使用Firepower威胁防御捕获和Packet Tracer

目录

简介

本文档介绍如何使用Firepower威胁防御(FTD)捕获和Packet Tracer实用程序。

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版本：

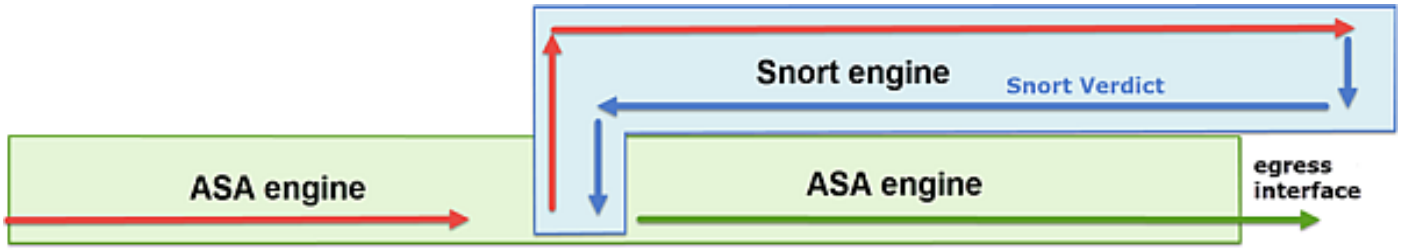
- 运行FTD软件6.1.0的ASA5515-X
- 运行FTD软件6.2.2的FPR4110
- 运行Firepower管理中心(FMC)软件6.2.2的FS4000

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

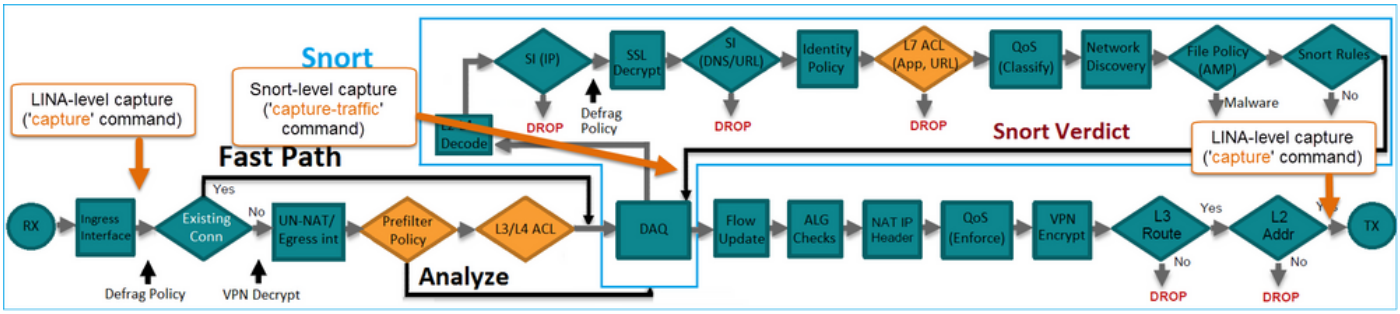
FTD数据包处理

FTD数据包处理可视化如下：



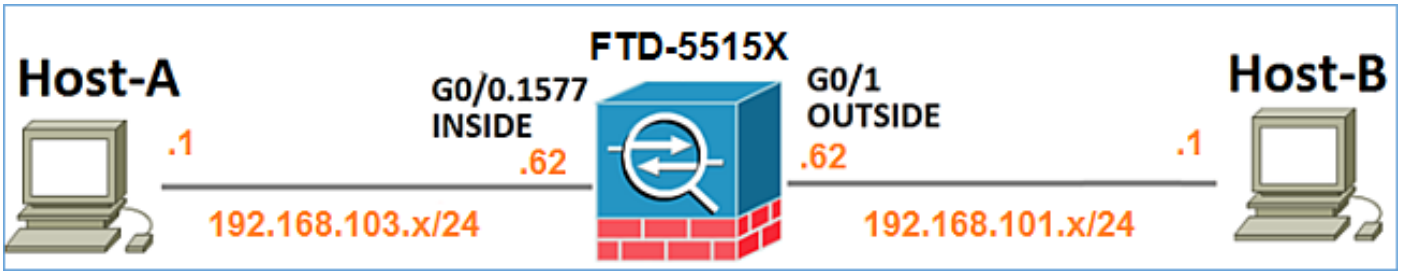
1. 数据包进入入口接口，由LINA引擎处理。
2. 如果策略要求数据包由Snort引擎进行检查。
3. Snort引擎返回数据包的判定。
4. LINA 引擎根据 Snort 的判定丢弃或转发数据包.

基于该体系结构，可以在以下位置获取FTD捕获：



配置

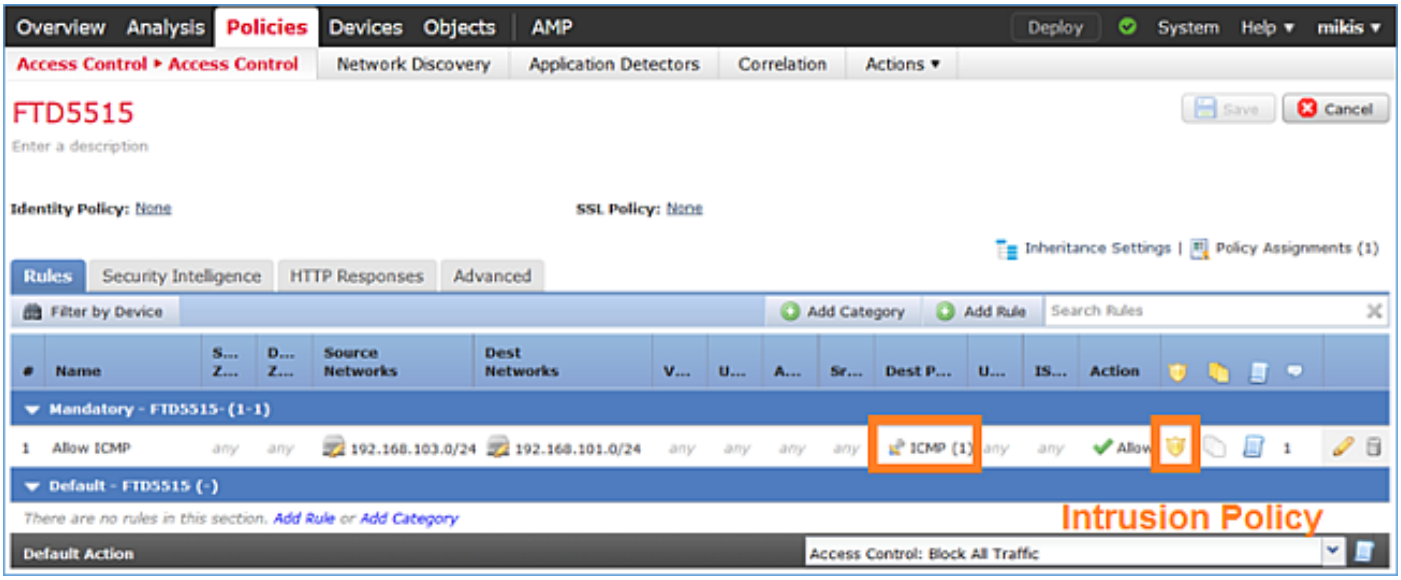
网络图



使用Snort引擎捕获

先决条件

在FTD上应用访问控制策略(ACP)，允许互联网控制消息协议(ICMP)流量通过。该策略还应用了入侵策略：



要求

1. 在FTD CLISH模式下启用捕获，无需过滤器。
2. 通过FTD ping并检查捕获的输出。

解决方案

步骤1:登录到FTD控制台或SSH到br1接口，并在FTD CLISH模式下启用捕获功能，无需过滤器。

```
<#root>

>

capture-traffic
```

```
Please choose domain to capture traffic from:
  0 - br1
  1 - Router

Selection?
```

1

```
Please specify tcpdump options desired.
(or enter '?' for a list of supported options)
Options:
```

在FTD 6.0.x上，命令为：

<#root>

>

system support

capture-traffic

第二步：通过FTD Ping并检查捕获的输出。

<#root>

>

capture-traffic

```
Please choose domain to capture traffic from:
  0 - br1
  1 - Router

Selection?
```

1

```
Please specify tcpdump options desired.
(or enter '?' for a list of supported options)
Options:
```

12:52:34.749945 IP olab-vl603-gw.cisco.com > olab-vl647-gw.cisco.com: ICMP echo request, id 0, seq 1, le
12:52:34.749945 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 0, seq 1, leng
12:52:34.759955 IP olab-vl603-gw.cisco.com > olab-vl647-gw.cisco.com: ICMP echo request, id 0, seq 2, le
12:52:34.759955 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 0, seq 2, leng
12:52:34.759955 IP olab-vl603-gw.cisco.com > olab-vl647-gw.cisco.com: ICMP echo request, id 0, seq 3, le
12:52:34.759955 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 0, seq 3, leng
12:52:34.759955 IP olab-vl603-gw.cisco.com > olab-vl647-gw.cisco.com: ICMP echo request, id 0, seq 4, le
12:52:34.759955 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 0, seq 4, leng
^C   <- to exit press CTRL + C

使用Snort引擎捕获

要求

1. 在FTD CLISH模式下使用IP 192.168.101.1过滤器启用捕获。
2. 通过FTD Ping并检查捕获的输出。

解决方案

步骤1:在FTD CLISH模式下使用IP 192.168.101.1过滤器启用捕获。

```
<#root>

>

capture-traffic


Please choose domain to capture traffic from:
  0 - br1
  1 - Router

Selection?

1


Please specify tcpdump options desired.
(or enter '?' for a list of supported options)
Options:

host 192.168.101.1
```

第二步：通过FTD Ping并检查捕获的输出：

```
13:28:36.079982 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 3, seq 0, len
13:28:36.079982 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 3, seq 1, len
13:28:36.079982 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 3, seq 2, len
13:28:36.079982 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 3, seq 3, len
13:28:36.079982 IP olab-vl647-gw.cisco.com > olab-vl603-gw.cisco.com: ICMP echo reply, id 3, seq 4, len
```

可以使用-n选项查看数字格式的主机和端口号。例如，早期的捕获显示为：

```
<#root>

>

capture-traffic
```

```
Please choose domain to capture traffic from:
  0 - br1
  1 - Router

Selection?
```

1

```
Please specify tcpdump options desired.
(or enter '?' for a list of supported options)
Options:
```

-n host 192.168.101.1

```
13:29:59.599959 IP 192.168.101.1 > 192.168.103.1: ICMP echo reply, id 5, seq 0, length 80
13:29:59.599959 IP 192.168.101.1 > 192.168.103.1: ICMP echo reply, id 5, seq 1, length 80
13:29:59.599959 IP 192.168.101.1 > 192.168.103.1: ICMP echo reply, id 5, seq 2, length 80
13:29:59.599959 IP 192.168.101.1 > 192.168.103.1: ICMP echo reply, id 5, seq 3, length 80
13:29:59.599959 IP 192.168.101.1 > 192.168.103.1: ICMP echo reply, id 5, seq 4, length 80
```

Tcpdump过滤器示例

示例 1：

要捕获Src IP或Dst IP = 192.168.101.1和Src port或Dst port = TCP/UDP 23，请输入以下命令：

<#root>

```
Options:
```

-n host 192.168.101.1 and port 23

示例 2：

要捕获Src IP = 192.168.101.1和Src port = TCP/UDP 23，请输入以下命令：

<#root>

```
Options:
```

-n src 192.168.101.1 and src port 23

示例 3：

要捕获Src IP = 192.168.101.1和Src port = TCP 23，请输入以下命令：

<#root>

```
Options:
-n src 192.168.101.1 and tcp and src port 23
```

示例 4：

要捕获Src IP = 192.168.101.1并查看数据包的MAC地址，请添加“e”选项，然后输入以下命令：

```
<#root>
Options:
-ne

src 192.168.101.1
17:57:48.709954
6c:41:6a:a1:2b:f6 > a8:9d:21:93:22:90,
 ethertype IPv4 (0x0800), length 58: 192.168.101.1.23 > 192.168.103.1.25420:
 Flags [S.], seq 3694888749, ack 1562083610, win 8192, options [mss 1380], length 0
```

示例 5：

要在捕获10个数据包后退出，请输入以下命令：

```
<#root>
Options:
-n -c 10 src 192.168.101.1

18:03:12.749945 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [.], ack 3758037348, win 32768, length
18:03:12.749945 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [P.], ack 1, win 32768, length 2
18:03:12.949932 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [P.], ack 1, win 32768, length 10
18:03:13.249971 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [.], ack 3, win 32768, length 0
18:03:13.249971 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [P.], ack 3, win 32768, length 2
18:03:13.279969 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [.], ack 5, win 32768, length 0
18:03:13.279969 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [P.], ack 5, win 32768, length 10
18:03:13.309966 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [.], ack 7, win 32768, length 0
18:03:13.309966 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [P.], ack 7, win 32768, length 12
18:03:13.349972 IP 192.168.101.1.23 > 192.168.103.1.27287: Flags [.], ack 9, win 32768, length 0
```

示例 6：

要将捕获写入名称为capture.pcap的文件并通过FTP将其复制到远程服务器，请输入以下命令：

```
<#root>
```

```
Options:

-w capture.pcap host 192.168.101.1
CTRL + C <- to stop the capture
> file copy 10.229.22.136 ftp / capture.pcap

Enter password for ftp@10.229.22.136:
Copying capture.pcap

Copy successful.


>
```

使用FTD LINA引擎捕获

要求

1.使用以下过滤器在FTD上启用两个捕获：

源 IP	192.168.103.1
目的 IP	192.168.101.1
协议	ICMP
接口	内部
源 IP	192.168.103.1
目的 IP	192.168.101.1
协议	ICMP
接口	外部

2.从Host-A(192.168.103.1)对Host-B(192.168.101.1)执行ping操作并检查捕获。

解决方案

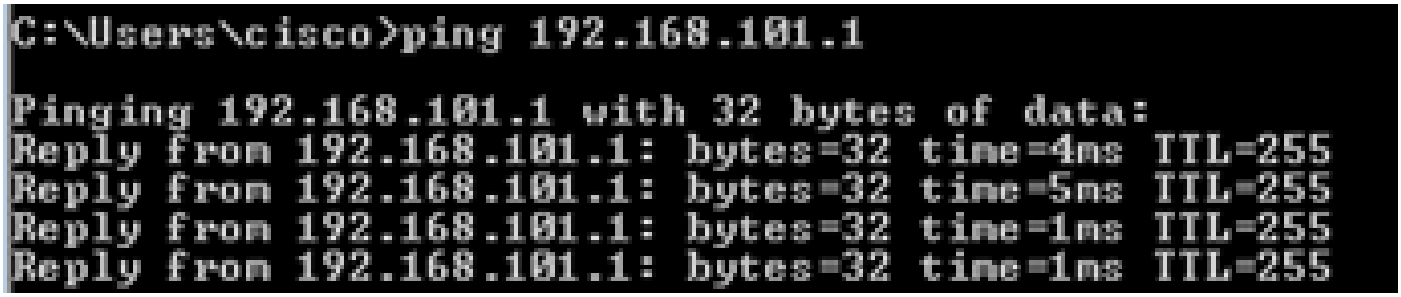
步骤1:启用捕获：

<#root>

```
> capture CAPI interface INSIDE match icmp host 192.168.103.1 host 192.168.101.1
> capture CAPO interface OUTSIDE match icmp host 192.168.101.1 host 192.168.103.1
```

第二步：在CLI中检查捕获。

从Host-A ping Host-B:



<#root>

```
> show capture

capture CAPI type raw-data interface INSIDE [Capturing

- 752 bytes

]
  match icmp host 192.168.103.1 host 192.168.101.1
capture CAPO type raw-data interface OUTSIDE [Capturing

- 720 bytes

]
  match icmp host 192.168.101.1 host 192.168.103.1
```

由于INSIDE接口上的Dot1Q报头，两个捕获的大小不同，如下面的输出示例所示：

<#root>

```
> show capture CAPI

8 packets captured
   1: 17:24:09.122338

802.1Q vlan#1577

 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   2: 17:24:09.123071 802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
   3: 17:24:10.121392 802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   4: 17:24:10.122018 802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
   5: 17:24:11.119714 802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   6: 17:24:11.120324 802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
   7: 17:24:12.133660 802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   8: 17:24:12.134239 802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
8 packets shown
```

<#root>

```
> show capture CAPO

8 packets captured
   1: 17:24:09.122765  192.168.103.1 > 192.168.101.1: icmp: echo request
   2: 17:24:09.122994  192.168.101.1 > 192.168.103.1: icmp: echo reply
   3: 17:24:10.121728  192.168.103.1 > 192.168.101.1: icmp: echo request
   4: 17:24:10.121957  192.168.101.1 > 192.168.103.1: icmp: echo reply
   5: 17:24:11.120034  192.168.103.1 > 192.168.101.1: icmp: echo request
   6: 17:24:11.120263  192.168.101.1 > 192.168.103.1: icmp: echo reply
   7: 17:24:12.133980  192.168.103.1 > 192.168.101.1: icmp: echo request
   8: 17:24:12.134194  192.168.101.1 > 192.168.103.1: icmp: echo reply
8 packets shown
```

使用FTD LINA引擎捕获 — 通过HTTP导出捕获

要求

使用浏览器导出在前面的场景中获取的捕获。

解决方案

要使用浏览器导出捕获，您需要：

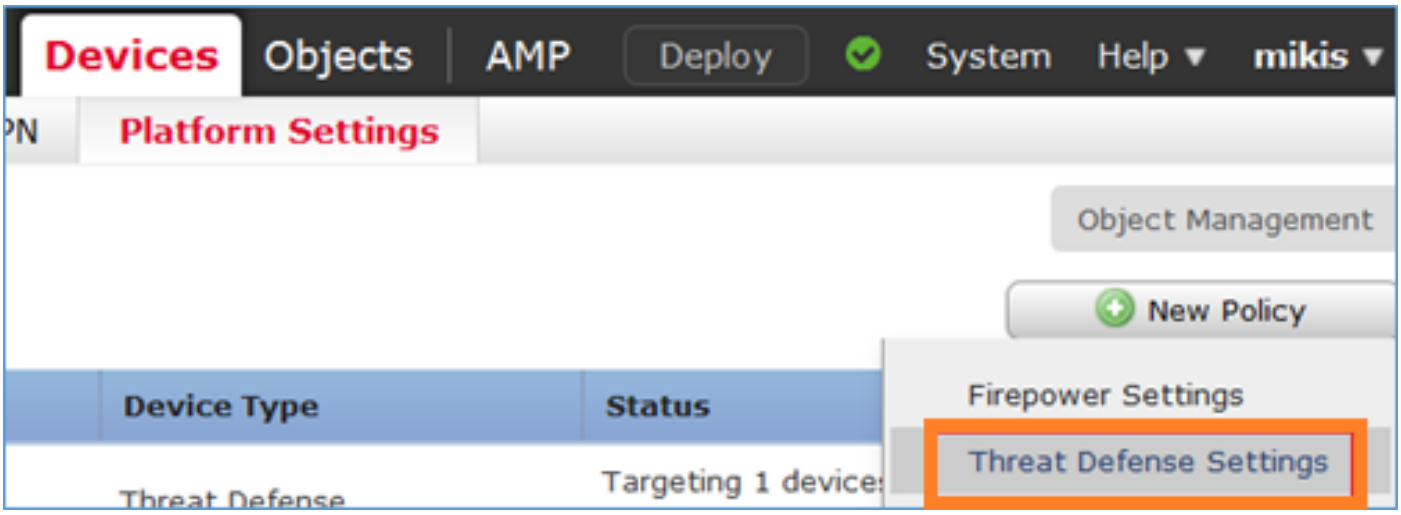
1. 启用HTTPS服务器
2. 允许HTTPS访问

默认情况下，HTTPS服务器处于禁用状态，且不允许访问：

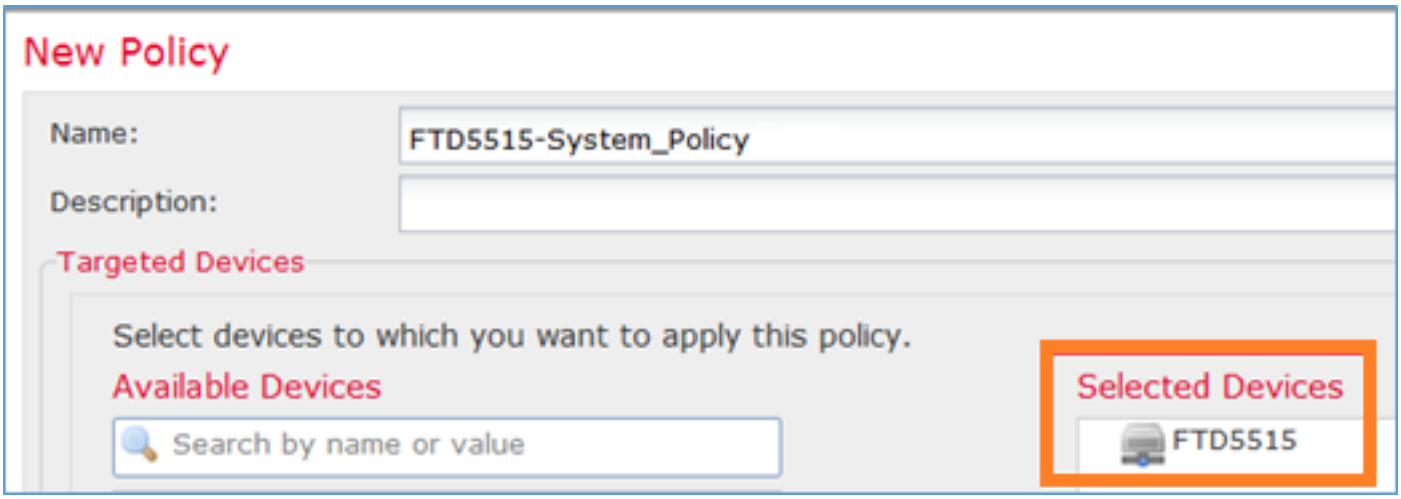
<#root>

```
>

show running-config http


>
```

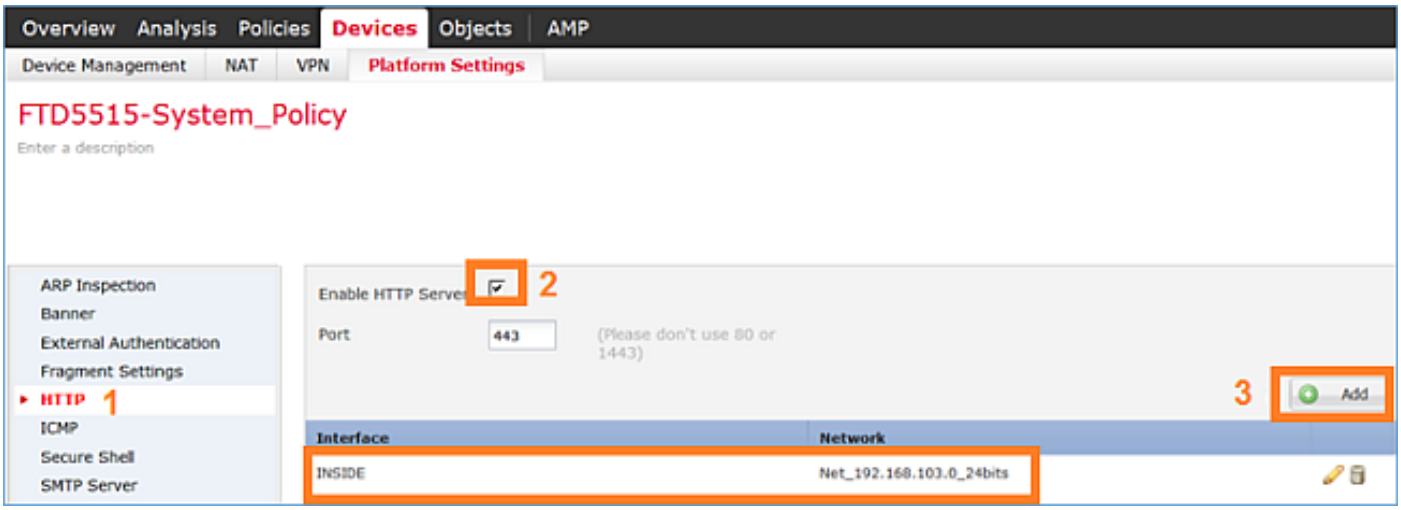
步骤1:导航到设备>平台设置，单击新策略，然后选择威胁防御设置:



指定策略名称和设备目标：



第二步：启用HTTPS服务器并添加要允许通过HTTPS访问FTD设备的网络：



保存并部署。

在策略部署时，可以启用debug http以查看HTTP服务的启动：

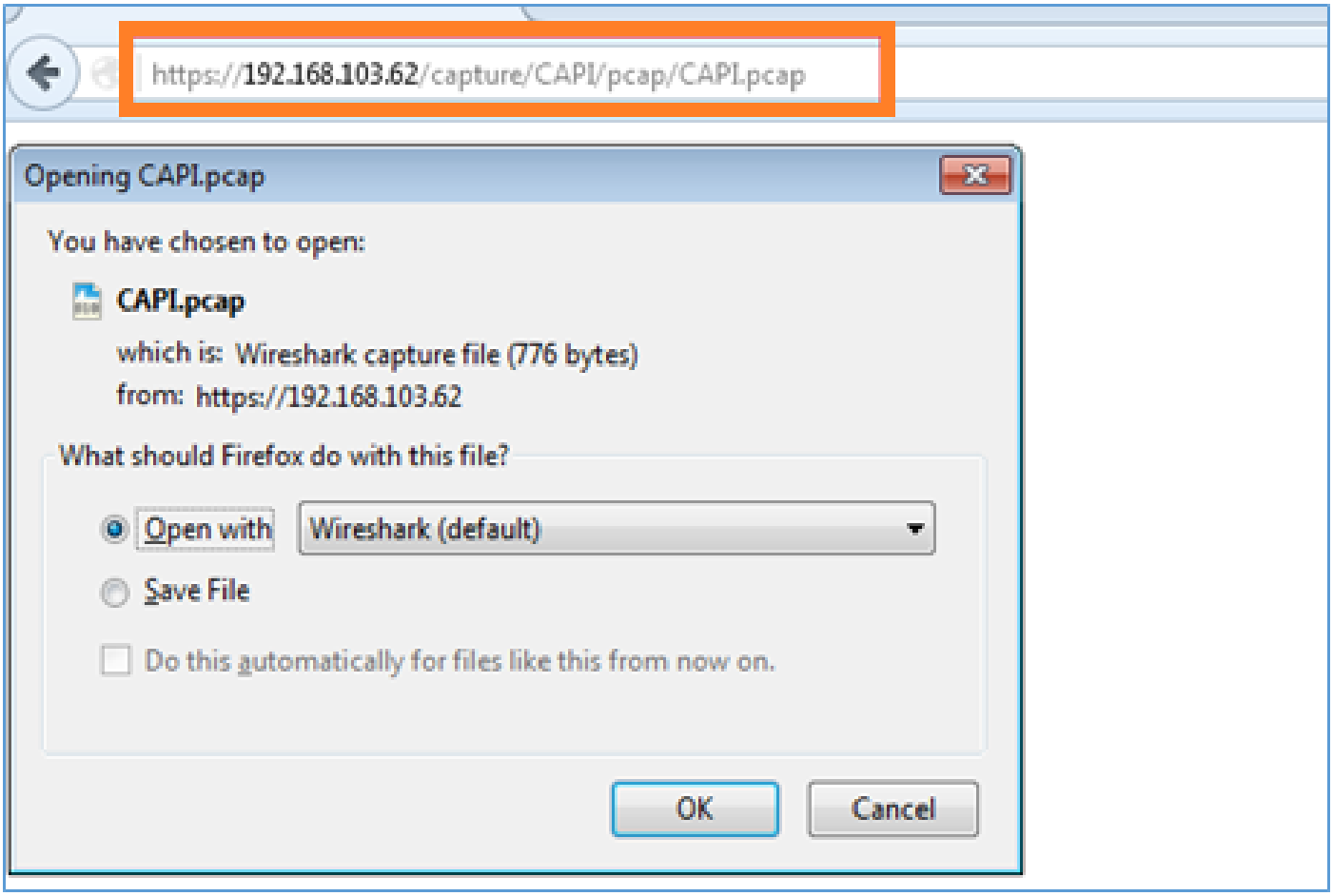
<#root>

```
> debug http 255

debug http enabled at level 255.

http_enable: Enabling HTTP server
HTTP server starting.
```

FTD CLI的结果是：

```
<#root>

> unebug all

> show run http
http server enable
http 192.168.103.0 255.255.255.0 INSIDE
```

在Host-A(192.168.103.1)上打开浏览器，使用此URL下载第一个捕获：https://192.168.103.62/capture/CAPI/pcap/CAPI.pcap。

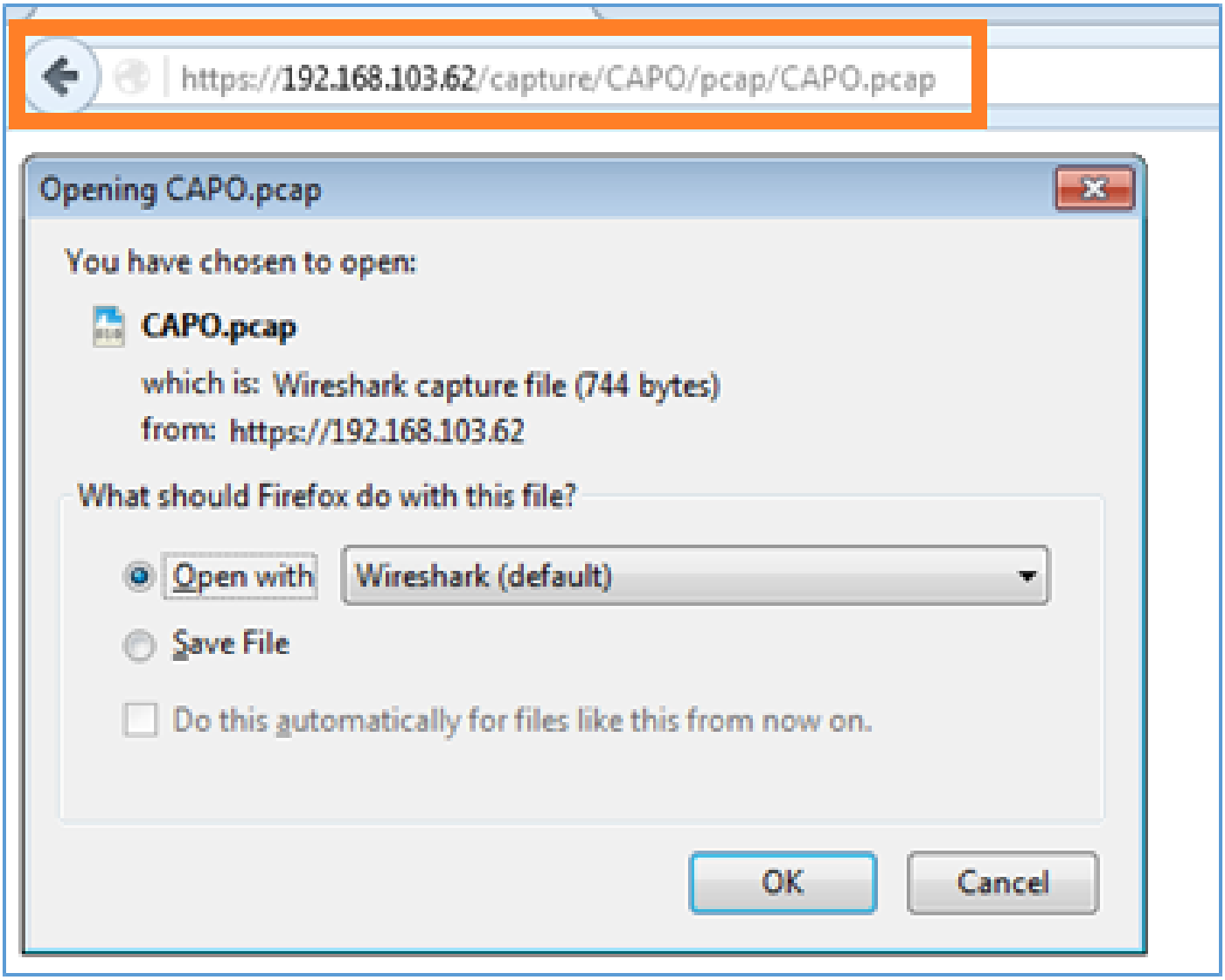


供参考：

https://192.168.103.62/capture/CAPI/pcap/CAPI.pcap	启用HTTP服务器的FTD数据接口的

	IP
https://192.168.103.62/capture/CAPI/pcap/CAPI.pcap	FTD捕获的名称
https://192.168.103.62/capture/CAPI/pcap/CAPI.pcap	下载的文件的名称

对于第二次捕获，请使用https://192.168.103.62/capture/CAPO/pcap/CAPO.pcap。



使用FTD LINA引擎捕获 — 通过FTP/TFTP/SCP导出捕获

要求

使用FTP/TFTP/SCP协议导出在早期场景中获取的捕获。

解决方案

将捕获导出到FTP服务器：

<#root>

firepower

 # copy /pcap capture:CAPI ftp://ftp_username:ftp_password@192.168.78.73/CAPI.pcap

Source capture name [CAPI]?

Address or name of remote host [192.168.78.73]?

Destination username [ftp_username]?

Destination password [ftp_password]?

Destination filename [CAPI.pcap]?
!!!!!!

114 packets copied in 0.170 secs

firepower#

将捕获导出到TFTP服务器：

<#root>

firepower

 # copy /pcap capture:CAPI tftp://192.168.78.73

Source capture name [CAPI]?

Address or name of remote host [192.168.78.73]?

Destination filename [CAPI]?
!!!!!!!!!!!!!!!

346 packets copied in 0.90 secs

firepower#

将捕获导出到SCP服务器：

<#root>

firepower#

copy /pcap capture:CAPI scp://scp_username:scp_password@192.168.78.55

Source capture name [CAPI]?

Address or name of remote host [192.168.78.55]?

```
Destination username [scp_username]?

Destination filename [CAPI]?
The authenticity of host '192.168.78.55 (192.168.78.55)' can't be established.
RSA key fingerprint is <cb:ca:9f:e9:3c:ef:e2:4f:20:f5:60:21:81:0a:85:f9:02:0d:0e:98:d0:9b:6c:dc:f9:af:4
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.78.55' (SHA256) to the list of known hosts.

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
454 packets copied in 3.950 secs (151 packets/sec)


firepower#
```

从FTD卸载捕获。 目前，当您需要从FTD卸载捕获时，最简单的方法是执行以下步骤：

1.从Lina - copy /pcap capture:<cap_name> disk0:

2.从FPR根 — mv /ngfw/mnt/disk0/<cap_name> /ngfw/var/common/

3.从FMC UI - System > Health > Monitor > Device > Advanced Troubleshooting，然后在字段中输入<cap_name>并下载。

使用FTD LINA引擎捕获 — 跟踪实际流量数据包

要求

使用以下过滤器在FTD上启用捕获：

源 IP	192.168.103.1
目的 IP	192.168.101.1
协议	ICMP
接口	内部
数据包跟踪	是
跟踪数据包的数量	100

从Host-A(192.168.103.1)Host-B(192.168.101.1)执行ping操作并检查捕获。

解决方案

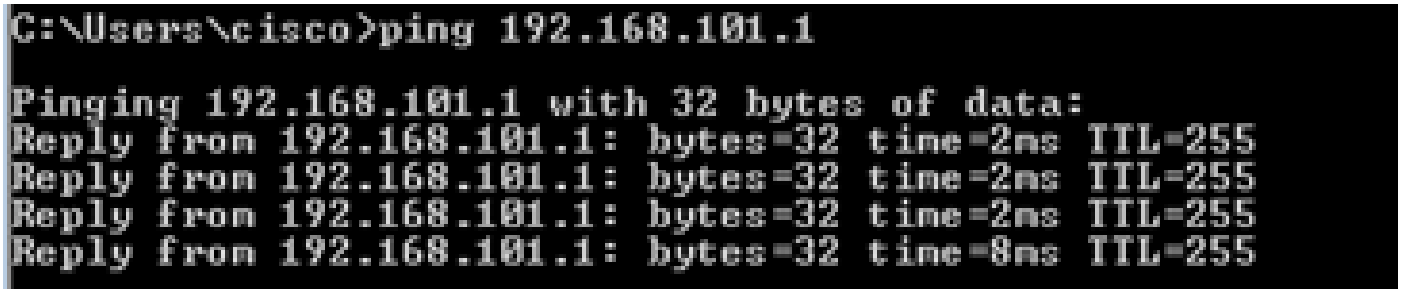
跟踪实际数据包对于排除连接问题非常有用。它允许您查看数据包经过的所有内部检查。添加trace detail关键字并指定要跟踪的数据包数量。默认情况下，FTD跟踪前50个入口数据包。

在这种情况下，为FTD在INSIDE接口上接收的前100个数据包启用带有跟踪详细信息的捕获：

<#root>

```
> capture CAPI2 interface INSIDE trace detail trace-count 100 match icmp host 192.168.103.1 host 192.168
```

从Host-A ping Host-B并检查结果：



捕获的数据包包括：

<#root>

```
> show capture CAPI2

8 packets captured
   1: 18:08:04.232989  802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   2: 18:08:04.234622  802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
   3: 18:08:05.223941  802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   4: 18:08:05.224872  802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
   5: 18:08:06.222309  802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   6: 18:08:06.223148  802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
   7: 18:08:07.220752  802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request
   8: 18:08:07.221561  802.1Q vlan#1577 P0 192.168.101.1 > 192.168.103.1: icmp: echo reply
8 packets shown
```

此输出显示第一个数据包的跟踪。感兴趣的部分：

- 在第12阶段，可以看到“正向流”。这是LINA引擎调度阵列（实际上是指内部操作顺序）。
- 阶段13是FTD将数据包发送到Snort实例的位置。
- 在第14阶段，可以看到Snort判定。

<#root>

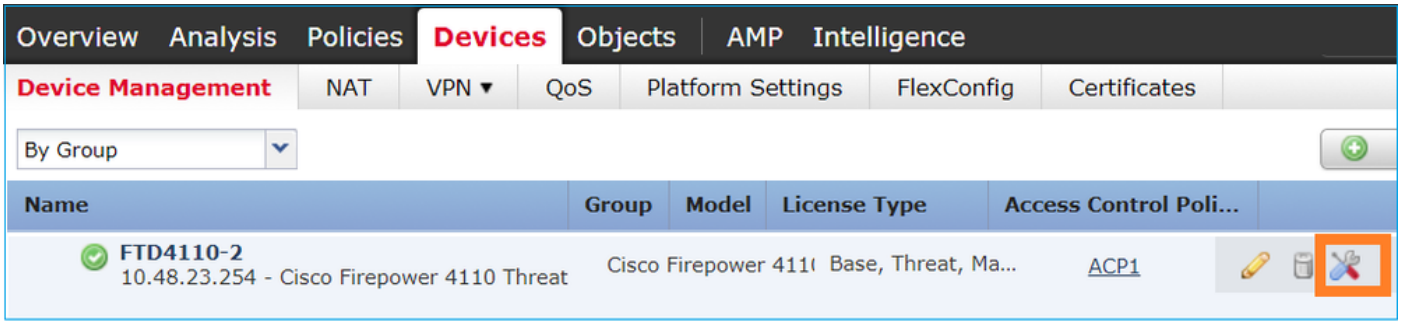
```
> show capture CAPI2 packet-number 1 trace detail
```

```
8 packets captured
   1: 18:08:04.232989 000c.2998.3fec a89d.2193.2293 0x8100 Length: 78
      802.1Q vlan#1577 P0 192.168.103.1 > 192.168.101.1: icmp: echo request (ttl 128, id 3346)
Phase: 1
Type: CAPTURE
... output omitted ...

Phase: 12
Type: FLOW-CREATION
Subtype:
Result: ALLOW
Config:
Additional Information:
New flow created with id 195, packet dispatched to next module
Module information for forward flow ...

snp_fp_inspect_ip_options
snp_fp_snort
snp_fp_inspect_icmp
snp_fp_adjacency
snp_fp_fragment
snp_ifc_stat


Module information for reverse flow ...

snp_fp_inspect_ip_options
snp_fp_inspect_icmp
snp_fp_snort
snp_fp_adjacency
snp_fp_fragment
snp_ifc_stat



Phase: 13
Type: EXTERNAL-INSPECT
Subtype:
Result: ALLOW
Config:
Additional Information:
Application: 'SNORT Inspect'

Phase: 14
Type: SNORT
Subtype:
Result: ALLOW
Config:
Additional Information:
Snort Verdict: (pass-packet) allow this packet


... output omitted ...

Result:
input-interface: OUTSIDE
input-status: up
input-line-status: up
output-interface: OUTSIDE
output-status: up
output-line-status: up
Action: allow

1 packet shown
```

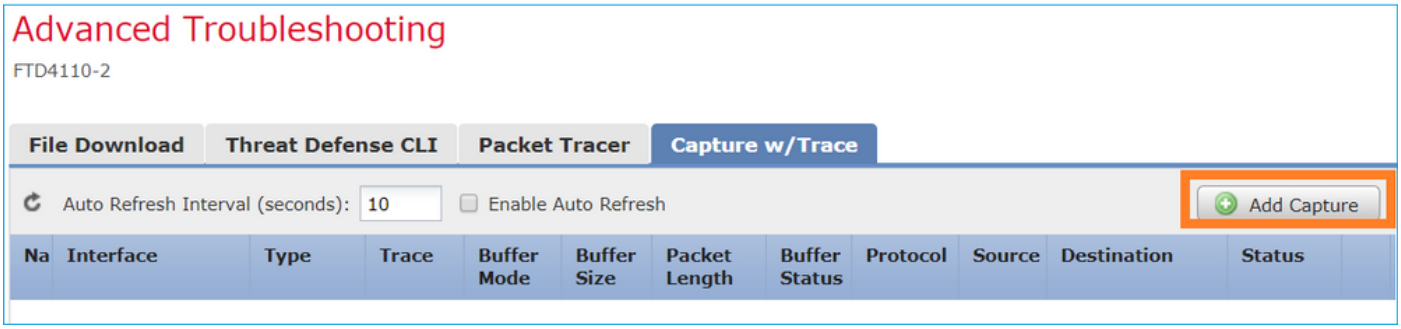
>

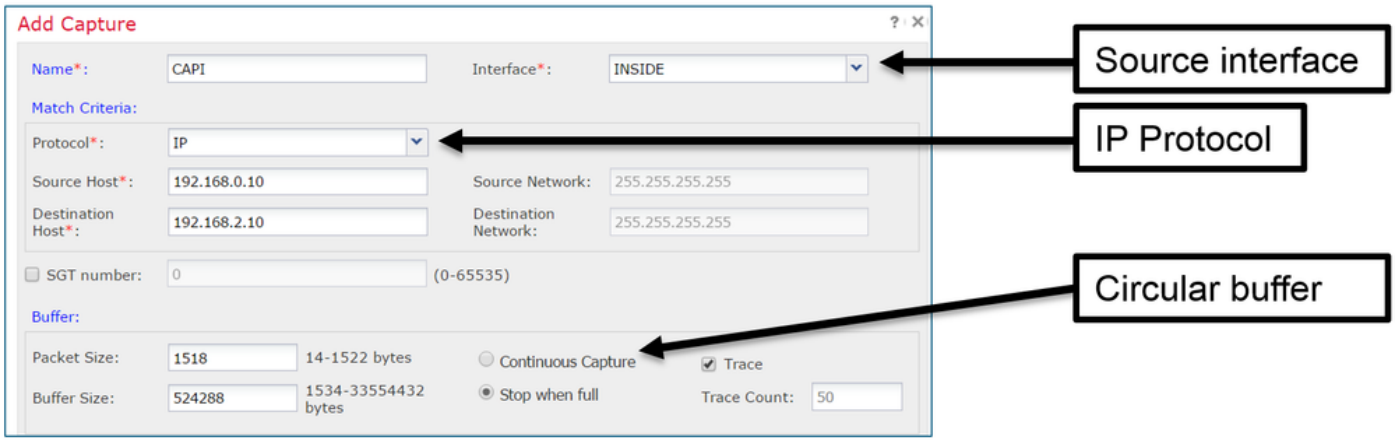
6.2以后FMC软件版本中的捕获工具

在FMC版本6.2.x中，引入了一个新的数据包捕获向导。导航到设备>设备管理，然后单击故障排除图标。然后选择Advanced Troubleshooting，最后选择Capture w/Trace。



选择Add Capture以创建FTD捕获：



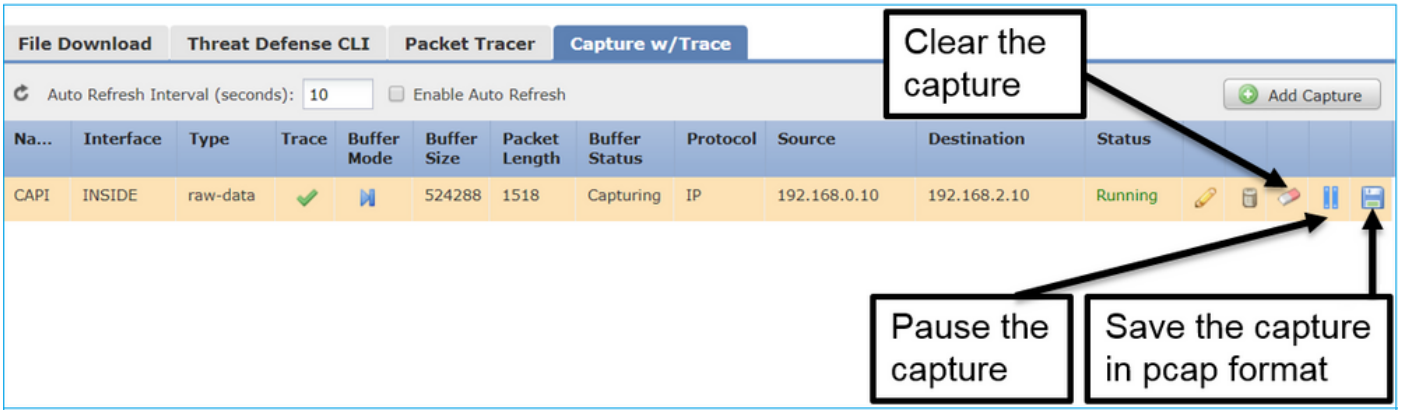


当前的FMC UI限制如下：

- 无法指定Src和Dst端口
- 只能匹配基本IP协议
- 无法为LINA引擎ASP丢弃启用捕获

解决方法 — 使用FTD CLI

从FMC UI应用捕获后，捕获会运行：



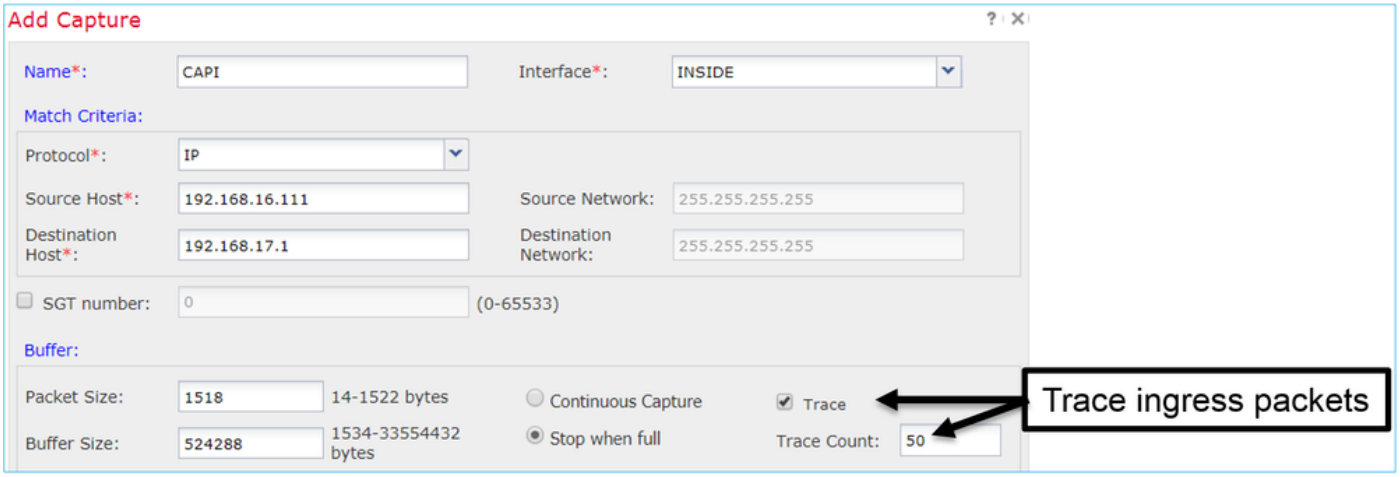
FTD CLI上的捕获：

<#root>

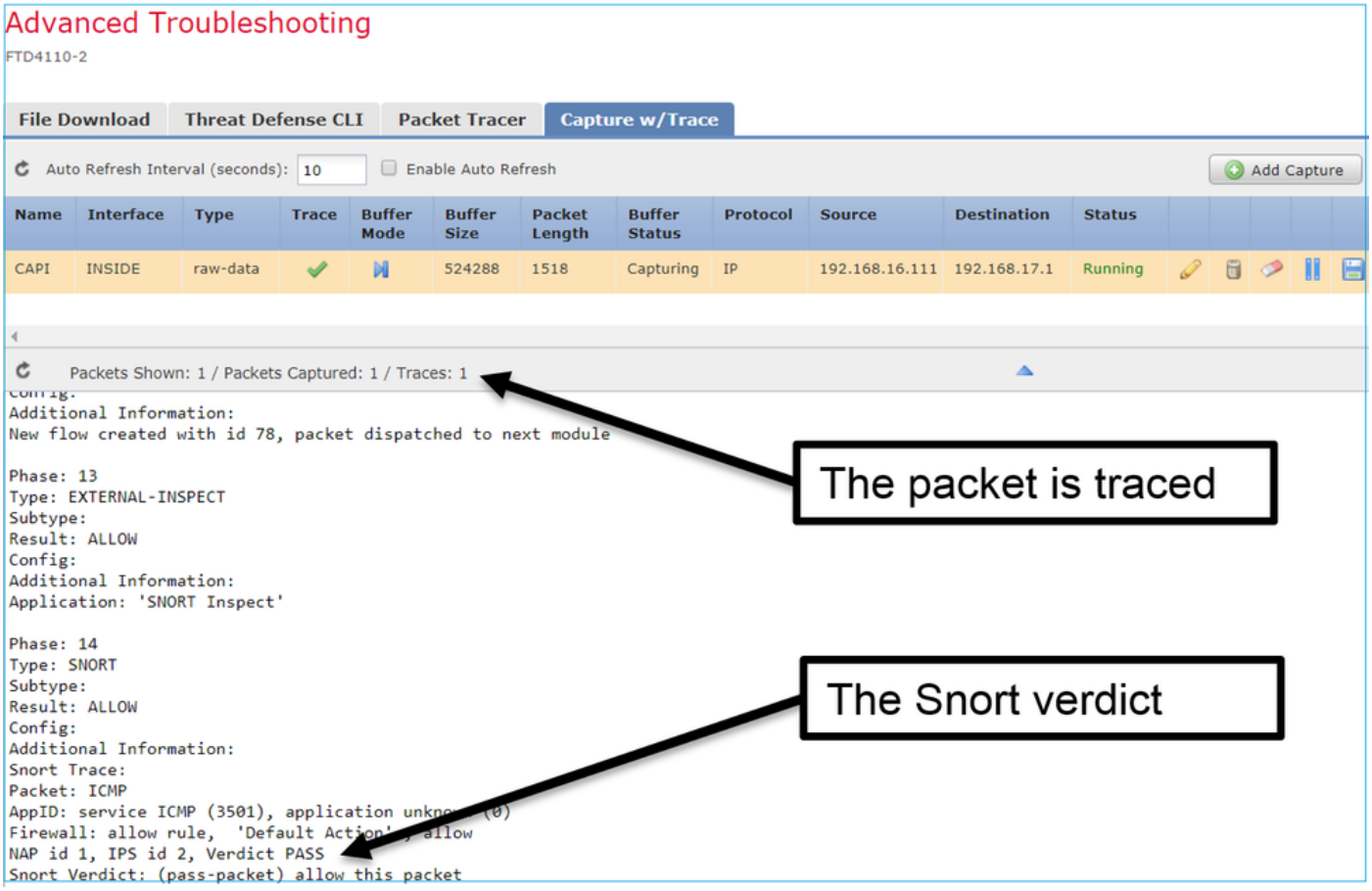
```
> show capture

capture CAPI%intf=INSIDE% type raw-data trace interface INSIDE [Capturing - 0 bytes]
  match ip host 192.168.0.10 host 192.168.2.10
>
```

在6.2之后FMC上跟踪实际数据包

在FMC 6.2.x上，Capture w/Trace向导允许您捕获和跟踪FTD上的实际数据包：



您可以在FMC UI中检查跟踪的数据包：



FTD Packet Tracer实用程序

要求

使用Packet Tracer实用程序处理此流，并检查内部处理数据包的方式：

Ingress 接口	内部
协议	ICMP回应请求
源 IP	192.168.103.1
目的 IP	192.168.101.1

解决方案

Packet Tracer生成虚拟数据包。如本例所示，数据包接受Snort检测。在Snort级别同时捕获的捕获(capture-traffic)显示ICMP回应请求：

<#root>

> packet-tracer input INSIDE icmp 192.168.103.1 8 0 192.168.101.1

```
Phase: 1
Type: CAPTURE
Subtype:
Result: ALLOW
Config:
Additional Information:
MAC Access list

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

Phase: 3
Type: ROUTE-LOOKUP
Subtype: Resolve Egress Interface
Result: ALLOW
Config:
Additional Information:
found next-hop 192.168.101.1 using egress ifc  OUTSIDE

Phase: 4
Type: ACCESS-LIST
Subtype: log
Result: ALLOW
Config:
access-group CSM_FW_ACL_ global
access-list CSM_FW_ACL_ advanced permit ip 192.168.103.0 255.255.255.0 192.168.101.0 255.255.255.0 rule
access-list CSM_FW_ACL_ remark rule-id 268436482: ACCESS POLICY: FTD5515 - Mandatory/1
access-list CSM_FW_ACL_ remark rule-id 268436482: L4 RULE: Allow ICMP
```

Additional Information:
This packet is sent to snort for additional processing where a verdict is reached

```
... output omitted ...

Phase: 12
Type: FLOW-CREATION
Subtype:
Result: ALLOW
Config:
Additional Information:
New flow created with id 203, packet dispatched to next module

Phase: 13
Type: SNORT
Subtype:
Result: ALLOW
Config:
Additional Information:
Snort Trace:
Packet: ICMP
AppID: service ICMP (3501), application unknown (0)
Firewall: allow rule, id 268440225, allow
NAP id 2, IPS id 0, Verdict PASS
```

```
Snort Verdict: (pass-packet) allow this packet


Result:
input-interface: INSIDE
input-status: up
input-line-status: up
output-interface: OUTSIDE
output-status: up
output-line-status: up
Action: allow

>
```

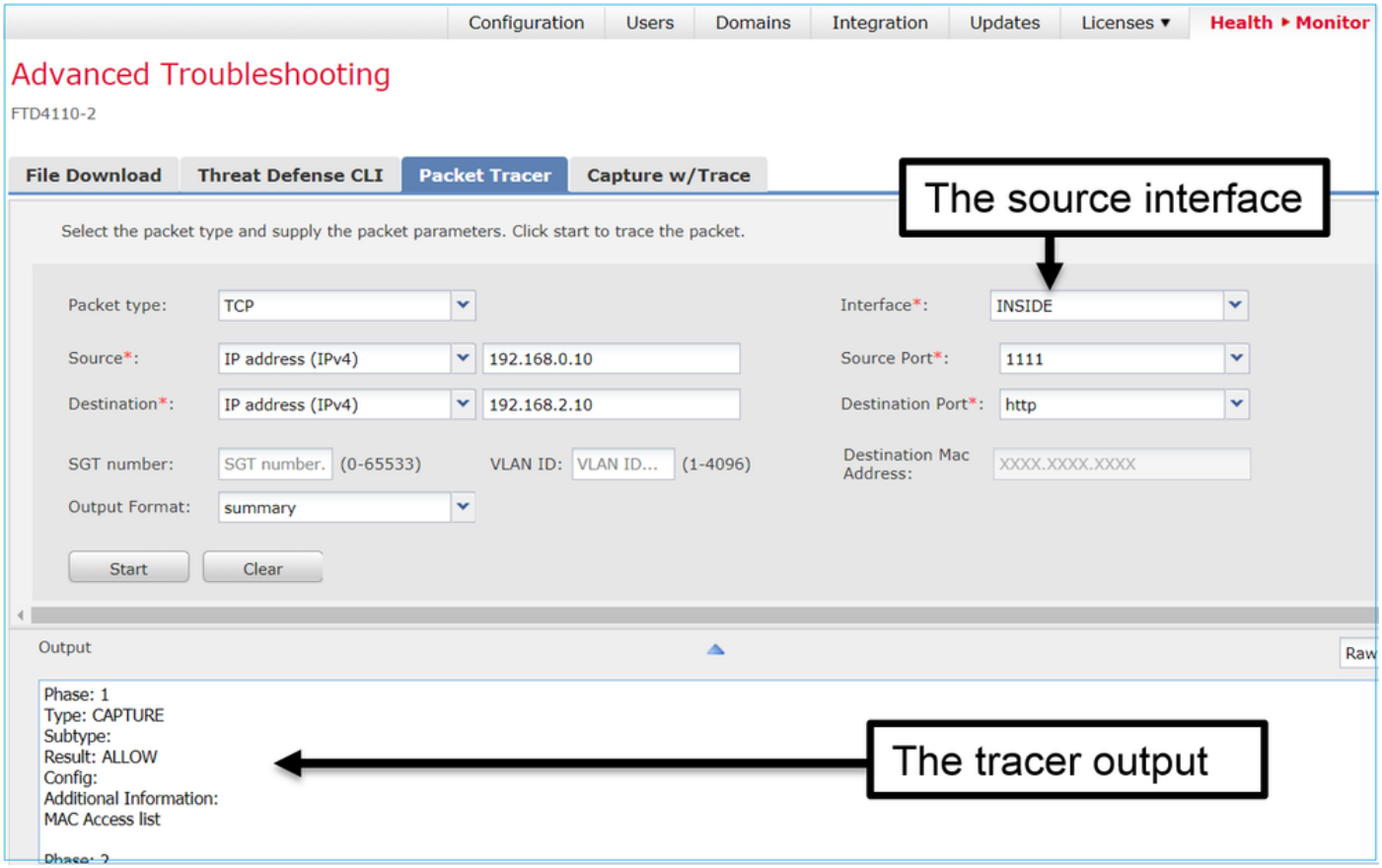
Packet Tracer测试时的Snort级别捕获显示虚拟数据包：

<#root>

```
>

capture-traffic


Please choose domain to capture traffic from:
  0 - management0
  1 - Router

Selection? 1

Please specify tcpdump options desired.
(or enter '?' for a list of supported options)
Options:

-n
13:27:11.939755 IP 192.168.103.1 > 192.168.101.1: ICMP echo request, id 0, seq 0, length 8
```

6.2以后FMC软件版本的Packet Tracer UI工具

在FMC版本6.2.x中引入了Packet Tracer UI工具。该工具与捕获工具以相同的方式访问，并允许您从FMC UI在FTD上运行Packet Tracer:



相关信息

- [Firepower威胁防御命令参考指南]
- [Firepower系统版本说明，版本6.1.0]
- [适用于Firepower设备管理器的思科Firepower威胁防御配置指南，版本6.1]
- [技术支持和文档 - Cisco Systems]

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