在FP9300（机箱内）上配置FTD集群

目录

简介

本文档介绍如何在FPR9300设备上配置和验证集群功能。

> **警告**：本文档中提供的信息包括集群的初始安装/配置。本文档不适用于设备更换（退货授权— RMA）流程

先决条件

要求

本文档没有任何特定的要求。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- 运行1.1(4.95)的思科Firepower 9300安全设备
- 运行6.0.1的Firepower威胁防御(FTD)（内部版本1213）
- 运行6.0.1.1的FireSIGHT管理中心(FMC)（内部版本1023）

实验完成时间：1 小时.

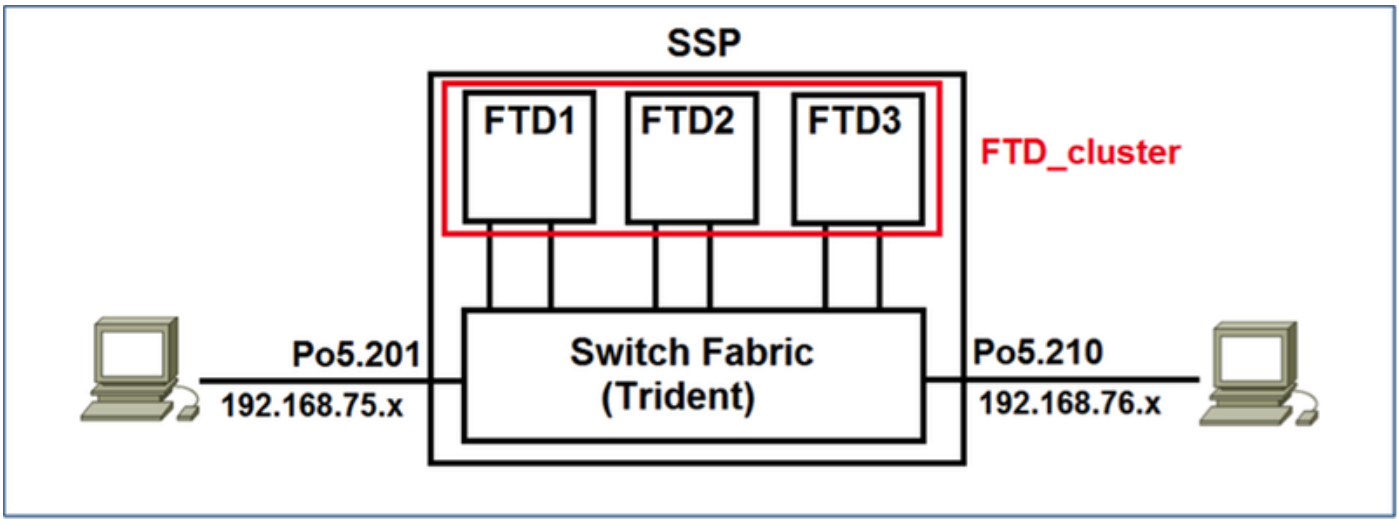
本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您的网络处于活动状态，请确保您了解所有命令的潜在影响。

背景信息

- 在带FTD设备的FPR9300上，您可以在所有受支持版本上配置机箱内集群。
- 机箱间集群在6.2中引入。
- 端口通道48创建为集群控制链路。对于机箱内集群，此链路使用Firepower 9300背板进行集群通信。
- 不支持单个数据接口，管理接口除外。
- 管理接口分配给集群中的所有设备。

配置

网络图



任务1.为FTD集群创建必要接口

任务要求：

创建集群、管理接口和端口通道数据接口。

解决方案：

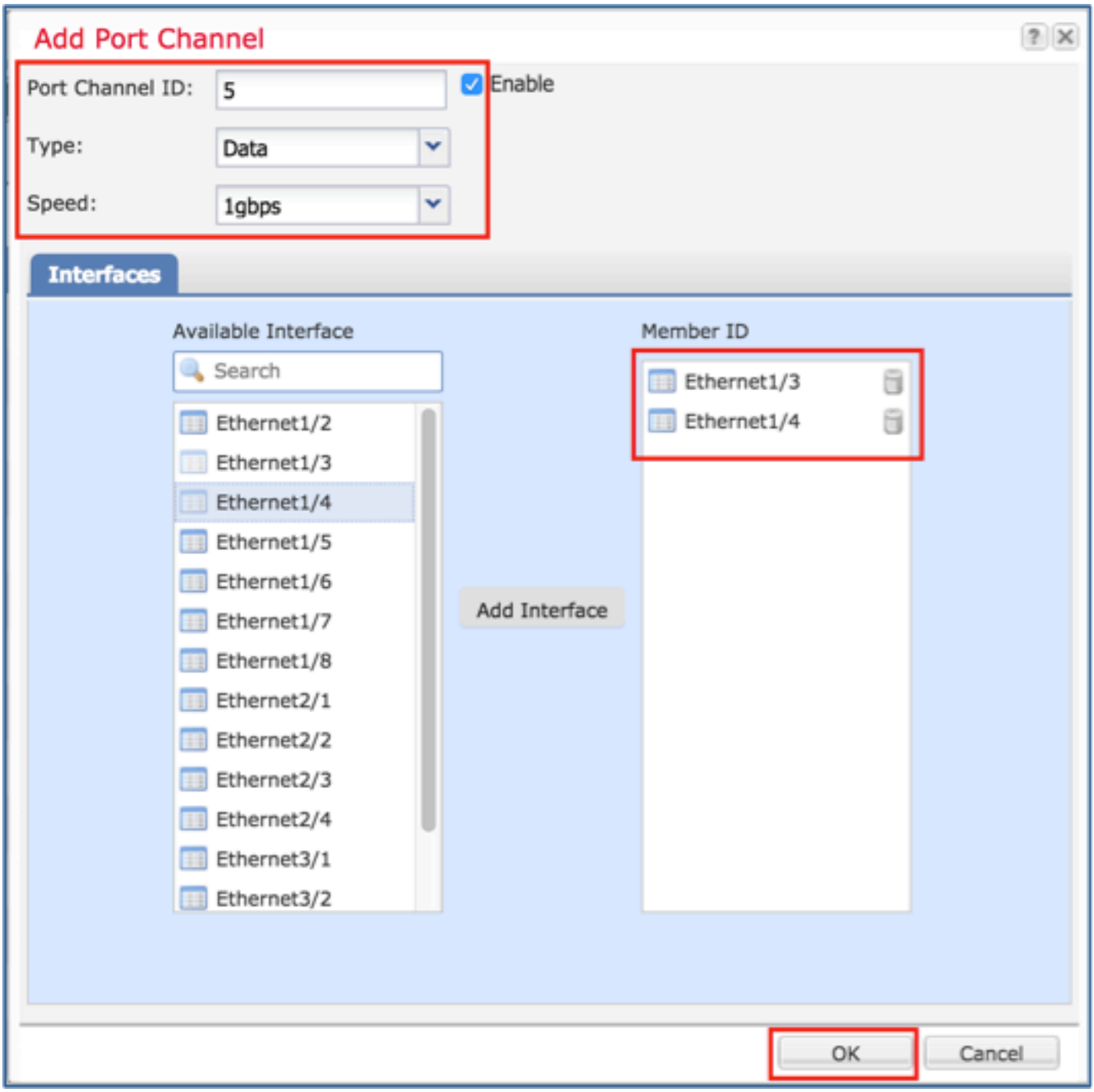
步骤1.创建端口通道数据接口。

要创建新接口，您必须登录FPR9300机箱管理器并导航至接口**选**项卡。

选择**Add Port Channel**并使用以下参数创建新的端口通道接口：

端口通道ID	5
类型	数据
enable	Yes
成员ID	Ethernet1/3、Ethernet 1/4

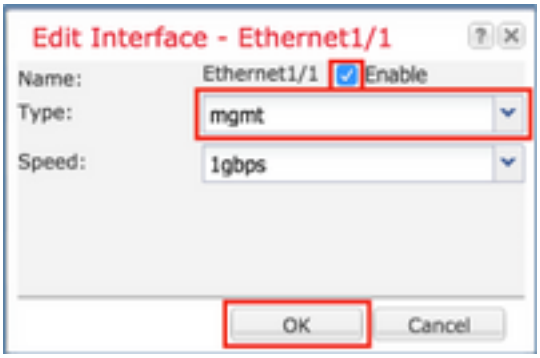
选择OK以保存配置，如图所示。



步骤2.创建管理接口。

在Interfaces选项卡上，选择该接口，单击Edit并配置Management Type接口。

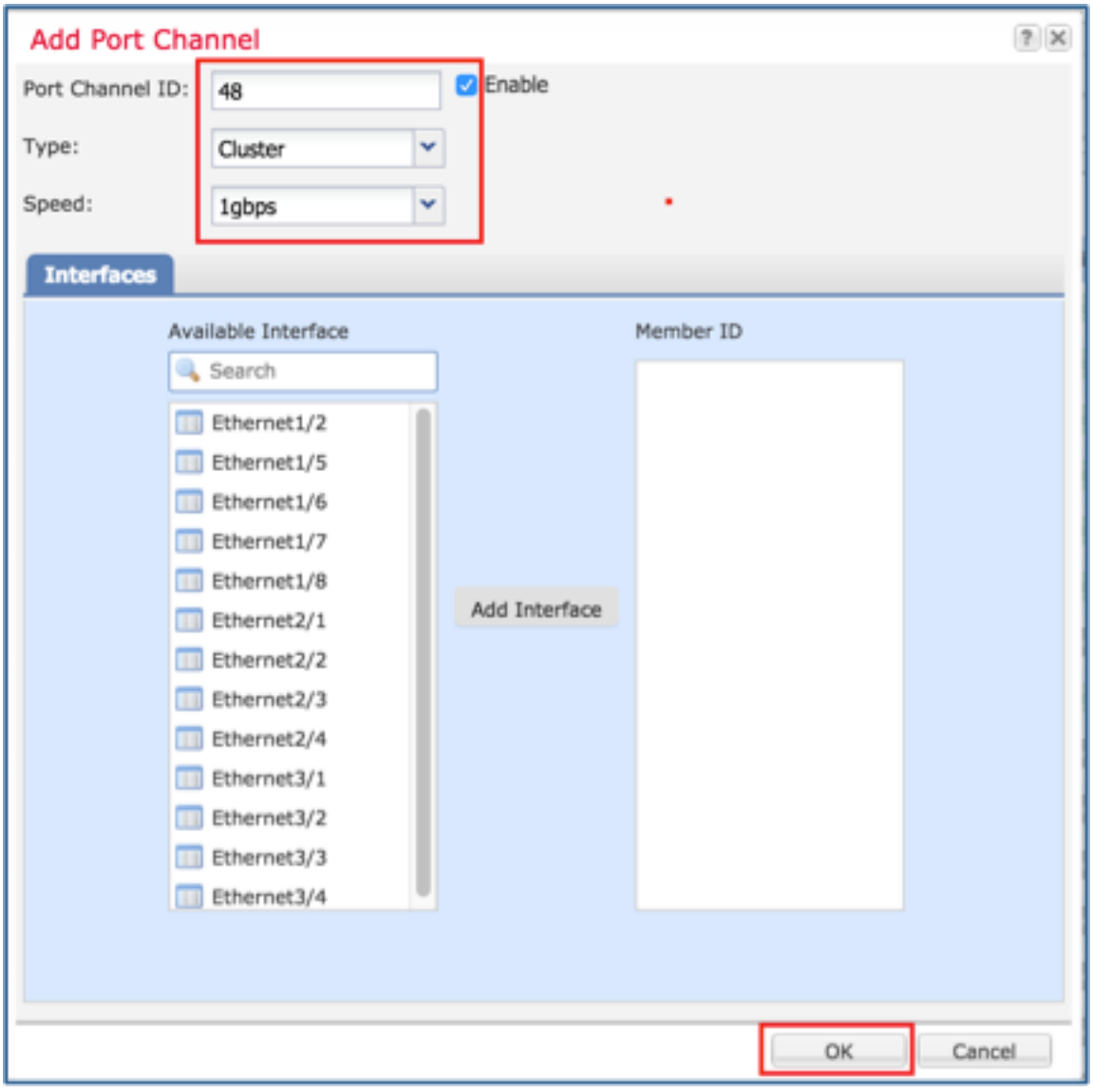
单击OK保存配置，如图所示。



步骤3.创建集群控制链路接口。

单击“添**加端口通道**”按钮，然后使用这些参数创建一个新的端口通道接口，如图所示。

端口通道ID	48
类型	集群
enable	Yes
成员ID	-



任务2.创建FTD集群

任务要求：

创建FTD集群设备。

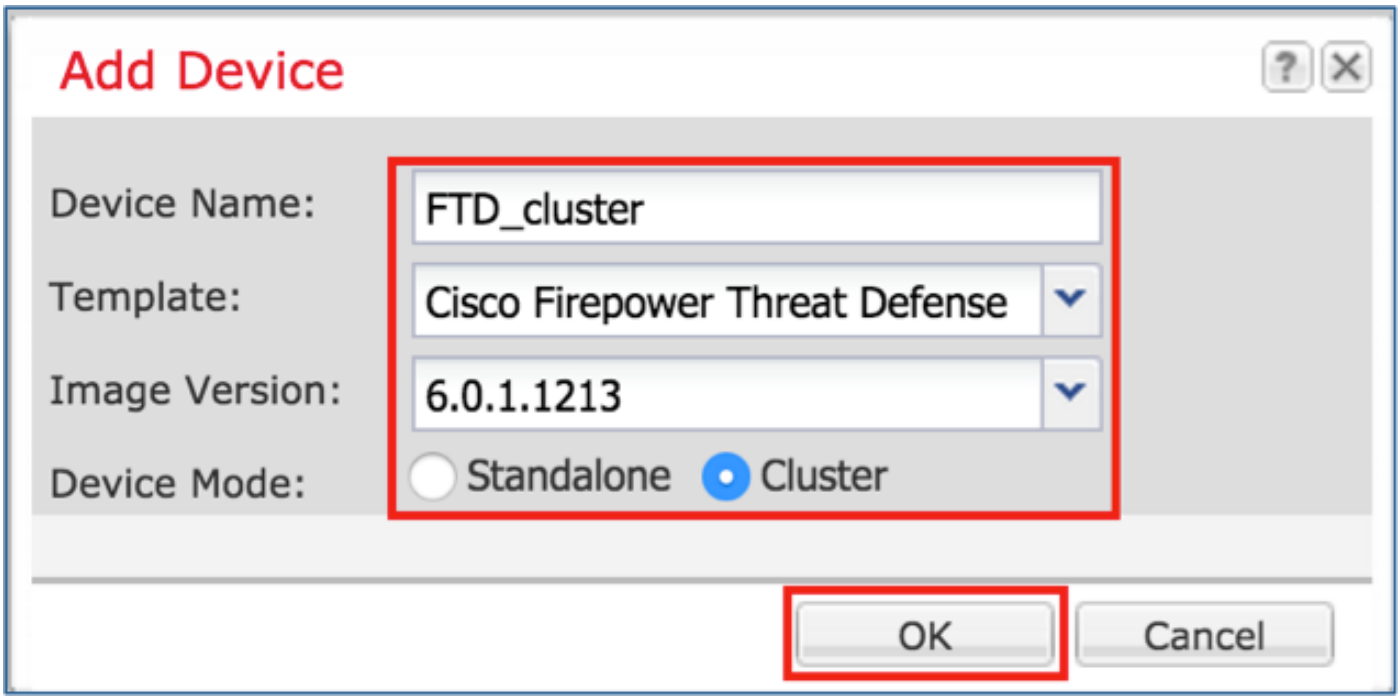
解决方案：

步骤1.导航至Logical Devices，然后单击Add **Device按钮**。

创建FTD集群，如下所示：

设备名	FTD_cluster
模板	思科Firepower威胁防御
映像版本	6.0.1.1213
设备模式	集群

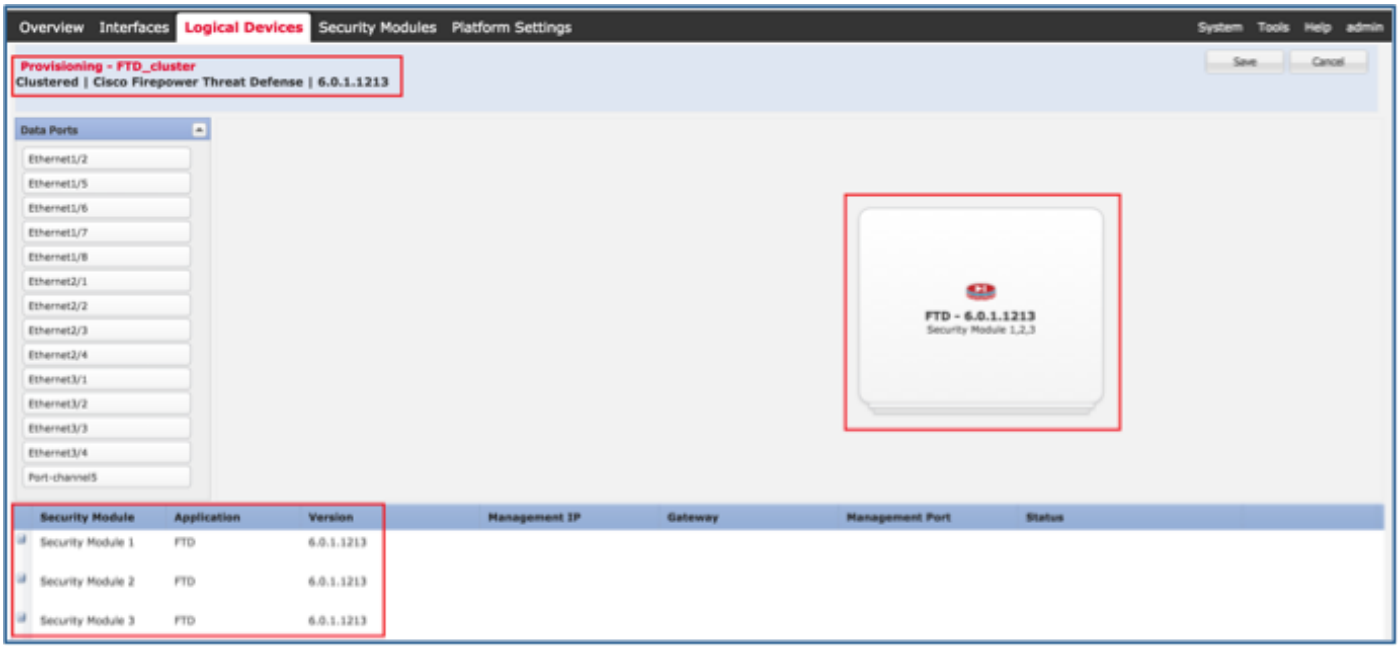
要添加设备，请单击**OK**，如图所示。



步骤2.配置和部署FTD集群。

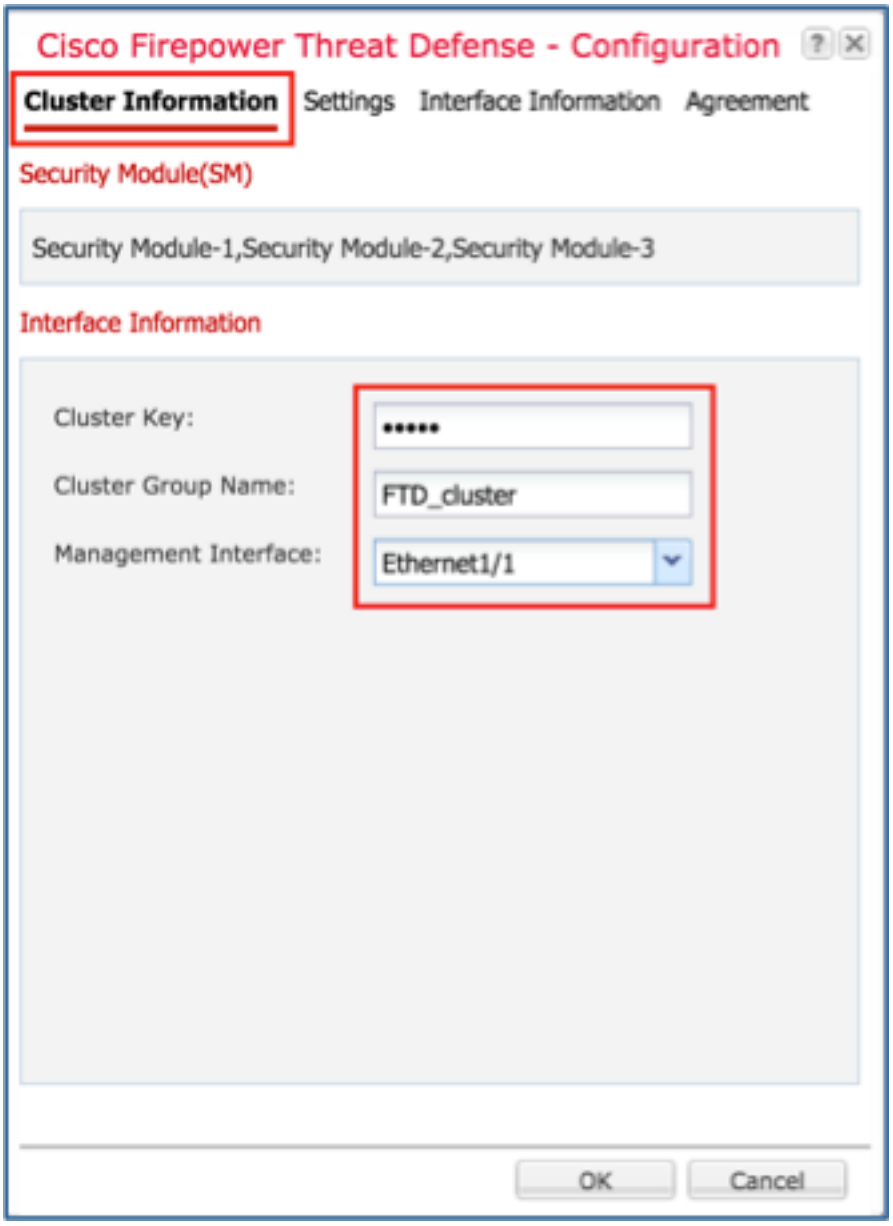
创建FTD设备后，系统会将您重定向到Provisioning- device_name窗口。

点击设备图标以启动配置，如图所示。



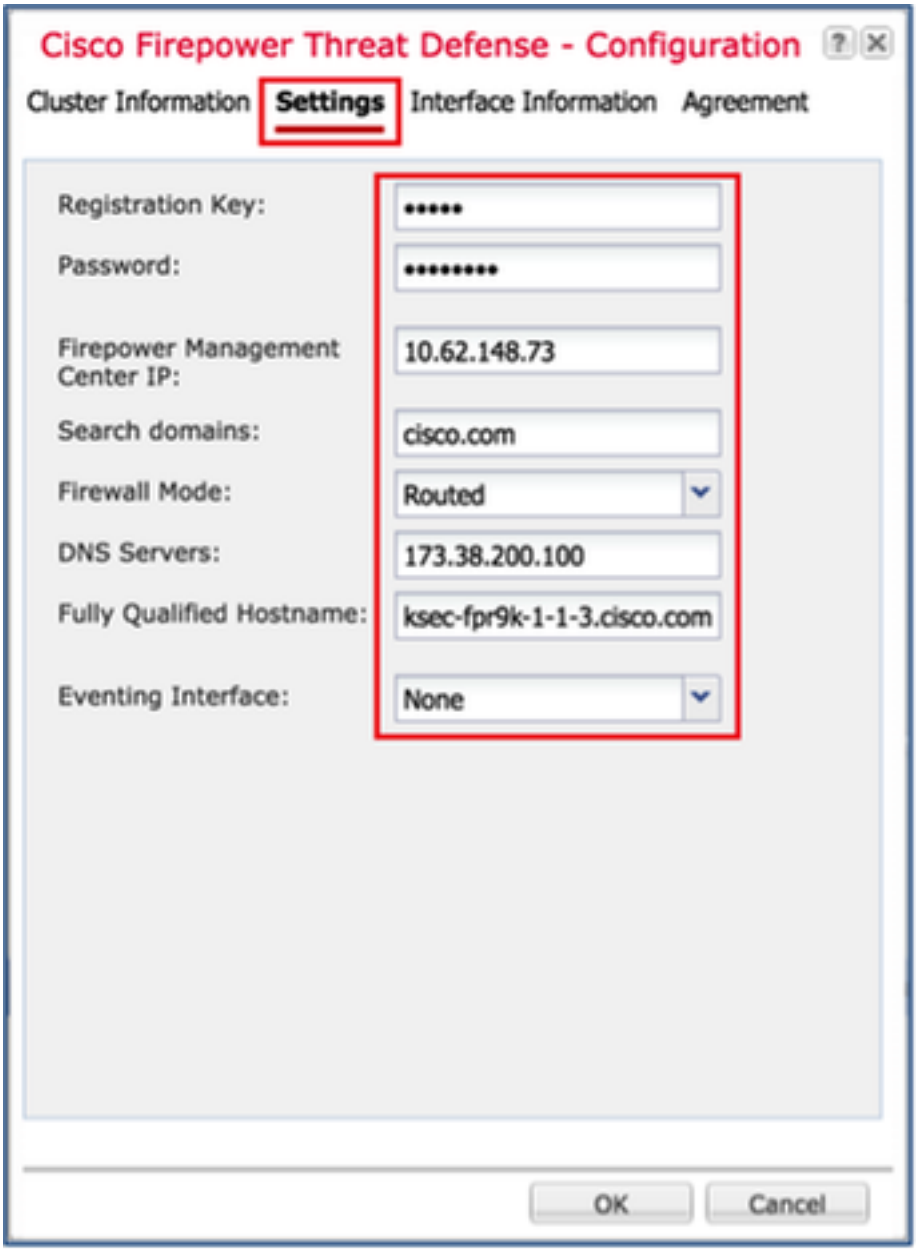
使用这些设**置配置**FTD集群信息选项卡，如图所示。

群集密钥	思科
群集组名称	FTD_cluster
管理接口	以太网接口1/1



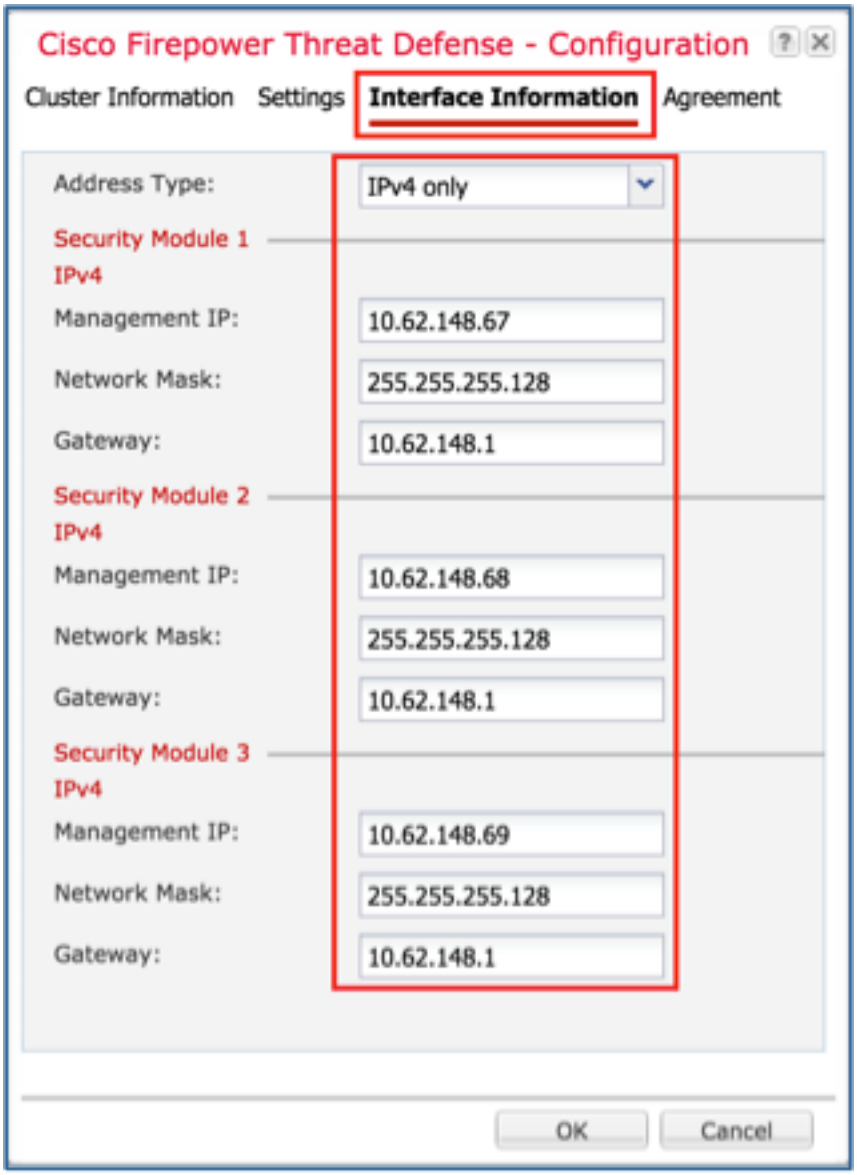
使用这些设置**配置**FTD设置选项卡，如图所示。

注册密钥	思科
密码	管理123
Firepower管理中心IP	10.62.148.73
搜索域	cisco.com
防火墙模式	路由
DNS Servers	173.38.200.100
完全限定主机名	ksec-fpr9k-1-1-3.cisco.com
事件接口	无

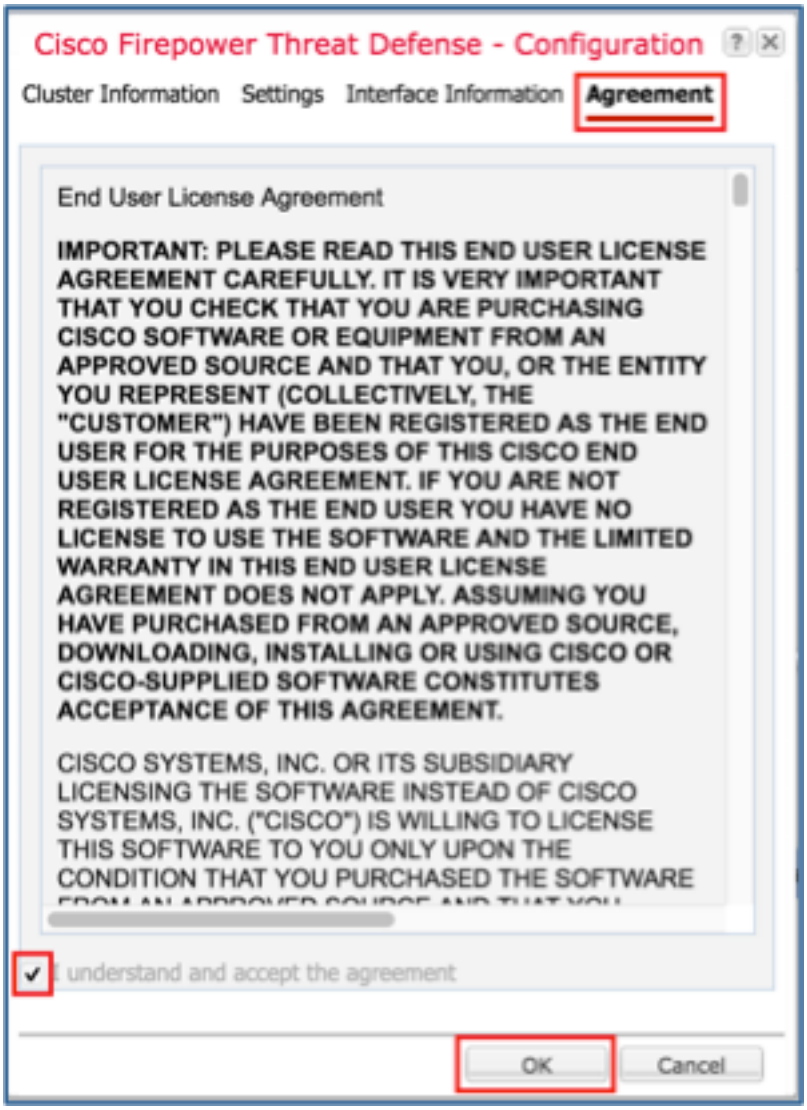


使用这些设**置配置**FTD接口信息选项卡，如图所示。

地址类型	仅IPv4
安全模块1	
管理IP	10.62.148.67
网络掩码	255.255.255.128
网关	10.62.148.1
安全模块2	
管理IP	10.62.148.68
网络掩码	255.255.255.128
网关	10.62.148.1
安全模块3	
管理IP	10.62.148.69
网络掩码	255.255.255.128
网关	10.62.148.1

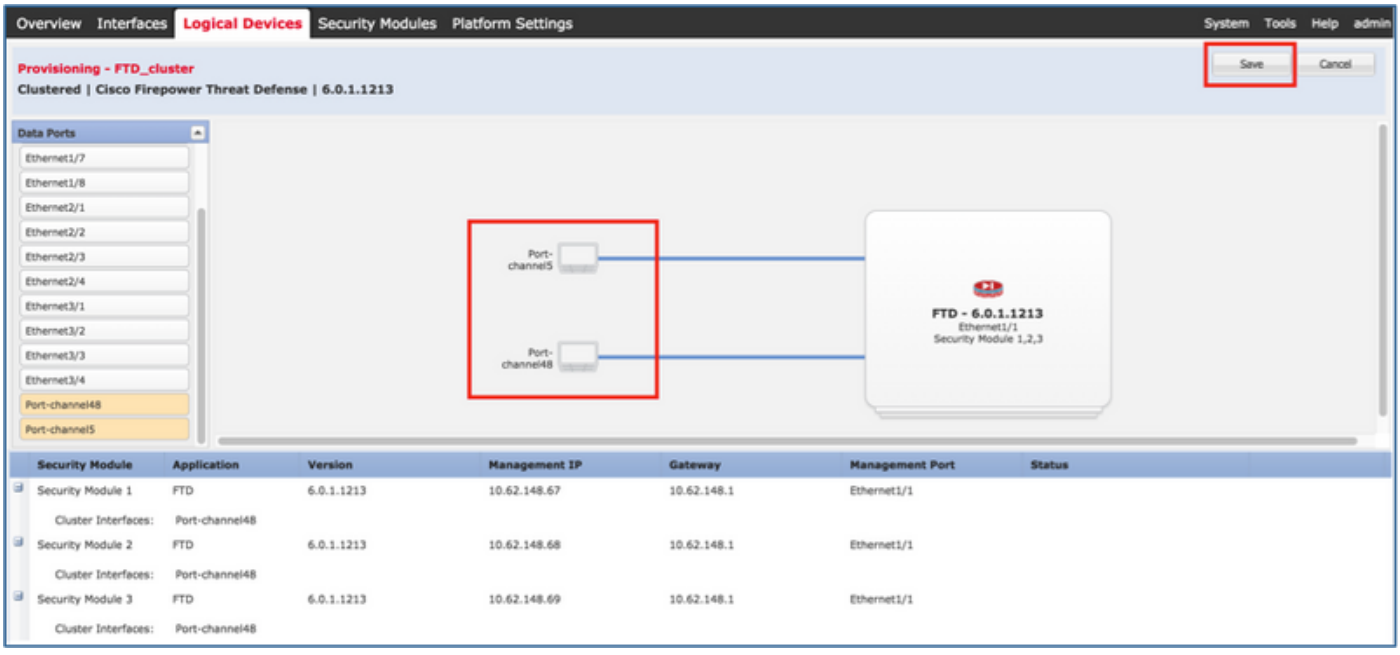


接受“协议”选**项卡**上的协议，**然后**单击“确定”，如图所示。



步骤3.为FTD分配数据接口。

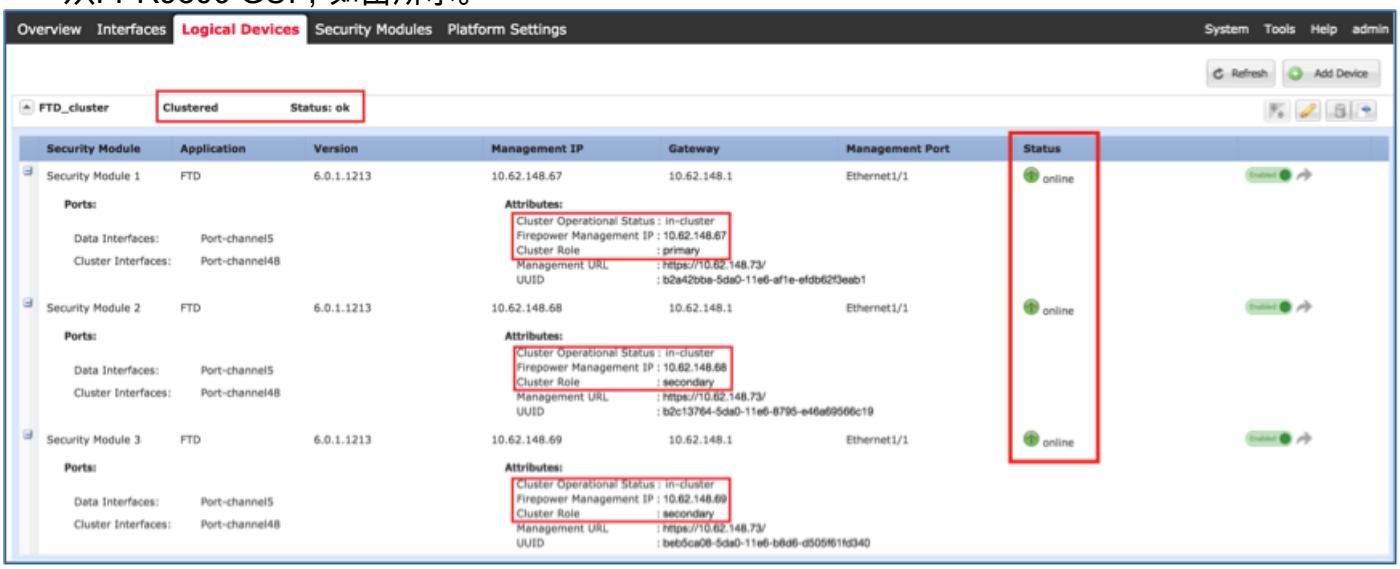
展开Data Ports区域，然后点击要分配给FTD的每个接口。完成后，选择**Save**以创建FTD集群，如图所示。



等待几分钟，以便集群部署，然后进行主设备选举。

验证：

- 从FPR9300 GUI，如图所示。



- 从FPR9300 CLI

```
FPR9K-1-A#
FPR9K-1-A# scope ssa
FPR9K-1-A /ssa # show app-instance
Application Name      Slot ID     Admin State      Operational State     Running Version Startup
Version Cluster Oper State
--------------------- ---------- --------------- --------------------- --------------- -----------
---- ------------------
ftd                   1           Enabled          Online                6.0.1.1213      6.0.1.1213
In Cluster
ftd                   2           Enabled          Online                6.0.1.1213      6.0.1.1213
In Cluster
ftd                   3           Enabled          Online                6.0.1.1213      6.0.1.1213
In Cluster
```

- 从LINA(ASA)CLI

```
firepower# show cluster info
Cluster FTD_cluster: On
    Interface mode: spanned
    This is "unit-1-1" in state MASTER
        ID        : 0
        Version   : 9.6(1)
        Serial No.: FLM19216KK6
        CCL IP    : 127.2.1.1
        CCL MAC   : 0015.c500.016f
        Last join : 21:51:03 CEST Aug 8 2016
        Last leave: N/A
Other members in the cluster:
    Unit "unit-1-3" in state SLAVE
        ID        : 1
        Version   : 9.6(1)
        Serial No.: FLM19206H7T
        CCL IP    : 127.2.1.3
        CCL MAC   : 0015.c500.018f
        Last join : 21:51:05 CEST Aug 8 2016
        Last leave: N/A
    Unit "unit-1-2" in state SLAVE
```

```
        ID        : 2
        Version   : 9.6(1)
        Serial No.: FLM19206H71
        CCL IP    : 127.2.1.2
        CCL MAC   : 0015.c500.019f
        Last join : 21:51:30 CEST Aug 8 2016
        Last leave: N/A

firepower# cluster exec show cluster interface-mode
cluster interface-mode spanned


unit-1-3:**************************************************************
cluster interface-mode spanned


unit-1-2:**************************************************************
cluster interface-mode spanned
firepower#

firepower# cluster exec show cluster history
================================================================================
From State           To State             Reason
================================================================================
21:49:25 CEST Aug 8 2016
DISABLED             DISABLED             Disabled at startup

21:50:18 CEST Aug 8 2016
DISABLED             ELECTION             Enabled from CLI

21:51:03 CEST Aug 8 2016
ELECTION             MASTER_POST_CONFIG   Enabled from CLI

21:51:03 CEST Aug 8 2016
MASTER_POST_CONFIG   MASTER               Master post config done and waiting for ntfy

================================================================================


unit-1-3:**************************************************************
================================================================================
From State           To State             Reason
================================================================================
21:49:44 CEST Aug 8 2016
DISABLED             DISABLED             Disabled at startup

21:50:37 CEST Aug 8 2016
DISABLED             ELECTION             Enabled from CLI

21:50:37 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:50:41 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:50:41 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:50:46 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message

21:50:46 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message
```

```
21:50:51 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message

21:50:51 CEST Aug 8 2016
ELECTION             ONCALL                Received cluster control message

21:50:56 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message

21:50:56 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:51:01 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message

21:51:01 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:51:04 CEST Aug 8 2016
ONCALL               SLAVE_COLD          Received cluster control message

21:51:04 CEST Aug 8 2016
SLAVE_COLD           SLAVE_APP_SYNC       Client progression done

21:51:05 CEST Aug 8 2016
SLAVE_APP_SYNC       SLAVE_CONFIG         Slave application configuration sync done

21:51:17 CEST Aug 8 2016
SLAVE_CONFIG         SLAVE_BULK_SYNC       Configuration replication finished

21:51:29 CEST Aug 8 2016
SLAVE_BULK_SYNC       SLAVE                 Configuration replication finished

================================================================================


unit-1-2:************************************************************
================================================================================
From State           To State             Reason
================================================================================
21:49:24 CEST Aug 8 2016
DISABLED             DISABLED             Disabled at startup

21:50:16 CEST Aug 8 2016
DISABLED             ELECTION             Enabled from CLI

21:50:17 CEST Aug 8 2016
ELECTION              ONCALL               Received cluster control message

21:50:21 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message

21:50:21 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:50:26 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message

21:50:26 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:50:31 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message
```

```
21:50:31 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:50:36 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:50:36 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:50:41 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:50:41 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:50:46 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:50:46 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:50:51 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:50:51 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:50:56 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:50:56 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:51:01 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:51:01 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:51:06 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:51:06 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:51:12 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:51:12 CEST Aug 8 2016
ELECTION              ONCALL              Received cluster control message

21:51:17 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:51:17 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message

21:51:22 CEST Aug 8 2016
ONCALL               ELECTION            Received cluster control message

21:51:22 CEST Aug 8 2016
ELECTION             ONCALL              Received cluster control message
```

```
21:51:27 CEST Aug 8 2016
ONCALL               ELECTION             Received cluster control message

21:51:27 CEST Aug 8 2016
ELECTION             ONCALL               Received cluster control message

21:51:30 CEST Aug 8 2016
ONCALL               SLAVE_COLD          Received cluster control message

21:51:30 CEST Aug 8 2016
SLAVE_COLD           SLAVE_APP_SYNC       Client progression done

21:51:31 CEST Aug 8 2016
SLAVE_APP_SYNC       SLAVE_CONFIG         Slave application configuration sync done

21:51:43 CEST Aug 8 2016
SLAVE_CONFIG         SLAVE_BULK_SYNC       Configuration replication finished

21:51:55 CEST Aug 8 2016
SLAVE_BULK_SYNC       SLAVE                 Configuration replication finished

================================================================================
firepower#
```

任务3.将FTD集群注册到FMC

任务要求：

将逻辑设备添加到FMC，然后将其分组到集群。

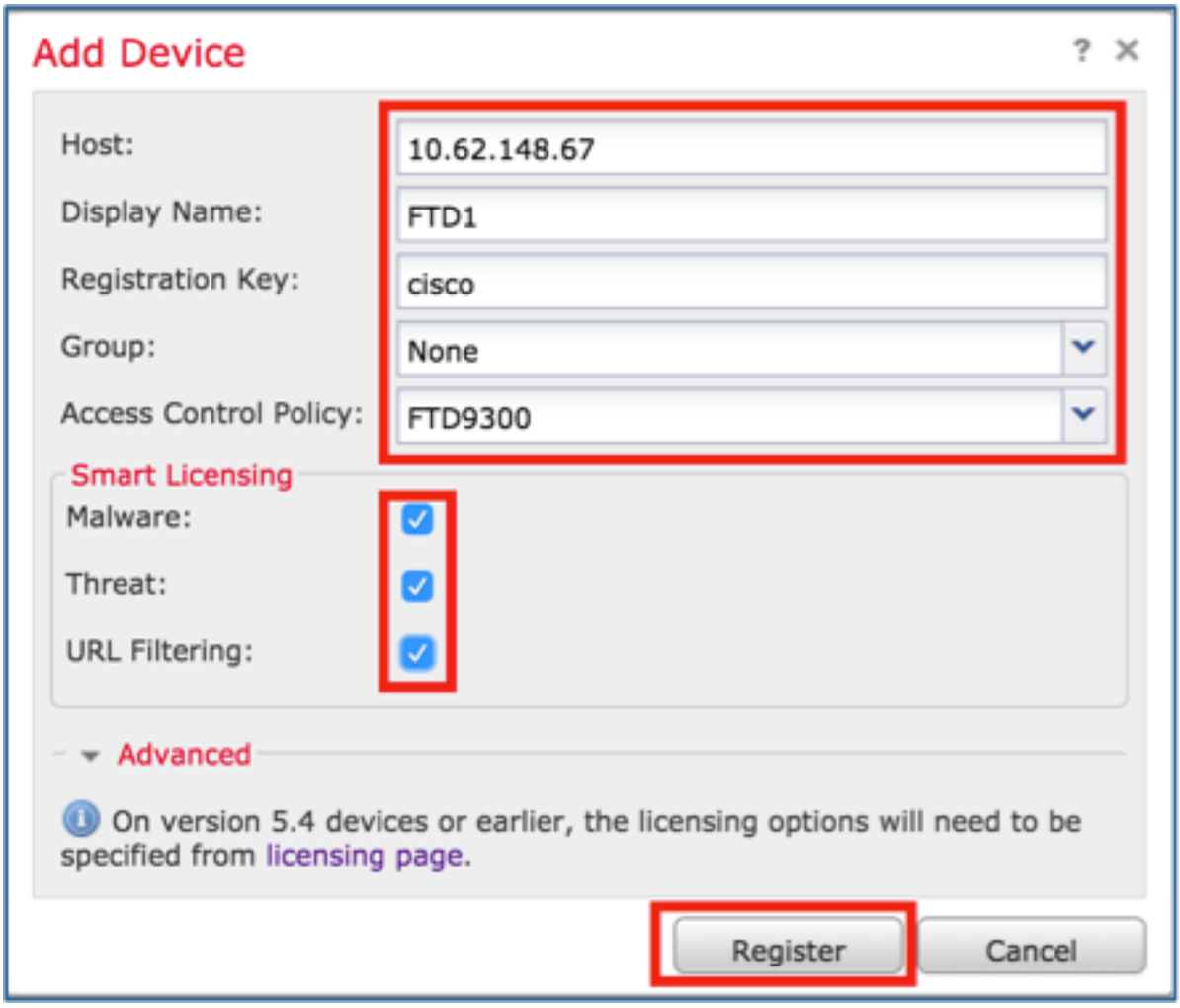
解决方案：

步骤1.将逻辑设备添加到FMC。与FMC版本6.3一样，您必须仅注册一个FTD设备（建议成为主设备）。 其余FTD由FMC自动发现。

登录FMC并导航至“设备”**>“设备管理”选**项卡，然后**单击“添加设备**”。

使用映像中所述的设置添加第一个逻辑设备。

单击“**Register(注**册)”开始注册。



验证如图所示。

任务4.在FMC上配置端口通道子接口

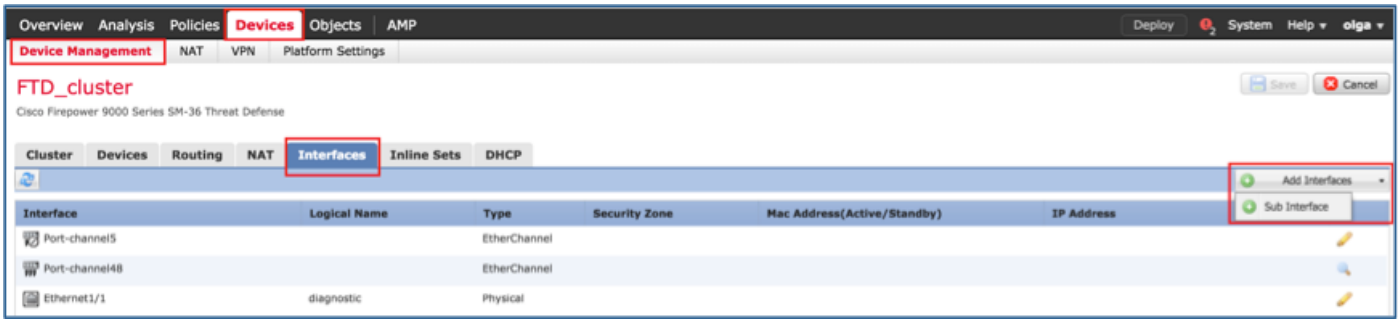
任务要求：

为端口通道数据接口配置子接口。

解决方案：

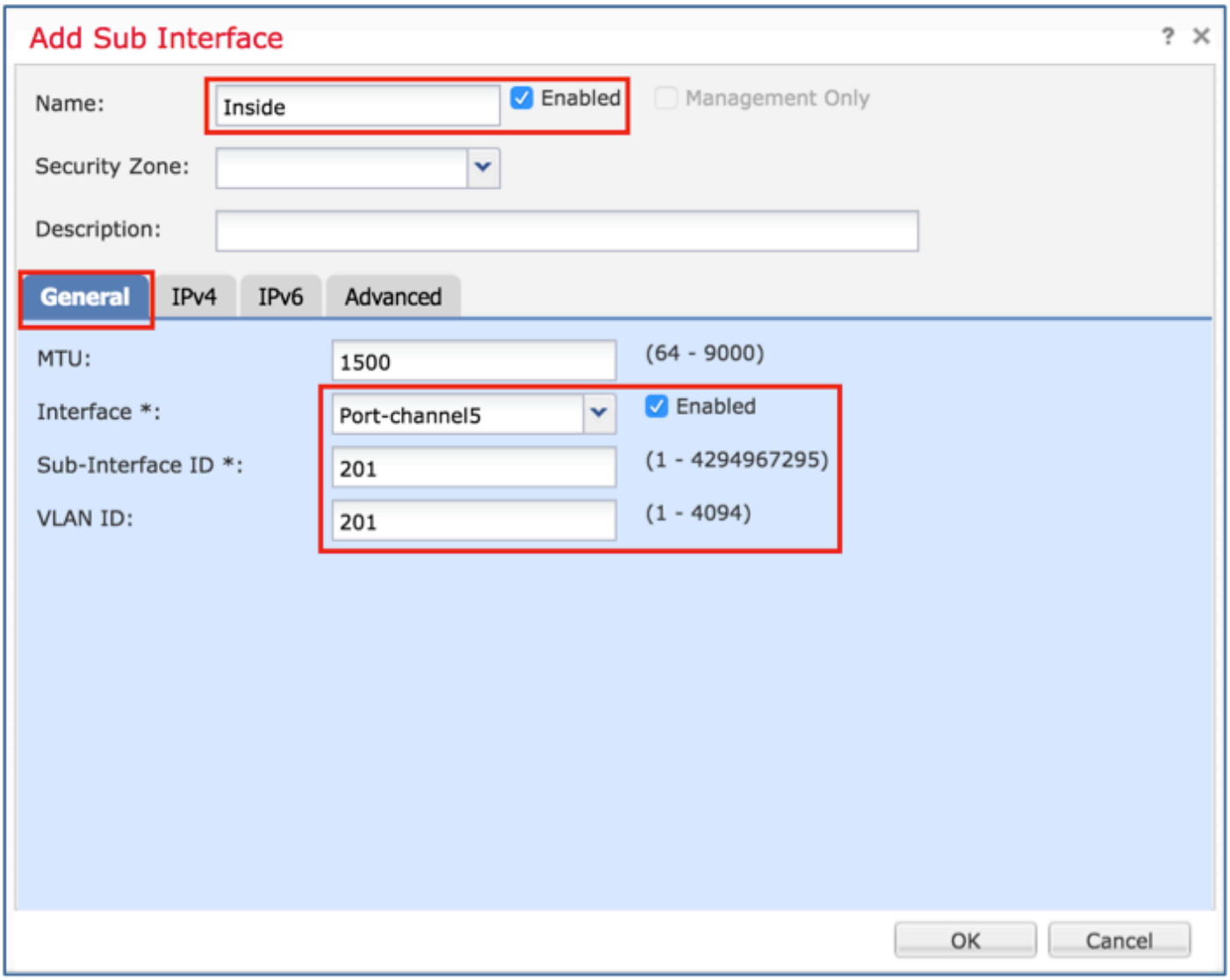
步骤1.从FMC GUI中，选择“FTD_cluster**编辑”按钮**。

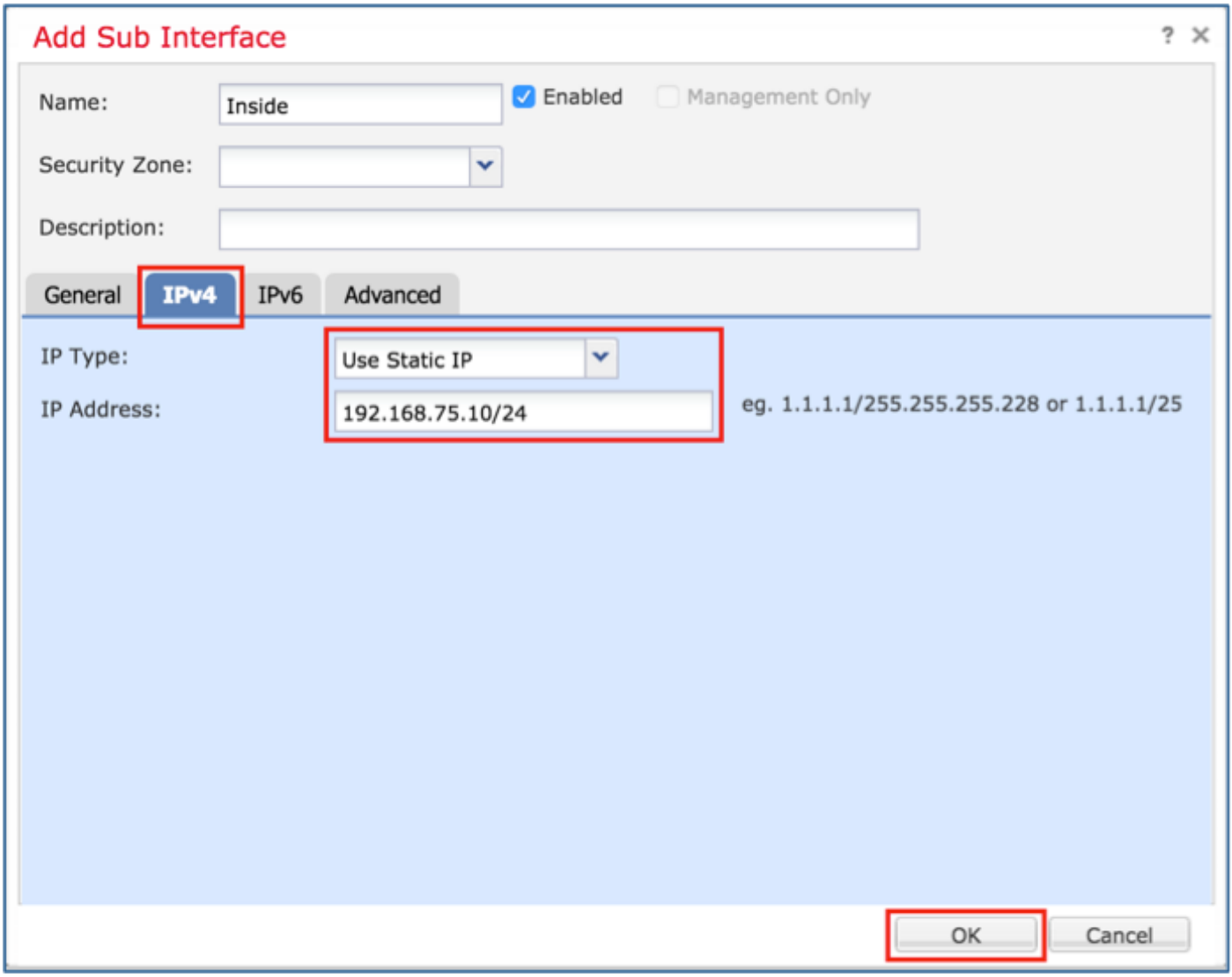
导航至接口选项卡，然后单击**添加接口>子接**口，如图所示。



使用这些详细信息配置第一个子接口。选择**OK**以应用更改，如图所示。

名称	内部
General 选项卡	
接口	端口通道5
子接口ID	201
VLAN ID	201
IPv4选项卡	
IP类型	使用静态IP
IP Address	192.168.75.10/24



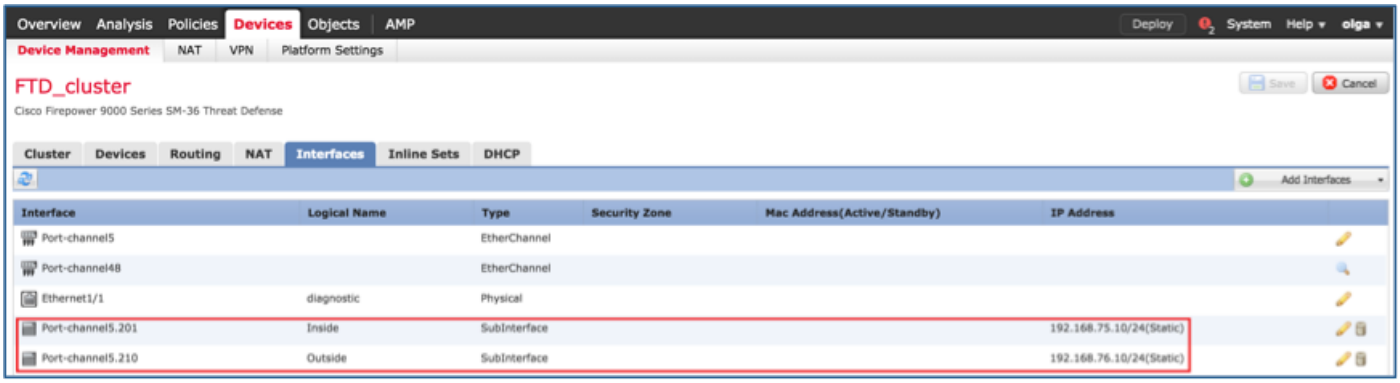


使用这些详细信息配置第二个子接口。

名称	外部
General 选项卡	
接口	端口通道5
子接口ID	210
VLAN ID	210
IPv4选项卡	
IP类型	使用静态IP
IP Address	192.168.76.10/24

单击OK以创建子接口。单击Save，然后Deploy changes to the FTD_cluster，如图所示。

验证：



任务5.检验基本连通性

任务要求：

创建捕获并检查两台虚拟机之间的连接。

解决方案：

步骤1.在所有集群设备上创建捕获。

导航至主设备的LINA(ASA)CLI，并为内部和外部接口创建捕获。

```
firepower#
firepower# cluster exec capture capi interface inside match icmp any any
unit-1-1(LOCAL):*******************************************************


unit-1-3:*************************************************************


unit-1-2:*************************************************************
firepower#
firepower# cluster exec capture capo interface outside match icmp any any
unit-1-1(LOCAL):*******************************************************


unit-1-3:*************************************************************


unit-1-2:*************************************************************
firepower#
```

验证：

```
firepower# cluster exec show capture
unit-1-1(LOCAL):*******************************************************
capture capi type raw-data interface Inside [Capturing - 0 bytes]
  match icmp any any
capture capo type raw-data interface Outside [Capturing - 0 bytes]
  match icmp any any


unit-1-3:*************************************************************
capture capi type raw-data interface Inside [Capturing - 0 bytes]
  match icmp any any
```

```
capture capo type raw-data interface Outside [Capturing - 0 bytes]
  match icmp any any


unit-1-2:**********************************************************
capture capi type raw-data interface Inside [Capturing - 0 bytes]
  match icmp any any
capture capo type raw-data interface Outside [Capturing - 0 bytes]
  match icmp any any
firepower#
```

步骤2.从VM1对VM2执行ping测试。

对4个数据包进行测试。在测试后检查捕获输出：

```
firepower# cluster exec show capture
unit-1-1(LOCAL):******************************************************
capture capi type raw-data interface Inside [Capturing - 0 bytes]
  match icmp any any
capture capo type raw-data interface Outside [Capturing - 0 bytes]
  match icmp any any


unit-1-3:**********************************************************
capture capi type raw-data interface Inside [Capturing - 752 bytes]
  match icmp any any
capture capo type raw-data interface Outside [Capturing - 752 bytes]
  match icmp any any


unit-1-2:**********************************************************
capture capi type raw-data interface Inside [Capturing - 0 bytes]
  match icmp any any
capture capo type raw-data interface Outside [Capturing - 0 bytes]
  match icmp any any
firepower#
```

运行命令以检查特定设备上的捕获输出：

```
firepower# cluster exec unit unit-1-3 show capture capi

8 packets captured

   1: 12:58:36.162253       802.1Q vlan#201 P0 192.168.75.100 > 192.168.76.100: icmp: echo
request
   2: 12:58:36.162955       802.1Q vlan#201 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
   3: 12:58:37.173834       802.1Q vlan#201 P0 192.168.75.100 > 192.168.76.100: icmp: echo
request
   4: 12:58:37.174368       802.1Q vlan#201 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
   5: 12:58:38.187642       802.1Q vlan#201 P0 192.168.75.100 > 192.168.76.100: icmp: echo
request
   6: 12:58:38.188115       802.1Q vlan#201 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
   7: 12:58:39.201832       802.1Q vlan#201 P0 192.168.75.100 > 192.168.76.100: icmp: echo
request
   8: 12:58:39.202321       802.1Q vlan#201 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
8 packets shown

firepower# cluster exec unit unit-1-3 show capture capo

8 packets captured

   1: 12:58:36.162543       802.1Q vlan#210 P0 192.168.75.100 > 192.168.76.100: icmp: echo
```

```
request
   2: 12:58:36.162894       802.1Q vlan#210 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
   3: 12:58:37.174002       802.1Q vlan#210 P0 192.168.75.100 > 192.168.76.100: icmp: echo
request
   4: 12:58:37.174307       802.1Q vlan#210 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
   5: 12:58:38.187764       802.1Q vlan#210 P0 192.168.75.100 > 192.168.76.100: icmp: echo
request
   6: 12:58:38.188085       802.1Q vlan#210 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
   7: 12:58:39.201954       802.1Q vlan#210 P0 192.168.75.100 > 192.168.76.100: icmp: echo
request
   8: 12:58:39.202290       802.1Q vlan#210 P0 192.168.76.100 > 192.168.75.100: icmp: echo reply
8 packets shown
firepower#
```

完成此任务后，使用下一个命令删除捕获：

```
firepower# cluster exec no capture capi
unit-1-1(LOCAL):*********************************************************


unit-1-3:*********************************************************


unit-1-2:*********************************************************

firepower# cluster exec no capture capo
unit-1-1(LOCAL):*********************************************************


unit-1-3:*********************************************************


unit-1-2:*********************************************************
```

步骤3.从VM2下载文件到VM1。

VM1预配置为FTP服务器，VM2预配置为FTP客户端。

使用以下内容创建新捕获：

```
firepower# cluster exec capture capi interface inside match ip host 192.168.75.100 host
192.168.76.100
unit-1-1(LOCAL):*********************************************************


unit-1-3:*********************************************************


unit-1-2:*********************************************************

firepower# cluster exec capture capo interface outside match ip host 192.168.775.100 host
192.168.76.100
unit-1-1(LOCAL):*********************************************************


unit-1-3:*********************************************************


unit-1-2:*********************************************************
```

使用FTP客户端将文件从VM2下载到VM1。

检查show conn输出：

```
firepower# cluster exec show conn all
unit-1-1(LOCAL):*******************************************************
20 in use, 21 most used
Cluster:
fwd connections: 0 in use, 2 most used
dir connections: 0 in use, 52 most used
centralized connections: 0 in use, 6 most used

TCP Outside  192.168.76.100:49175 Inside  192.168.75.100:21, idle 0:00:32, bytes 665, flags
UIOeN
UDP cluster  255.255.255.255:49495 NP Identity Ifc  127.2.1.1:49495, idle 0:00:00, bytes
17858058, flags -
TCP cluster  127.2.1.3:10844 NP Identity Ifc  127.2.1.1:38296, idle 0:00:33, bytes 5496, flags
UI
…….
TCP cluster  127.2.1.3:59588 NP Identity Ifc  127.2.1.1:10850, idle 0:00:33, bytes 132, flags UO


unit-1-3:*************************************************************
12 in use, 16 most used
Cluster:
fwd connections: 0 in use, 4 most used
dir connections: 1 in use, 10 most used
centralized connections: 0 in use, 0 most used

TCP Outside  192.168.76.100:49175 Inside  192.168.75.100:21, idle 0:00:34, bytes 0, flags  y
TCP cluster  127.2.1.1:10851 NP Identity Ifc  127.2.1.3:48493, idle 0:00:52, bytes 224, flags UI
……..
TCP cluster  127.2.1.1:64070 NP Identity Ifc  127.2.1.3:10847, idle 0:00:11, bytes 806, flags UO


unit-1-2:*************************************************************
12 in use, 15 most used
Cluster:
fwd connections: 0 in use, 2 most used
dir connections: 0 in use, 3 most used
centralized connections: 0 in use, 0 most used

TCP cluster  127.2.1.1:10851 NP Identity Ifc  127.2.1.2:64136, idle 0:00:53, bytes 224, flags UI
……..
TCP cluster  127.2.1.1:15859 NP Identity Ifc  127.2.1.2:10847, idle 0:00:11, bytes 807, flags UO
```

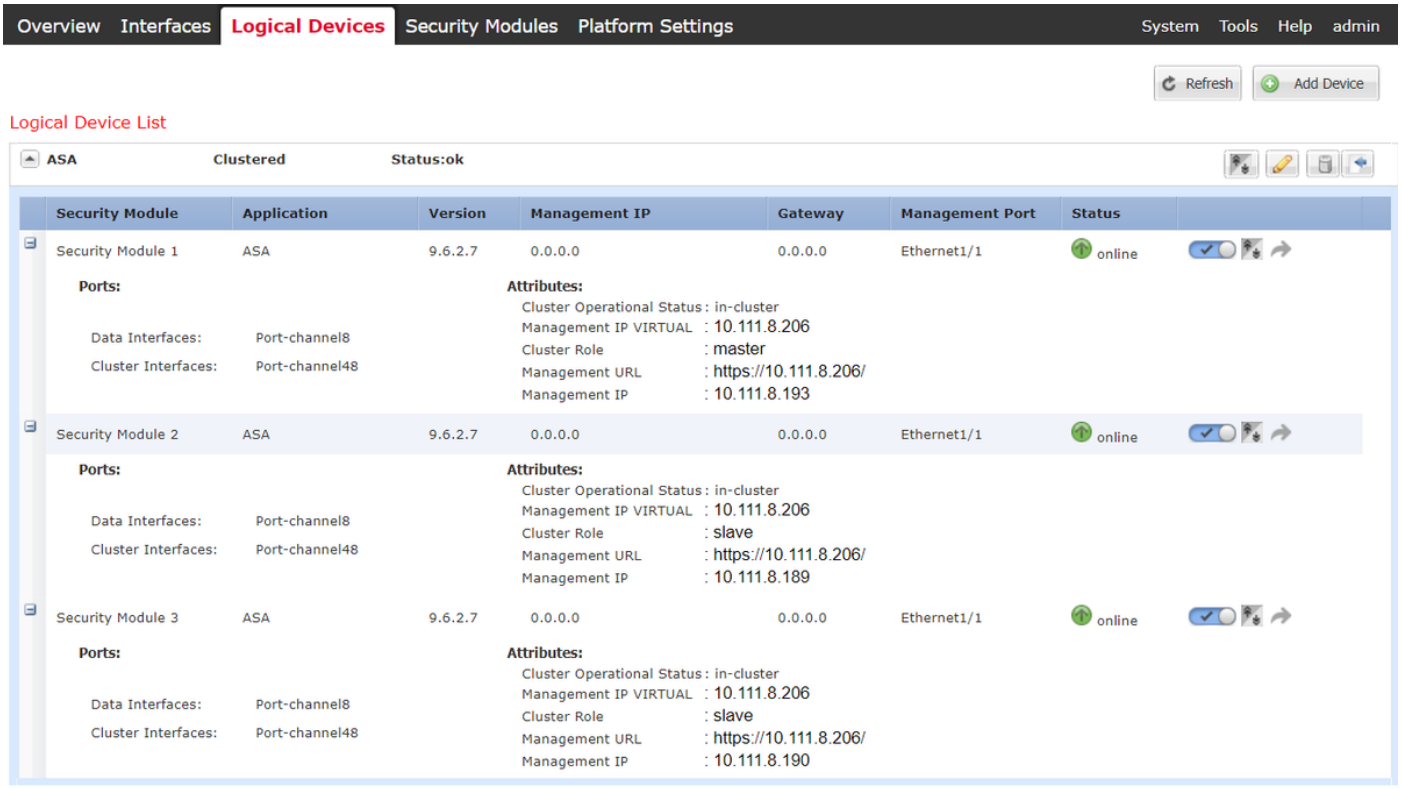
显示捕获输出：

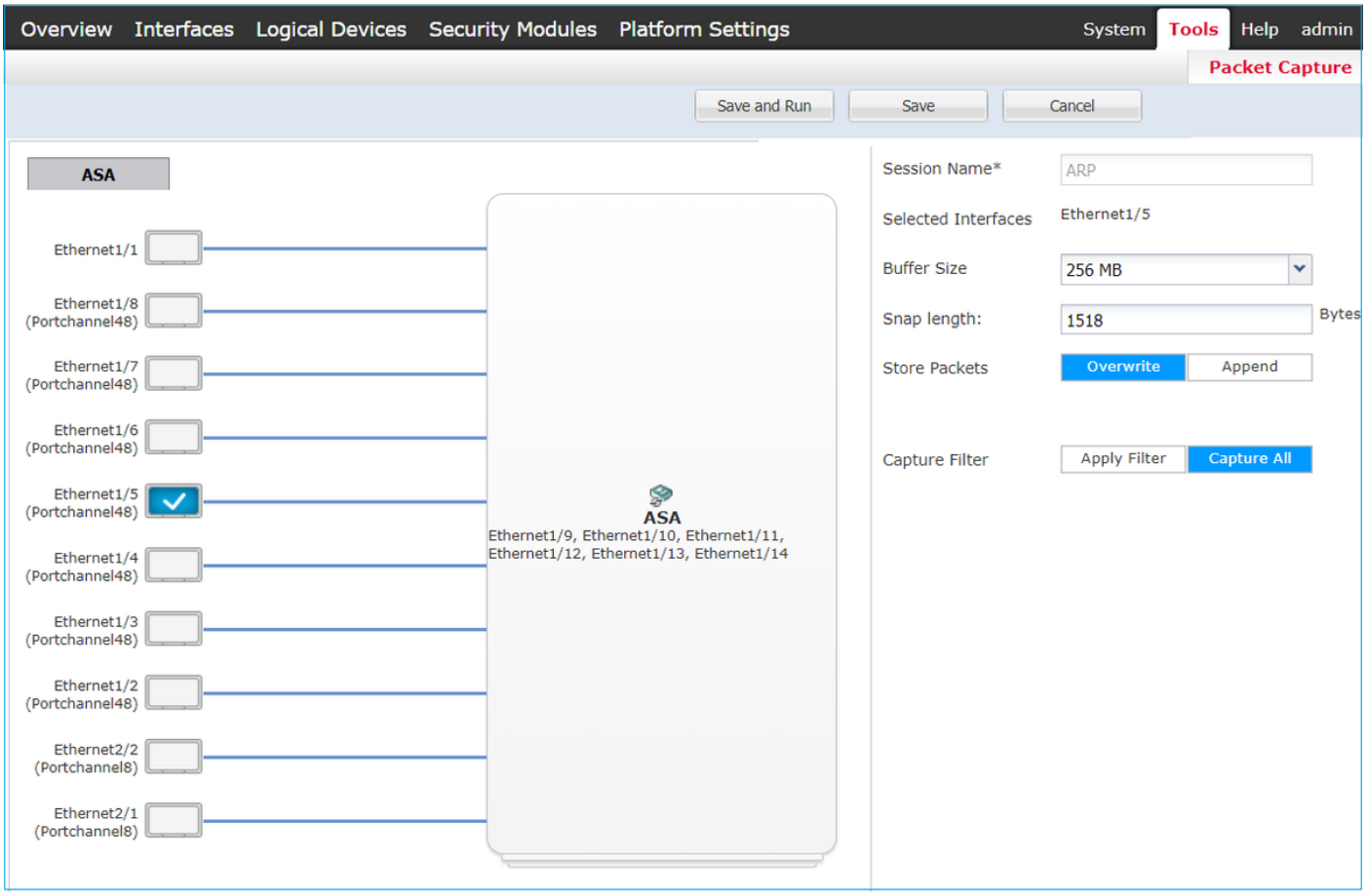
```
firepower# cluster exec show cap
unit-1-1(LOCAL):*******************************************************
capture capi type raw-data interface Inside [Buffer Full - 523954 bytes]
  match ip host 192.168.75.100 host 192.168.76.100
capture capo type raw-data interface Outside [Buffer Full - 524028 bytes]
  match ip host 192.168.75.100 host 192.168.76.100


unit-1-3:*************************************************************
capture capi type raw-data interface Inside [Buffer Full - 524062 bytes]
  match ip host 192.168.75.100 host 192.168.76.100
capture capo type raw-data interface Outside [Buffer Full - 524228 bytes]
  match ip host 192.168.75.100 host 192.168.76.100
```

```
unit-1-2:**************************************************************
capture capi type raw-data interface Inside [Capturing - 0 bytes]
  match ip host 192.168.75.100 host 192.168.76.100
capture capo type raw-data interface Outside [Capturing - 0 bytes]
  match ip host 192.168.75.100 host 192.168.76.100
```

从机箱管理器UI捕获集群

在下图中，您可以看到FPR9300上具有2个端口通道（8和48）的3单元集群。 逻辑设备是ASA，但在FTD的情况下将是相同的概念。需要记住的重要一点是，尽管有**3个集群单元**，但从捕获角度看，只有一个**逻辑设备**:





任务6.从集群中删除从设备

任务要求：

登录FMC并从集群中删除从属设备。

解决方案：

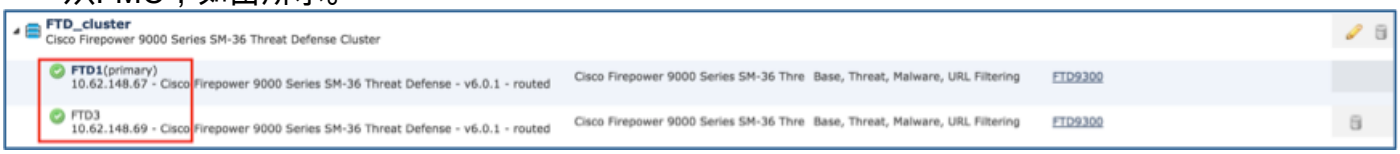
步骤1.登录FMC并导航至Device > Device Management。

点击从设备旁边的垃圾桶图标，如图所示。

系统将显示确认窗口。选择是以确认，如图所示。

验证：

- 从FMC，如图所示。



- 从FXOS CLI。

```
FPR9K-1-A# scope ssa
FPR9K-1-A /ssa # show app-instance
Application Name      Slot ID     Admin State      Operational State     Running Version Startup
Version Cluster Oper State
-------------------- ---------- --------------- -------------------- --------------- -----------
---- ------------------
ftd                   1          Enabled          Online               6.0.1.1213      6.0.1.1213
In Cluster
ftd                   2          Enabled          Online               6.0.1.1213      6.0.1.1213
In Cluster
ftd                   3          Enabled          Online               6.0.1.1213      6.0.1.1213
In Cluster
```

- 从LINA(ASA)CLI。

```
firepower# show cluster info
Cluster FTD_cluster: On
    Interface mode: spanned
    This is "unit-1-1" in state MASTER
        ID        : 0
        Version   : 9.6(1)
        Serial No.: FLM19216KK6
        CCL IP    : 127.2.1.1
        CCL MAC   : 0015.c500.016f
        Last join : 21:51:03 CEST Aug 8 2016
        Last leave: N/A
Other members in the cluster:
    Unit "unit-1-3" in state SLAVE
        ID        : 1
        Version   : 9.6(1)
        Serial No.: FLM19206H7T
        CCL IP    : 127.2.1.3
        CCL MAC   : 0015.c500.018f
        Last join : 21:51:05 CEST Aug 8 2016
        Last leave: N/A
    Unit "unit-1-2" in state SLAVE
        ID        : 2
        Version   : 9.6(1)
        Serial No.: FLM19206H71
        CCL IP    : 127.2.1.2
        CCL MAC   : 0015.c500.019f
        Last join : 21:51:30 CEST Aug 8 2016
        Last leave: N/A
firepower#
```

注意：设备从FMC未注册，但仍是FPR9300上的集群成员。

验证

使用本部分可确认配置能否正常运行。

验证已完成，并涵盖在各个任务中。

故障排除

目前没有针对此配置的故障排除信息。

相关信息

- Cisco Firepower管理中心配置指南的所有版本均位于以下位置：
https://www.cisco.com/c/en/us/td/docs/security/firepower/roadmap/firepower-roadmap.html#id_47280。

- FXOS机箱管理器和CLI配置指南的所有版本均可在以下位置找到：
https://www.cisco.com/c/en/us/td/docs/security/firepower/fxos/roadmap/fxos-roadmap.html#pgfId-121950。

- 思科全球技术支持中心(TAC)强烈推荐此可视化指南，以深入了解思科Firepower下一代安全技术的实用知识，包括本文中提到的知识：
http://www.ciscopress.com/title/9781587144806。

- 对于与Firepower技术相关的所有配置和故障排除技术说明。
https://www.cisco.com/c/en/us/support/security/defense-center/tsd-products-support-series-home.html。

- 技术支持和文档 - Cisco Systems