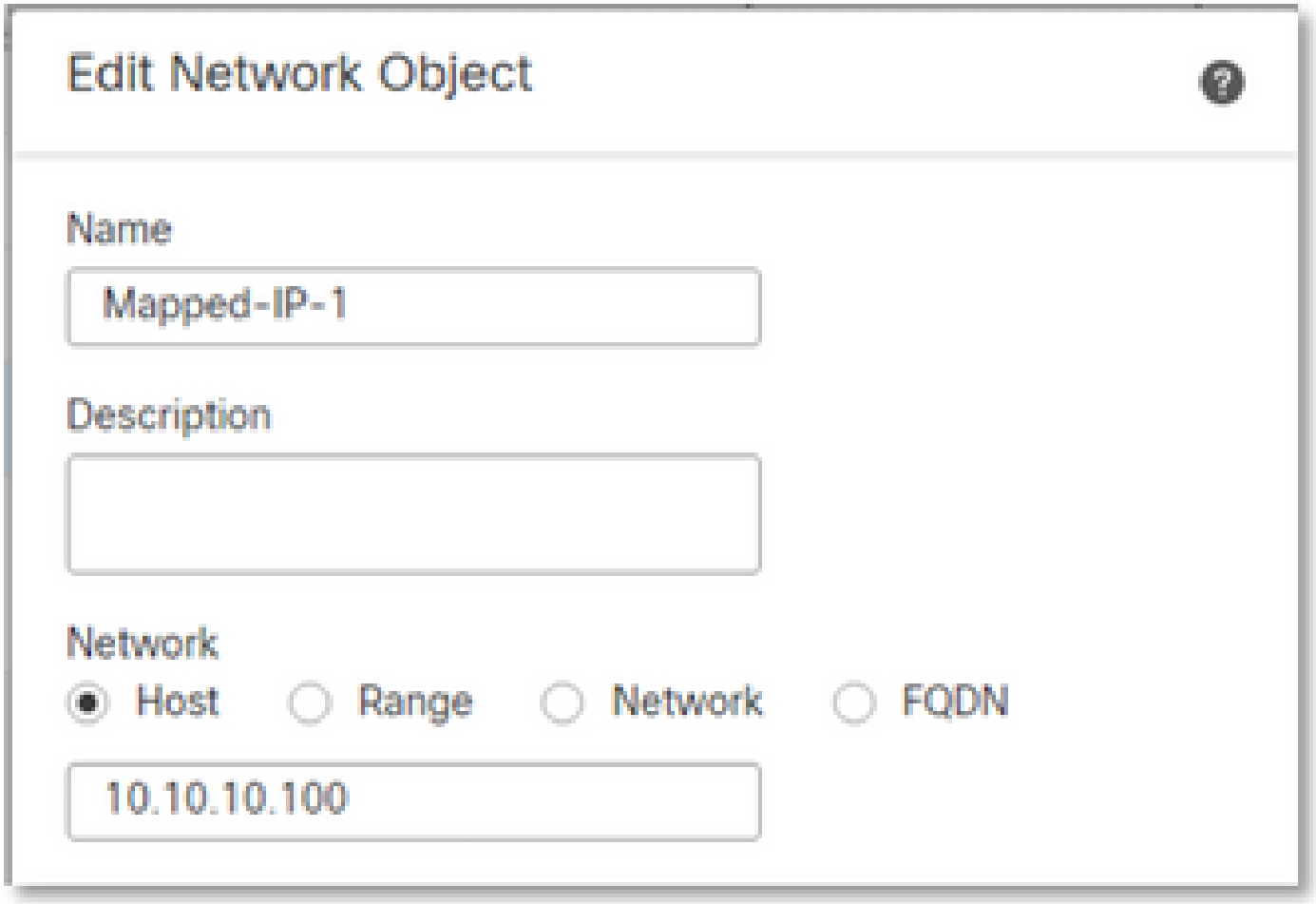
例如，用于实际IP地址和映射IP地址的网络对象分别为Inside-Network和Mapped-IPGroup。

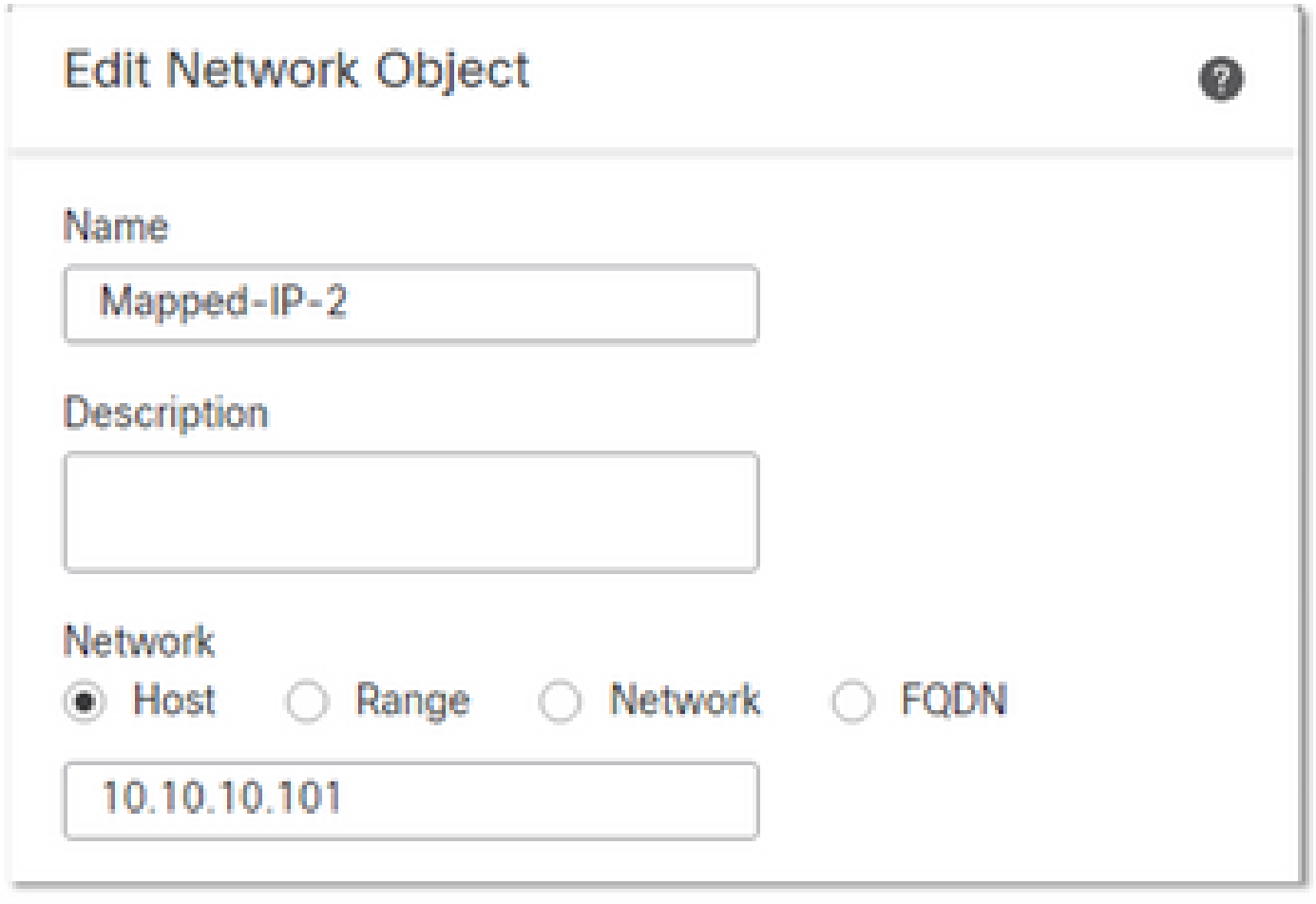
Inside-Network表示内部网络192.168.10.0/24。



Mapped-IPGroup（由Mapped-IP-1 10.10.10.100和Mapped-IP-2 10.10.10.101组成）用于将所有内部流量映射到外部区域。


Edit Network Group
Name
Mapped_IPGroup
Description
Allow Overrides
Available Networks
Search
Add
Selected Networks
Search by name
Mapped-IP-2
Mapped-IP-1
Add

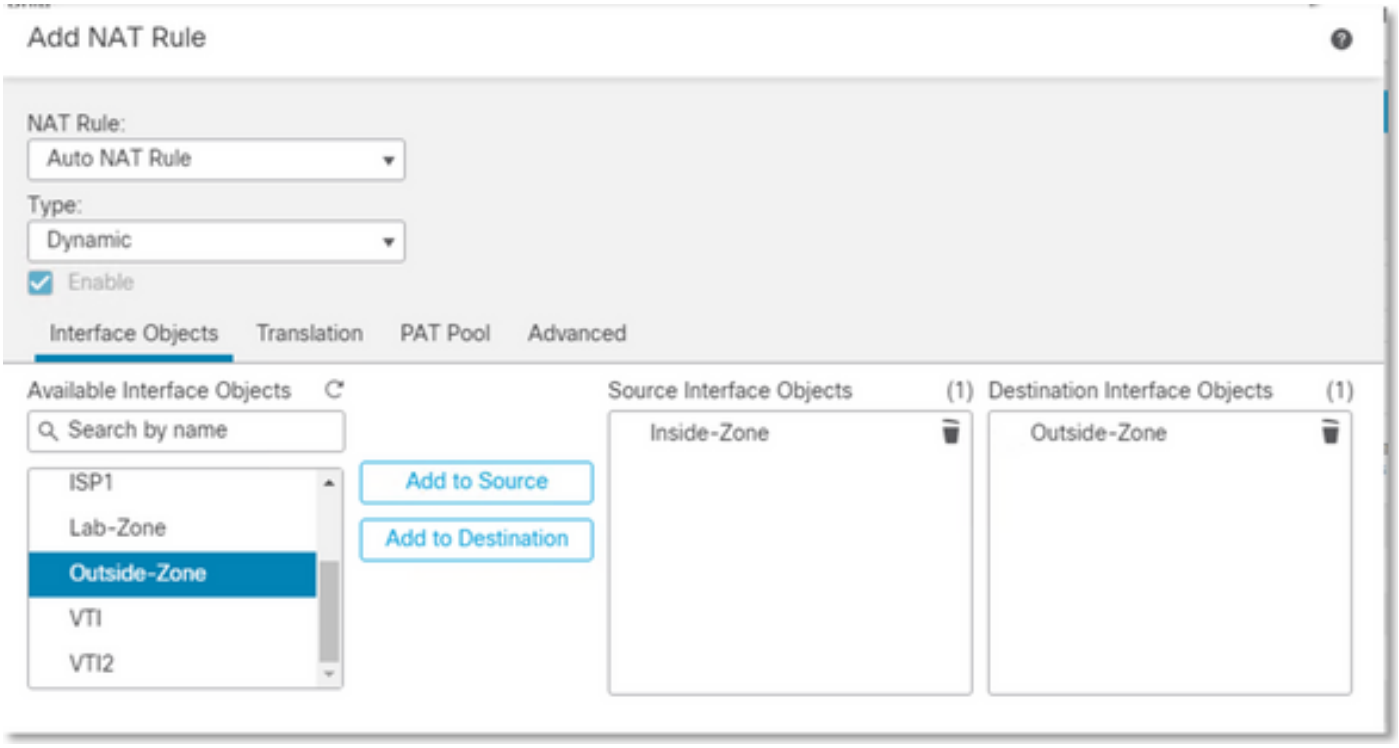

Edit Network Object
Name
Mapped-IP-1
Description
Network
Host
Range
Network
FQDN
10.10.10.100

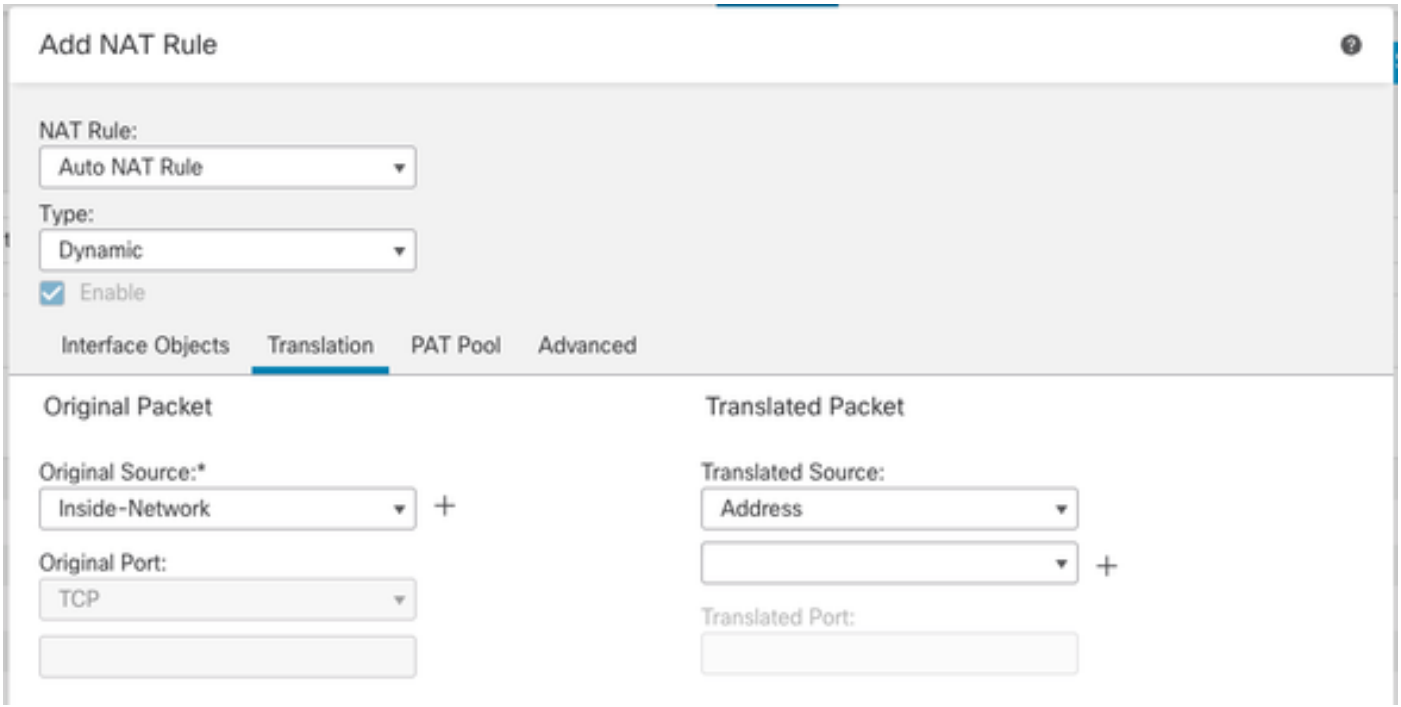

Edit Network Object
Name
Mapped-IP-2
Description
Network
Host
Range
Network
FQDN
10.10.10.101

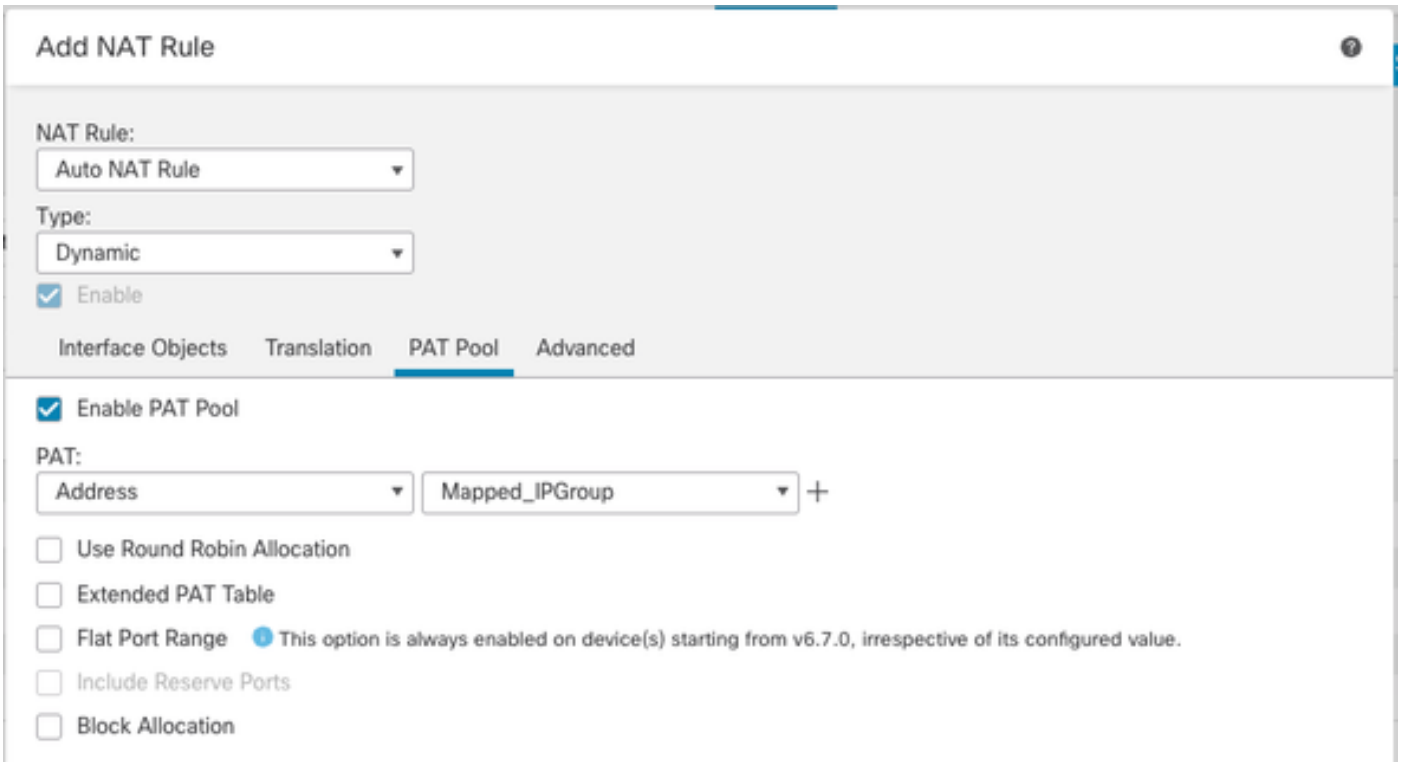
动态PAT配置

- 为出站流量配置动态NAT规则。此NAT规则将内部网络子网映射到外部NAT池。

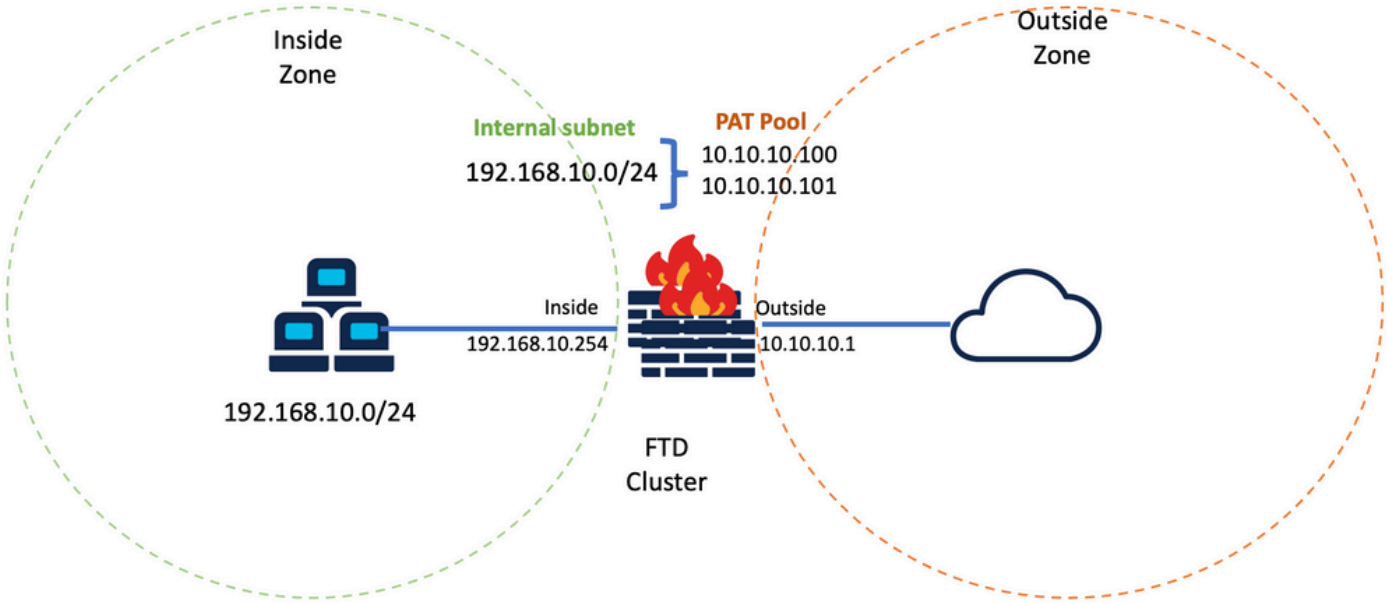
例如，从内部网络到外部区域的内部区域流量被转换为映射的IPGroup池。







最终配置



最终实验设置。

验证

使用本部分可确认配置能否正常运行。

检验IP接口和NAT配置

<#root>

```
> show ip


System IP Addresses:
Interface Name IP address Subnet mask Method
Port-channel1 Inside 192.168.10.254 255.255.255.0 manual
Port-channel2 Outside 10.10.10.254 255.255.255.0 manual
```

<#root>

```
> show running-config nat


!
object network Inside-Network
nat (Inside,Outside) dynamic pat-pool Mapped_IPGroup
```

检验端口块分配

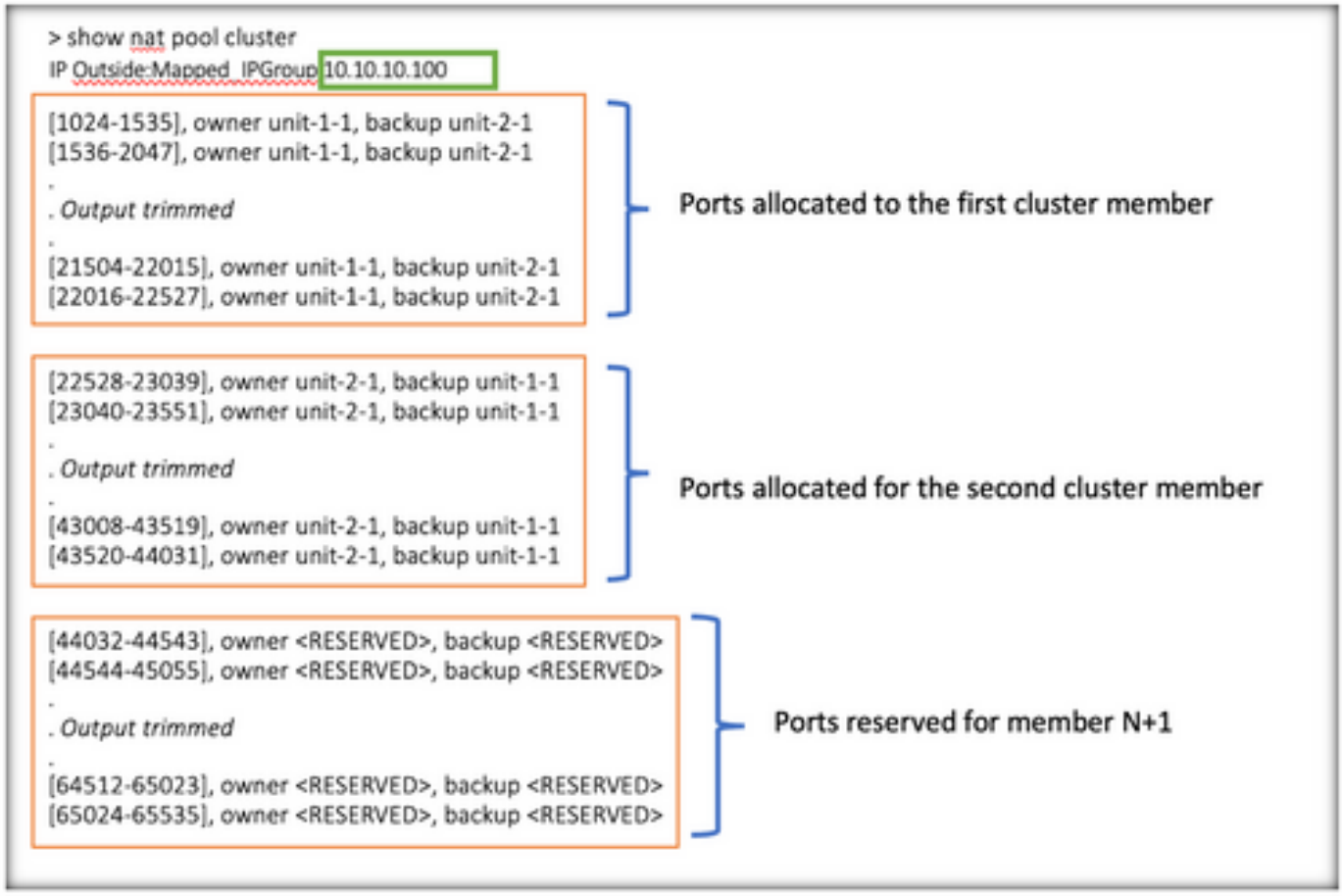
在Firepower 7.0之后，改进的PAT端口块分配可确保控制单元保留端口供加入节点使用，并主动回收未使用的端口。 端口分配的工作原理如下：

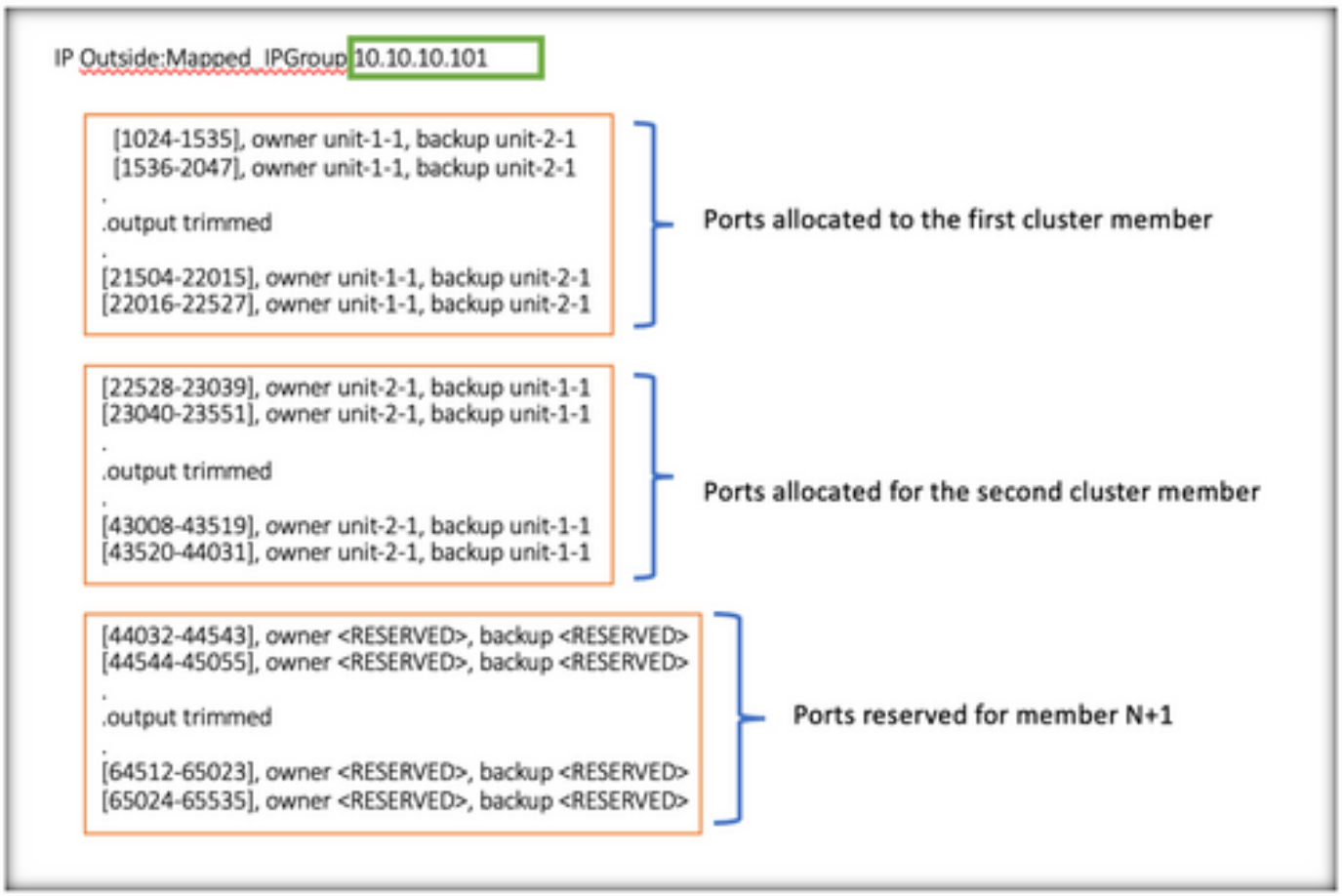
- 在刚刚启动的集群上，控制单元最初拥有50%的端口，其余端口则予以保留。
- 随着更多节点加入集群，每台设备拥有的端口块数量会相应调整。
- 控制单元为(N+1)节点保留端口块，直到集群已满。 集群成员限制由在集群组配置级别下配置的cluster-member-limit 命令定义。
- 默认情况下，cluster-member-limit为16。
  <#root>

  ```
  > show cluster info

  Cluster FTD-Cluster: On
  Interface mode: spanned

  Cluster Member Limit : 16


  [...]
  ```

- 当集群成员数量达到配置的值时，所cluster-member-limit有端口块将分布到集群成员之间。

例如，在由两台设备(N=2)组成的集群组中，集群成员限制的默认值为16，可以观察到为N+1个成员定义了端口分配，在本例中为3。这会保留一些端口供下一设备使用，直到达到最大集群限制。

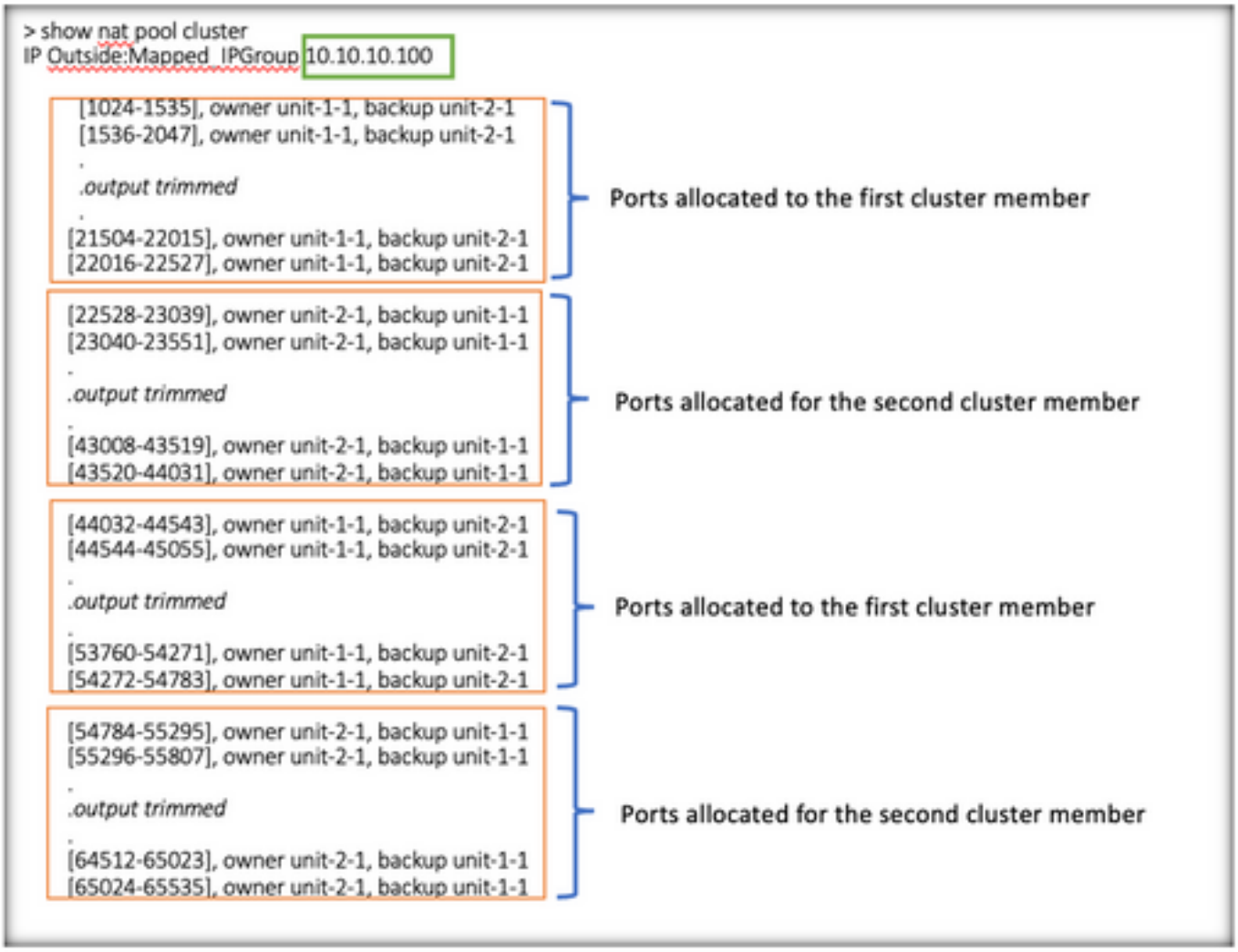

> show nat pool cluster
IP Outside:Mapped IPGroup 10.10.10.100
[1024-1535], owner unit-1-1, backup unit-2-1
[1536-2047], owner unit-1-1, backup unit-2-1
. Output trimmed
[21504-22015], owner unit-1-1, backup unit-2-1
[22016-22527], owner unit-1-1, backup unit-2-1
Ports allocated to the first cluster member
[22528-23039], owner unit-2-1, backup unit-1-1
[23040-23551], owner unit-2-1, backup unit-1-1
. Output trimmed
[43008-43519], owner unit-2-1, backup unit-1-1
[43520-44031], owner unit-2-1, backup unit-1-1
Ports allocated for the second cluster member
[44032-44543], owner <RESERVED>, backup <RESERVED>
[44544-45055], owner <RESERVED>, backup <RESERVED>
. Output trimmed
[64512-65023], owner <RESERVED>, backup <RESERVED>
[65024-65535], owner <RESERVED>, backup <RESERVED>
Ports reserved for member N+1

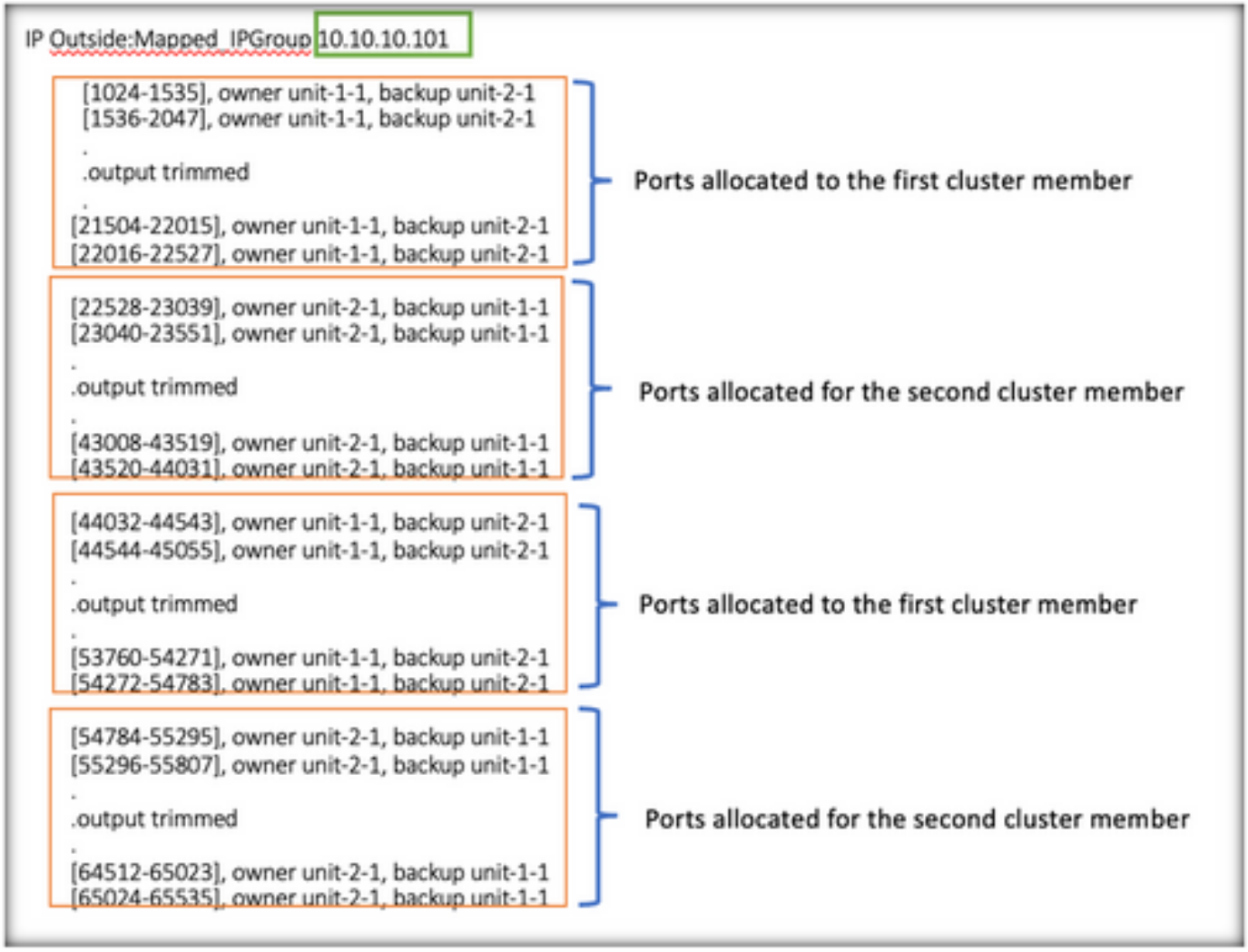

IP Outside:Mapped IPGroup 10.10.10.101
[1024-1535], owner unit-1-1, backup unit-2-1
[1536-2047], owner unit-1-1, backup unit-2-1
.output trimmed
[21504-22015], owner unit-1-1, backup unit-2-1
[22016-22527], owner unit-1-1, backup unit-2-1
Ports allocated to the first cluster member
[22528-23039], owner unit-2-1, backup unit-1-1
[23040-23551], owner unit-2-1, backup unit-1-1
.output trimmed
[43008-43519], owner unit-2-1, backup unit-1-1
[43520-44031], owner unit-2-1, backup unit-1-1
Ports allocated for the second cluster member
[44032-44543], owner <RESERVED>, backup <RESERVED>
[44544-45055], owner <RESERVED>, backup <RESERVED>
.output trimmed
[64512-65023], owner <RESERVED>, backup <RESERVED>
[65024-65535], owner <RESERVED>, backup <RESERVED>
Ports reserved for member N+1

```
> show nat pool cluster summary
port-blocks count display order: total, unit-1-1, unit-2-1
Codes: ^ - reserve, # - reclaimable
IP Outside:Mapped-IP-1 10.10.10.100 (126 - 42 / 42) ^ 42 # 0
IP Outside:Mapped-IP-1 10.10.10.101 (126 - 42 / 42) ^ 42 # 0
```

此外，最佳做法是将配置为与**cluster-member-limit** 为集群部署计划的设备数量匹配。

例如，在由两台设备(N=2)组成的集群组中，集群成员限制值为2，可以观察到端口分配均匀分布在所有集群设备上。保留的所有端口均未保留。






```
> show nat pool cluster summary
port-blocks count display order: total, unit-1-1, unit-2-1
Codes: ^ - reserve, # - reclaimable
IP Outside:Mapped-IP-1 10.10.10.100 (126 - 63 / 63) ^ 0 # 0
IP Outside:Mapped-IP-1 10.10.10.100 (126 - 63 / 63) ^ 0 # 0
```

检验端口块回收

- 每当新节点加入或离开集群时，必须将未使用的端口和来自所有单元的超额端口块释放给控制单元。
- 如果端口块已在使用中，则使用最少的端口块将标记为回收。
- 已回收的端口块上不允许新连接。当最后一个端口被清除时，它们被释放到控制单元。

```
> show nat pool cluster summary
port-blocks count display order: total, unit-1-1, unit-2-1
Codes: ^ - reserve, # - reclaimable
IP Outside:Mapped-IPGroup 10.10.10.100 (126 - 80 / 46) ^ 0 # 17
IP Outside:Mapped-IPGroup 10.10.10.101 (126 - 63 / 63) ^ 0 # 0
```

故障排除命令

本部分提供的信息可用于对配置进行故障排除。

- 检查配置的cluster-member-limit值：

<#root>

> show cluster info

Cluster FTD-Cluster: On
Interface mode: spanned

Cluster Member Limit : 2

[...]

> show running-config cluster

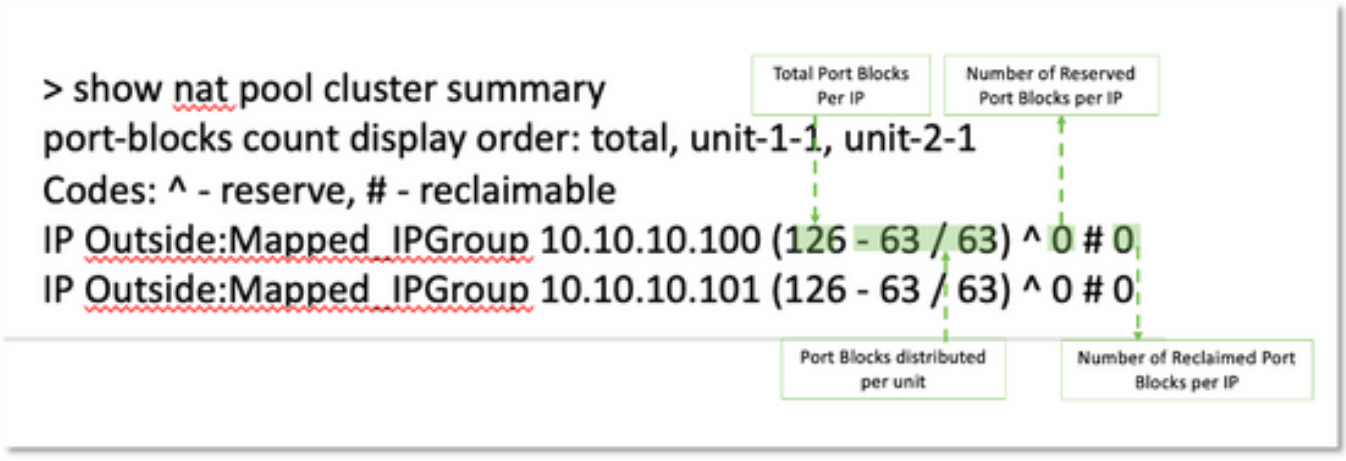
cluster group FTD-Cluster
key *****
local-unit unit-2-1
cluster-interface Port-channel48 ip 172.16.2.1 255.255.0.0

cluster-member-limit 2
[...]

- 显示集群中设备之间的端口块分布摘要：

<#root>

> show nat pool cluster summary



- 显示每个PAT地址的端口块当前分配给所有者和备用单元：

<#root>

```
> show nat pool cluster
```

```
IP Outside:Mapped_IPGroup 10.10.10.100
[1024-1535], owner unit-1-1, backup unit-2-1
[1536-2047], owner unit-1-1, backup unit-2-1
[2048-2559], owner unit-1-1, backup unit-2-1
[2560-3071], owner unit-1-1, backup unit-2-1
[...]
IP Outside:Mapped_IPGroup 10.10.10.101
[1024-1535], owner unit-1-1, backup unit-2-1
[1536-2047], owner unit-1-1, backup unit-2-1
[2048-2559], owner unit-1-1, backup unit-2-1
[2560-3071], owner unit-1-1, backup unit-2-1
[...]
```

- 显示与端口块的分发和使用相关的信息：

<#root>

```
> show
```

```
nat
```

```
 pool detail
```

```
TCP PAT pool Outside, address 10.10.10.100
        range 17408-17919, allocated 2 *
        range 27648-28159, allocated 2
TCP PAT pool Outside, address 10.10.10.101
        range 17408-17919, allocated 1 *
        range 27648-28159, allocated 2
[...]
```

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