Configure and Verify Secure Firewall and Firepower Internal Switch Captures

Contents

Introduction

This document describes the configuration and verification of the Firepower, and the Secure Firewall internal switch captures.

Prerequisites

Requirements

Basic product knowledge, capture analysis.

Components Used

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

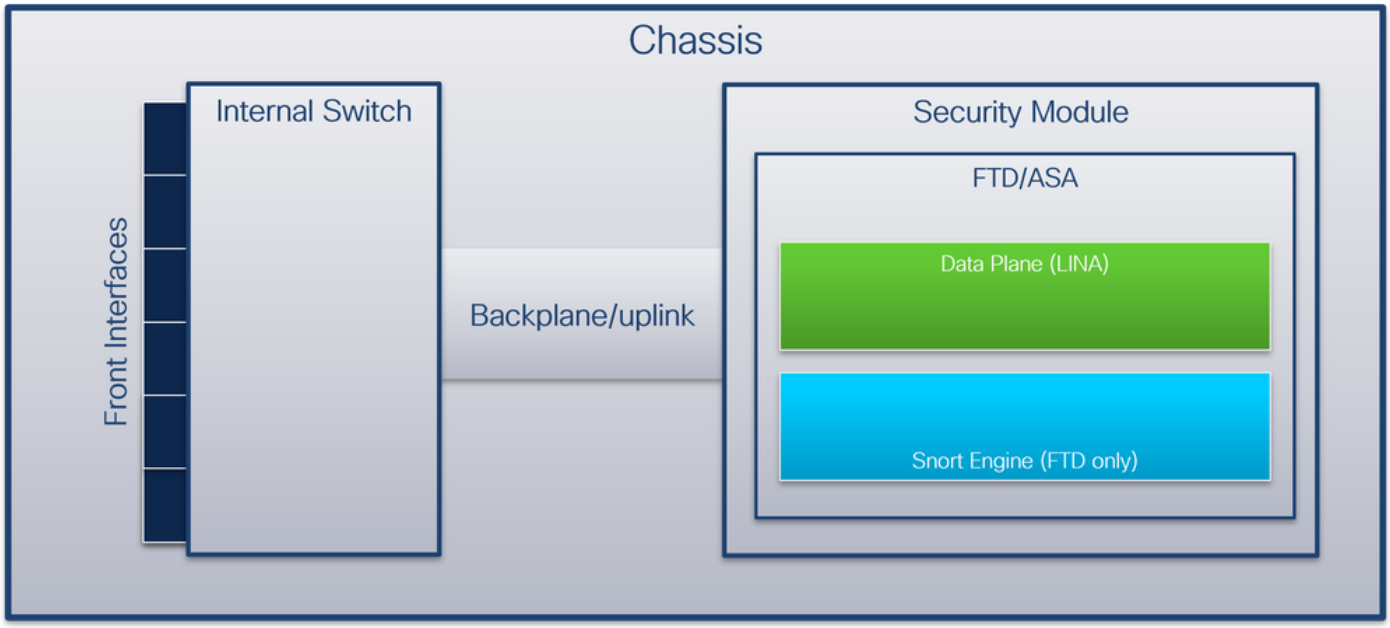
The information in this document is based on these software and hardware versions:

- Secure Firewall 31xx
- Firepower 41xx
- Firepower 93xx
- Cisco Secure eXtensible Operating System (FXOS) 2.12.0.x
- Cisco Secure Firewall Threat Defense (FTD) 7.2.0.x
- Cisco Secure Firewall Management Center (FMC) 7.2.0.x
- Cisco Secure Firewall Device Manager (FDM) 7.2.0.x
- Adaptive Security Appliance (ASA) 9.18(1)x
- Adaptive Security Appliance Device Manager (ASDM) 7.18.1.x
- Wireshark 3.6.7 (https://www.wireshark.org/download.html)

Background Information

High-Level Overview of the System Architecture

From the packet flow perspective, the architecture of the Firepower 4100/9300 and Secure Firewall 3100 can be visualized as shown in this figure:



The chassis includes these components:

- **Internal switch** – forwards packet from the network to the application and vice versa. The internal switch is connected to the **front interfaces** that reside on the built-in interface module or external network modules and connect to external devices, for example, switches. Examples of front interfaces are Ethernet 1/1, Ethernet 2/4, and so on. The “front” is not a strong technical definition. In this document, it is used to distinguish interfaces connected to external devices from the backplane or uplink interfaces.

- **Backplane or uplink** – an internal interface that connects the security module (SM) to the internal switch. This table shows backplane interfaces on Firepower 4100/9300 and uplink interface on Secure Firewall 3100:

Platform	Number of supported security modules	Backplane/uplink interfaces	Mapped applicati interfaces
Firepower 4100 (except Firepower 4110/4112)	1	SM1: Ethernet1/9 Ethernet1/10	Internal-Data0/0 Internal-Data0/1
Firepower 4110/4112	1	Ethernet1/9	Internal-Data0/0
Firepower 9300	3	SM1: Ethernet1/9 Ethernet1/10 SM2: Ethernet1/11 Ethernet1/12 SM3: Ethernet1/13 Ethernet1/14	Internal-Data0/0 Internal-Data0/1 Internal-Data0/0 Internal-Data0/1 Internal-Data0/0 Internal-Data0/1
Secure Firewall 3100	1	SM1: in_data_uplink1	Internal-Data0/1

In the case of 2 backplane interfaces per module, the internal switch and the applications on the modules perform traffic load-balancing over the 2 interfaces.

- **Security module, security engine,** or **blade** – the module where applications such as FTD or ASA are installed. Firepower 9300 supports up to 3 security modules.
- **Mapped application interface** - applications, such as FTD or ASA, map the backplane or uplink interfaces to internal interfaces. In other words, the backplane or uplink interfaces are visible as internal interfaces in applications.

Use the **show interface detail** command to verify internal interfaces:

```
> show interface detail | grep Interface
Interface Internal-Control0/0 "ha_ctl_nlp_int_tap", is up, line protocol is up
 Control Point Interface States:
       Interface number is 6
       Interface config status is active
       Interface state is active
Interface Internal-Data0/0 "", is up, line protocol is up
 Control Point Interface States:
       Interface number is 2
       Interface config status is active
       Interface state is active
Interface Internal-Data0/1 "", is up, line protocol is up
 Control Point Interface States:
       Interface number is 3
       Interface config status is active
       Interface state is active
Interface Internal-Data0/2 "nlp_int_tap", is up, line protocol is up
 Control Point Interface States:
       Interface number is 4
       Interface config status is active
```

```
       Interface state is active
Interface Internal-Data0/3 "ccl_ha_nlp_int_tap", is up, line protocol is up
 Control Point Interface States:
       Interface number is 5
       Interface config status is active
       Interface state is active
Interface Internal-Data0/4 "cmi_mgmt_int_tap", is up, line protocol is up
 Control Point Interface States:
       Interface number is 7
       Interface config status is active
       Interface state is active
Interface Port-channel6.666 "", is up, line protocol is up
Interface Ethernet1/1 "diagnostic", is up, line protocol is up
 Control Point Interface States:
       Interface number is 8
       Interface config status is active
       Interface state is active
```

High-Level Overview of the Internal Switch Operations

Firepower 4100/9300

To make a forwarding decision the internal switch uses an **interface VLAN tag**, or **port VLAN tag**, and a **virtual network tag (VN-tag)**.

The port VLAN tag is used by the internal switch to identify an interface. The switch inserts the port VLAN tag into each ingress packet that came on front interfaces. The VLAN tag is automatically configured by the system and cannot be manually changed. The tag value can be checked in the **fxos** command shell:

```
firepower# connect fxos
…
firepower(fxos)# show run int e1/2
!Command: show running-config interface Ethernet1/2
!Time: Tue Jul 12 22:32:11 2022

version 5.0(3)N2(4.120)

interface Ethernet1/2
 description U: Uplink
 no lldp transmit
 no lldp receive
 no cdp enable
 switchport mode dot1q-tunnel
 switchport trunk native vlan 102
 speed 1000
 duplex full
 udld disable
 no shutdown
```

The VN-tag is also inserted by the internal switch and used to forward the packets to the application. It is automatically configured by the system and cannot be manually changed.

The port VLAN tag and the VN-tag are shared with the application. The application inserts the respective egress interface VLAN tags and the VN-tags into each packet. When a packet from the application is received by the internal switch on the backplane interfaces, the switch reads the egress interface VLAN tag and the VN-tag, identifies the application and the egress interface, strips the port VLAN tag and the VN-tag, and forwards the packet to the network.

Secure Firewall 3100

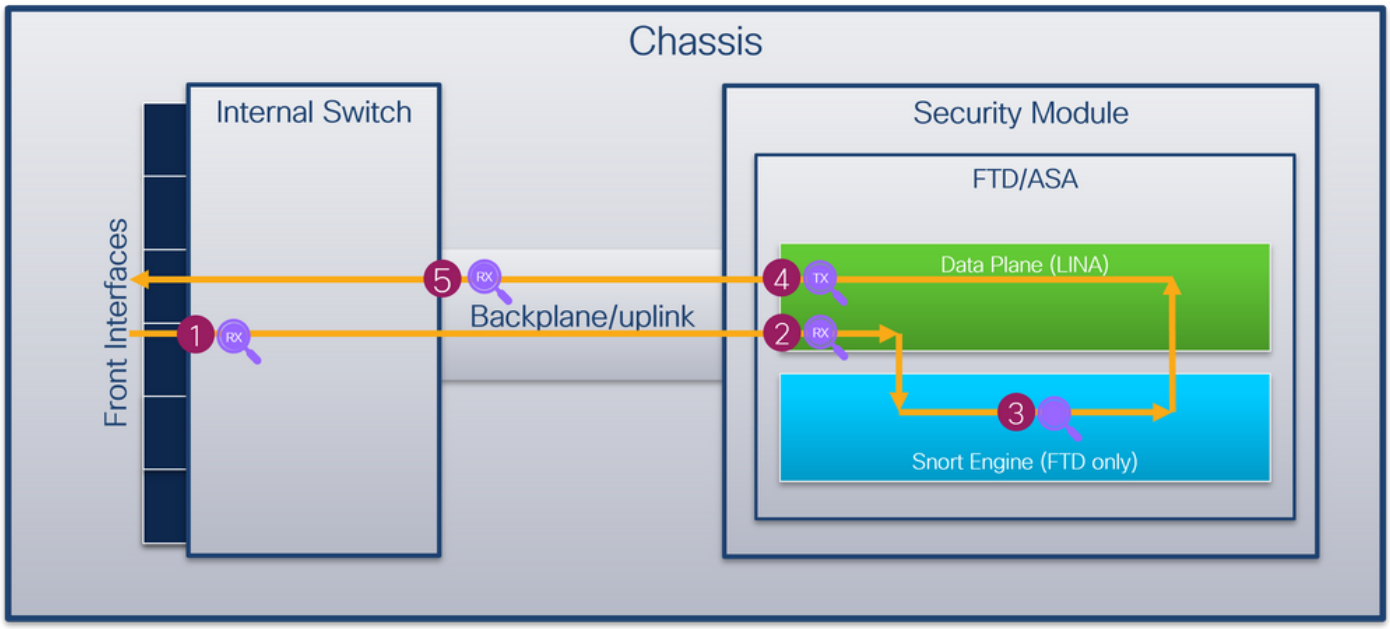
Like in Firepower 4100/9300, the port VLAN tag is used by the internal switch to identify an interface.

The port VLAN tag is shared with the application. The application inserts the respective egress interface VLAN tags into each packet. When a packet from the application is received by the internal switch on the uplink interface, the switch reads the egress interface VLAN tag, identifies the egress interface, strips the port VLAN tag, and forwards the packet to the network.

Packet Flow and Capture Points

The Firepower 4100/9300 and the Secure Firewall 3100 firewalls support packet captures on the interfaces of the internal switch.

This figure shows the packet capture points along the packet path within the chassis and the application:



The capture points are:

1. Internal switch front interface ingress capture point. A front interface is any interface connected to the peer devices such as switches.
2. Data plane interface ingress capture point
3. Snort capture point
4. Data plane interface egress capture point
5. Internal switch backplane or uplink ingress capture point. A backplane or uplink interface connects the internal switch to the application.

The internal switch supports only ingress interface captures. That is only the packets received from the network or from the ASA/FTD application can be captured. **Egress packet captures are not supported.**

Configuration and Verification on Firepower 4100/9300

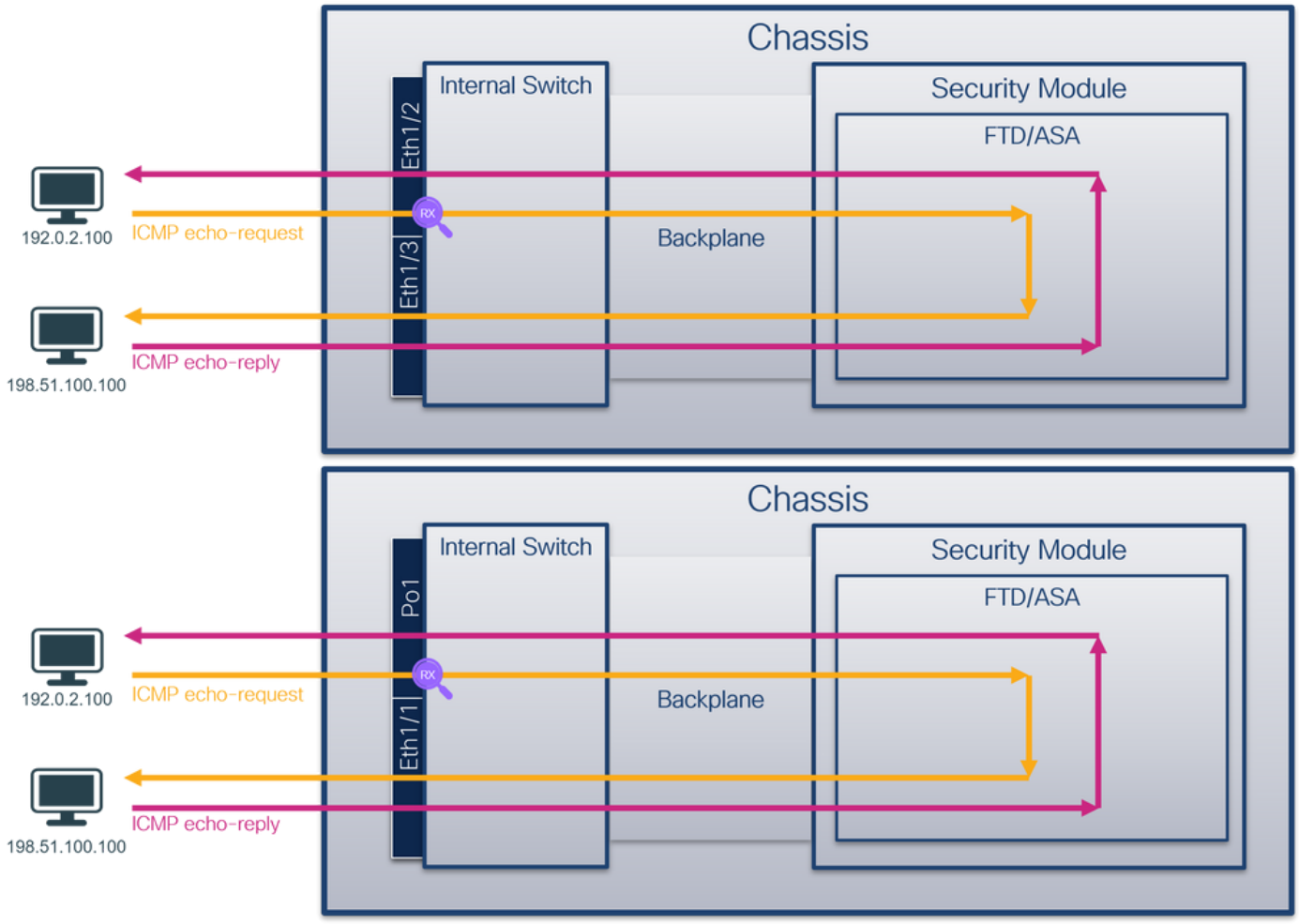
The Firepower 4100/9300 internal switch captures can be configured in **Tools > Packet Capture** on FCM or in **scope packet-capture** in FXOS CLI**.** For the description of the packet capture options refer to the *Cisco Firepower 4100/9300 FXOS Chassis Manager Configuration Guide* or *Cisco Firepower 4100/9300 FXOS CLI Configuration Guide*, chapter **Troubleshooting**, section **Packet Capture**.

These scenarios cover common use cases of Firepower 4100/9300 internal switch captures.

Packet Capture on a Physical or Port-channel Interface

Use the FCM and CLI to configure and verify a packet capture on interface Ethernet1/2 or Portchannel1 interface. In the case of a port-channel interface, ensure to select all physical member interfaces.

Topology, packet flow, and the capture points

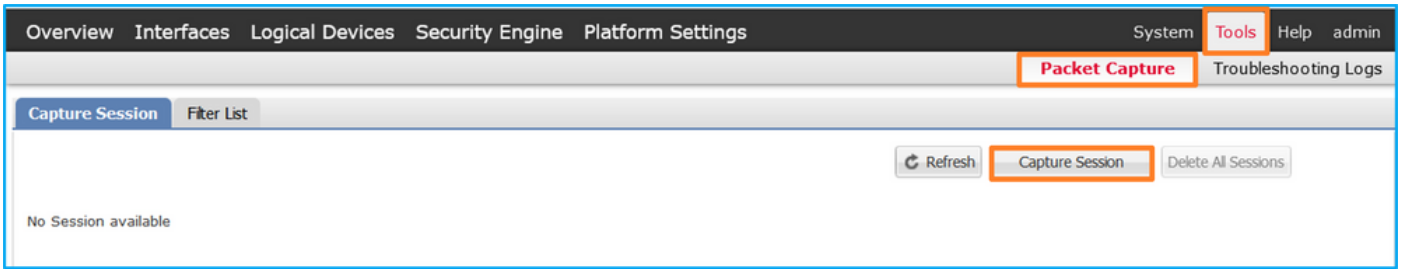


Configuration

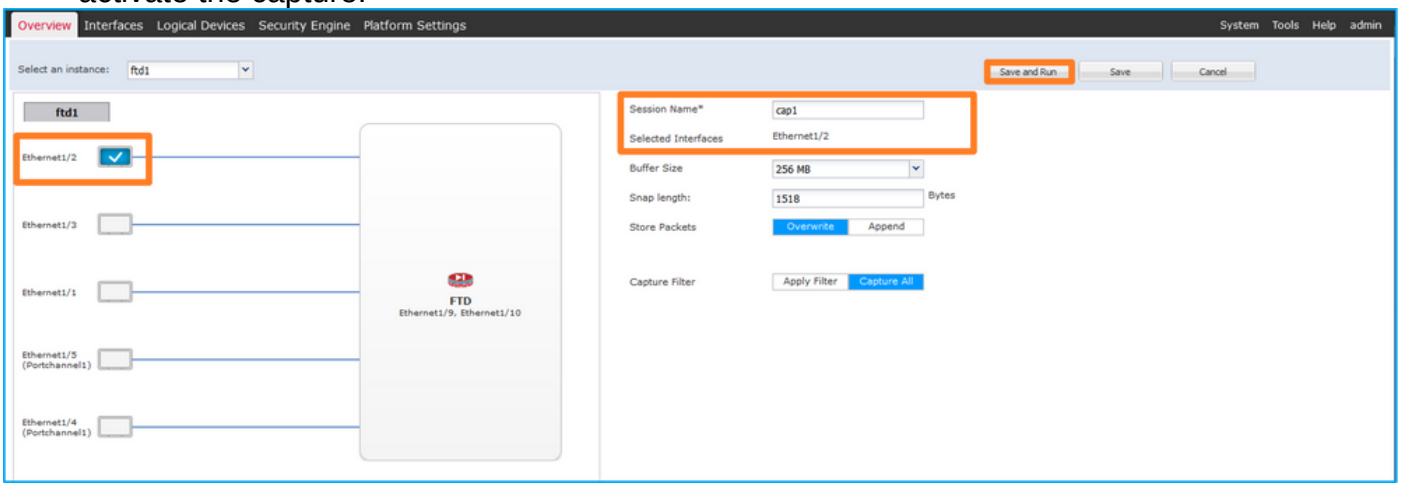
FCM

Follow these steps on FCM to configure a packet capture on interfaces Ethernet1/2 or Portchannel1:

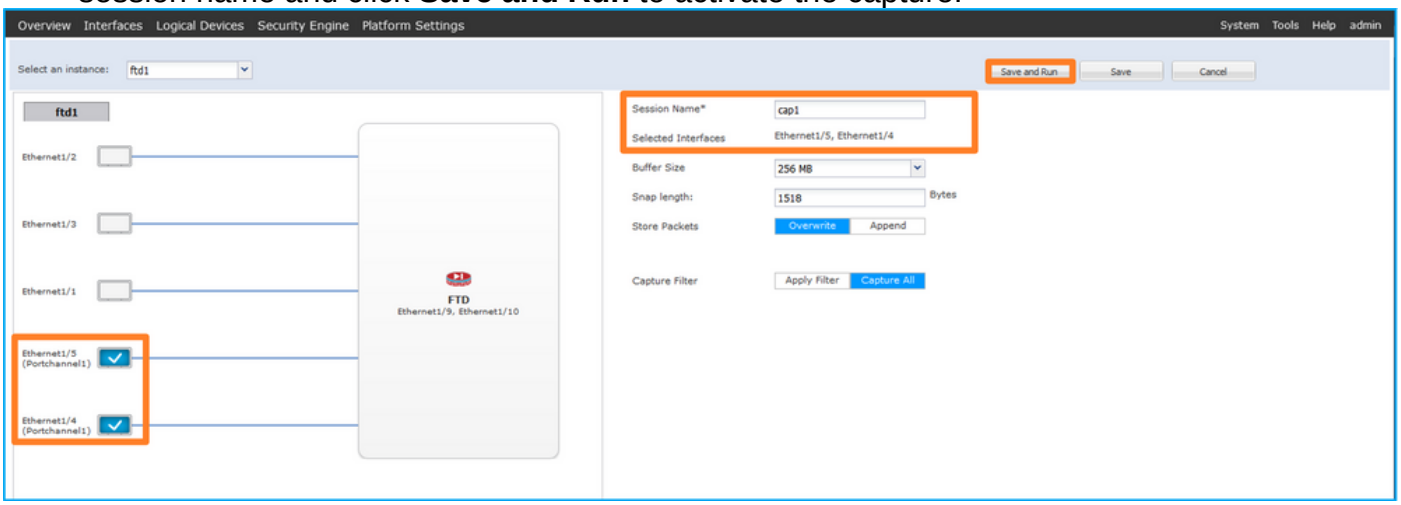
1. Use **Tools > Packet Capture > Capture Session** to create a new capture session**:**



2. Select the interface **Ethernet1/2**, provide the session name and click **Save and Run** to activate the capture:



3. In the case of a port-channel interface, select all physical member interfaces, provide the session name and click **Save and Run** to activate the capture:



FXOS CLI

Follow these steps on FXOS CLI to configure a packet capture on interfaces Ethernet1/2 or Portchannel1:

1. Identify the application type and identifier:

```
firepower# scope ssa
firepower /ssa # show app-instance
App Name    Identifier Slot ID     Admin State Oper State       Running Version Startup Version
Deploy Type Turbo Mode Profile Name Cluster State   Cluster Role
---------- ---------- ---------- ----------- --------------- -------------- -------------- --
--------- ---------- ------------ -------------- ------------
ftd         ftd1       1          Enabled     Online          7.2.0.82       7.2.0.82
```

```
Native      No                    Not Applicable  None
```

2. In the case of a port-channel interface, identify its member interfaces:

```
firepower# connect fxos
<output skipped>
firepower(fxos)# show port-channel summary
Flags:  D - Down        P - Up in port-channel (members)
       I - Individual  H - Hot-standby (LACP only)
       s - Suspended   r - Module-removed
       S - Switched    R - Routed
       U - Up (port-channel)
       M - Not in use. Min-links not met
--------------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
     Channel
--------------------------------------------------------------------------------
1     Po1(SU)     Eth      LACP      Eth1/4(P)    Eth1/5(P)
```

3. Create a capture session:

```
firepower# scope packet-capture
firepower /packet-capture # create session cap1
firepower /packet-capture/session* # create phy-port Eth1/2
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* # enable
firepower /packet-capture/session* # commit
firepower /packet-capture/session #
```

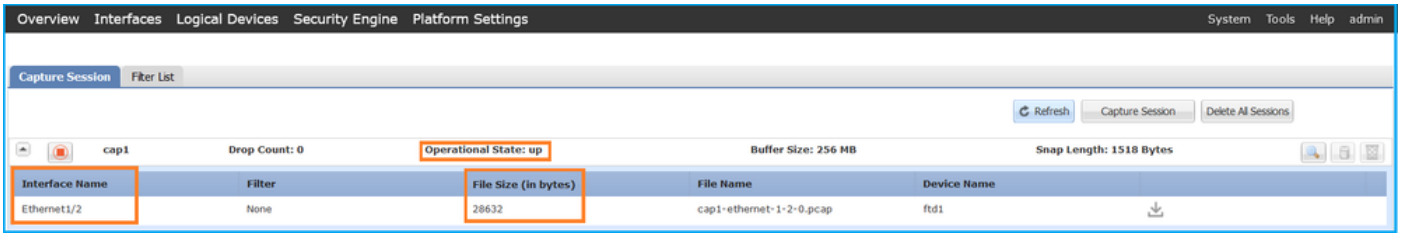
For port-channel interfaces, a separate capture for each member interface is configured:

```
firepower# scope packet-capture
firepower /packet-capture # create session cap1
firepower /packet-capture/session* # create phy-port Eth1/4
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* # create phy-port Eth1/5
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* # enable
firepower /packet-capture/session* # commit
firepower /packet-capture/session #
```

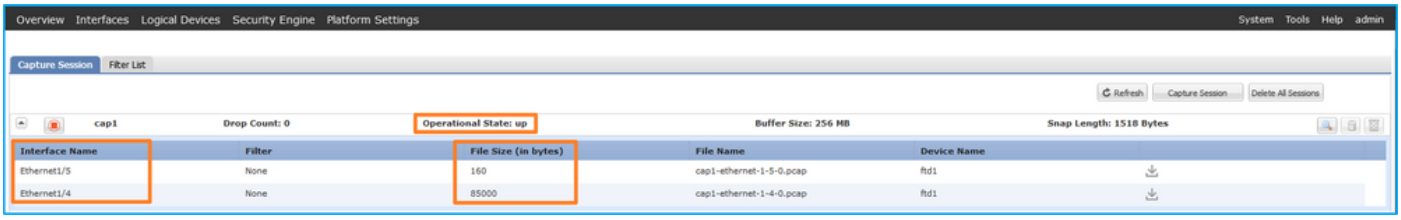
Verification

FCM

Verify the **Interface Name**, ensure that the **Operational Status** is up and that the **File Size (in bytes)** increases:



Portchannel1 with member interfaces Ethernet1/4 and Ethernet1/5:



FXOS CLI

Verify the capture details in **scope packet-capture**:

```
firepower# scope packet-capture
firepower /packet-capture # show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
    Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
    Slot Id: 1
    Port Id: 2
    Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-2-0.pcap
    Pcapsize: 75136  bytes
   Filter:
   Sub Interface: 0
    Application Instance Identifier: ftd1
    Application Name: ftd
```

Port-channel 1 with member interfaces Ethernet1/4 and Ethernet1/5:

```
firepower# scope packet-capture
firepower /packet-capture # show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
    Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
```

```
Slot Id: 1
 Port Id: 4
 Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-4-0.pcap
 Pcapsize: 310276  bytes
Filter:
Sub Interface: 0
 Application Instance Identifier: ftd1
 Application Name: ftd

Slot Id: 1
 Port Id: 5
 Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-5-0.pcap
 Pcapsize: 160  bytes
Filter:
Sub Interface: 0
 Application Instance Identifier: ftd1
 Application Name: ftd
```

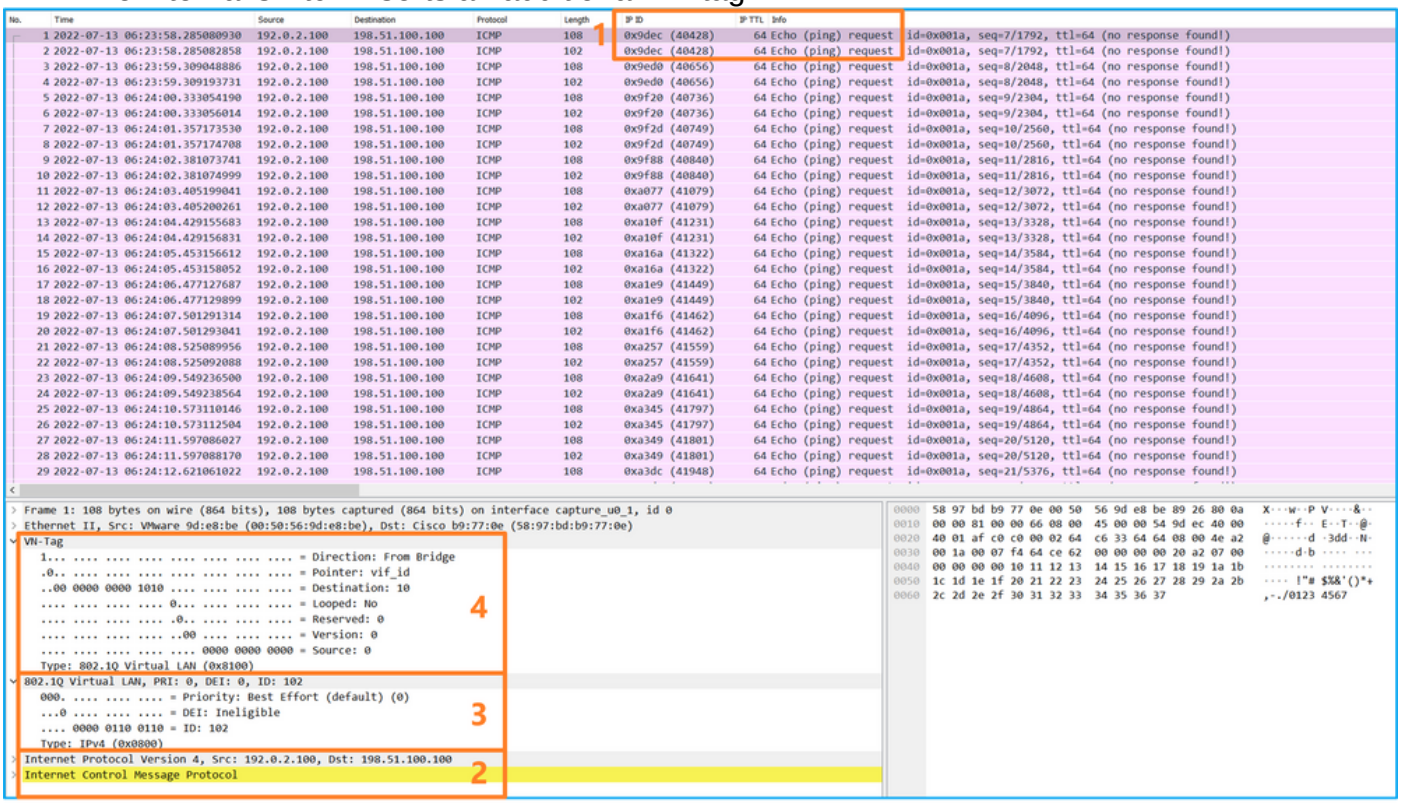
Collect capture files

Follow the steps in the section **Collect Firepower 4100/9300 Internal Switch Capture Files**.

Capture file analysis

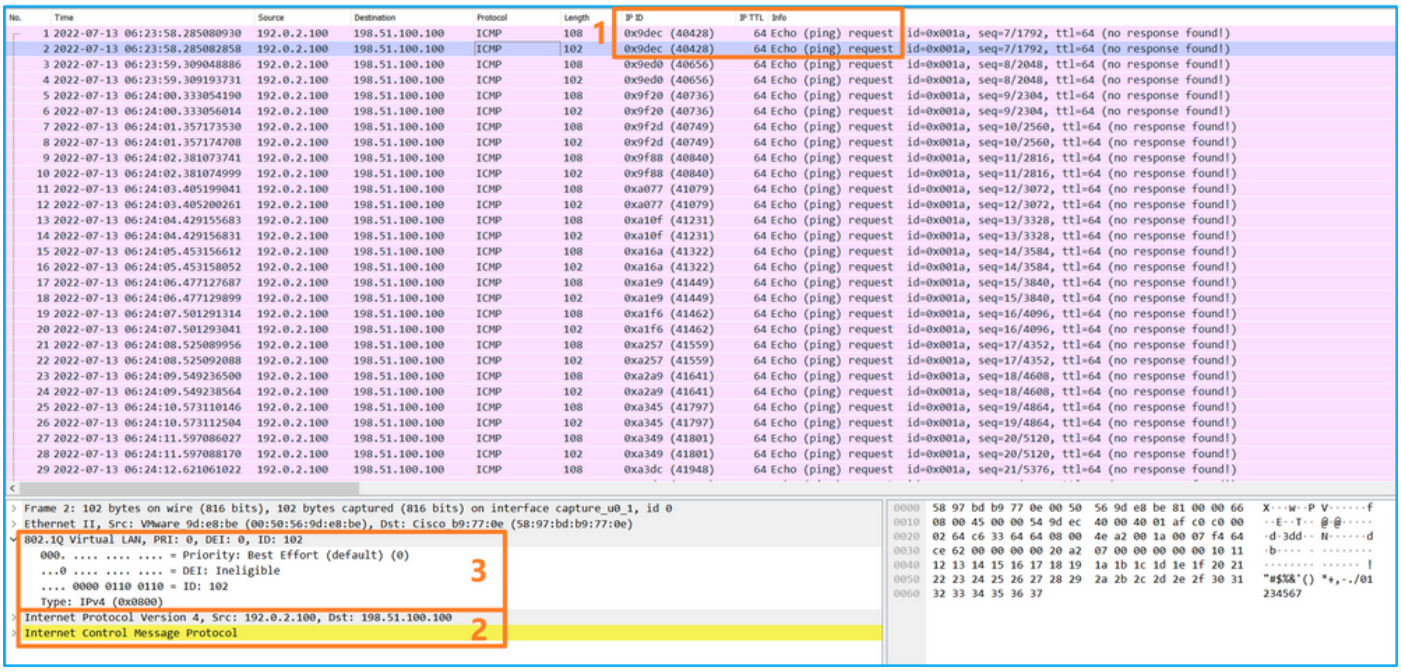
Use a packet capture file reader application to open the capture file for Ethernet1/2. Select the first packet and check the key points:

1. Only ICMP echo-request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the ingress interface Ethernet1/2.
4. The internal switch inserts an additional VN tag.



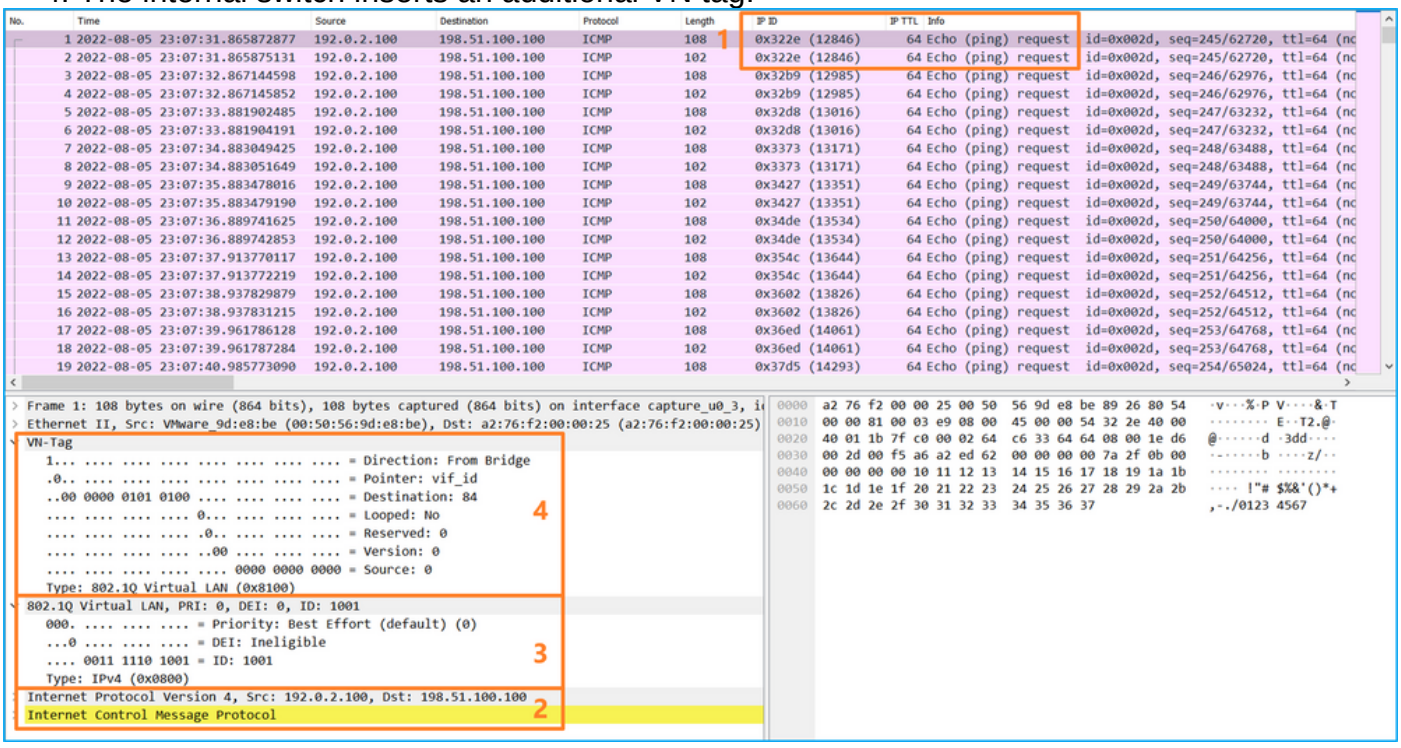
Select the second packet and check the key points:

1. Only ICMP echo-request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the ingress interface Ethernet1/2.



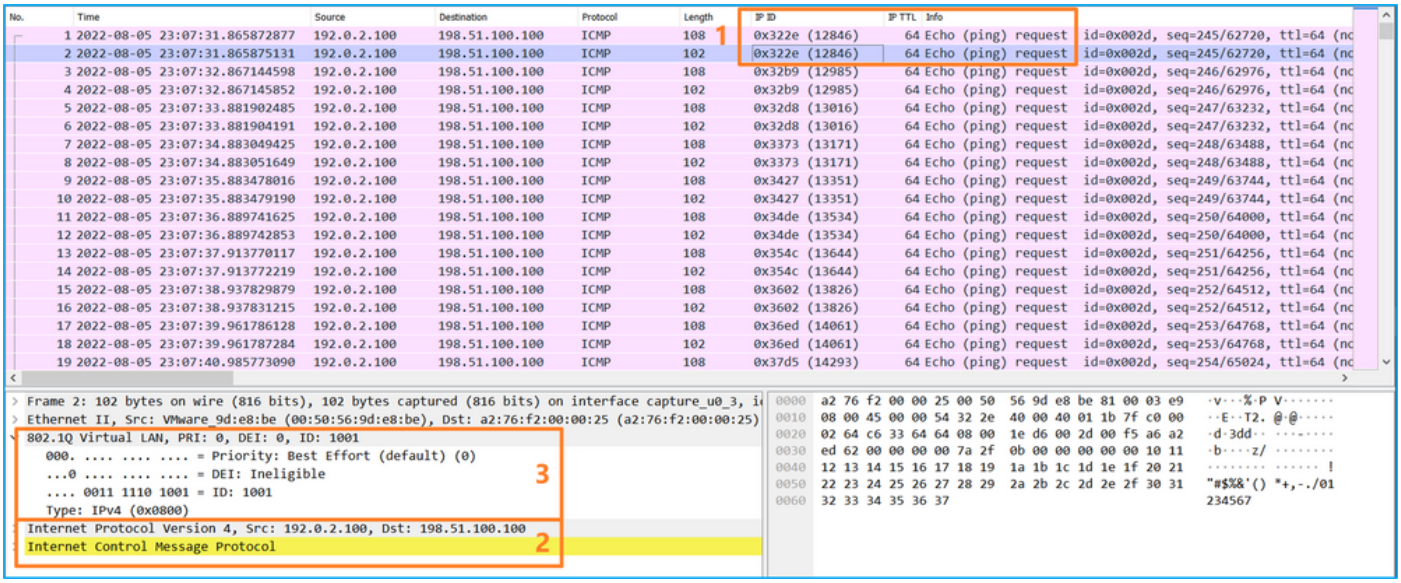
Open the capture files for Portchannel1 member interfaces. Select the first packet and check the key points:

1. Only ICMP echo-request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts an additional port VLAN tag **1001** that identifies the ingress interface Portchannel1.
4. The internal switch inserts an additional VN tag.



Select the second packet and check the key points:

1. Only ICMP echo-request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts an additional port VLAN tag **1001** that identifies the ingress interface Portchannel1.



Explanation

When a packet capture on a front interface is configured, the switch simultaneously captures each packet twice:

- After the insertion of the port VLAN tag.
- After the insertion of the VN tag.

In the order of operations, the VN tag is inserted at a later stage than the port VLAN tag insertion. However, in the capture file, the packet with the VN tag is shown earlier than the packet with the port VLAN tag.

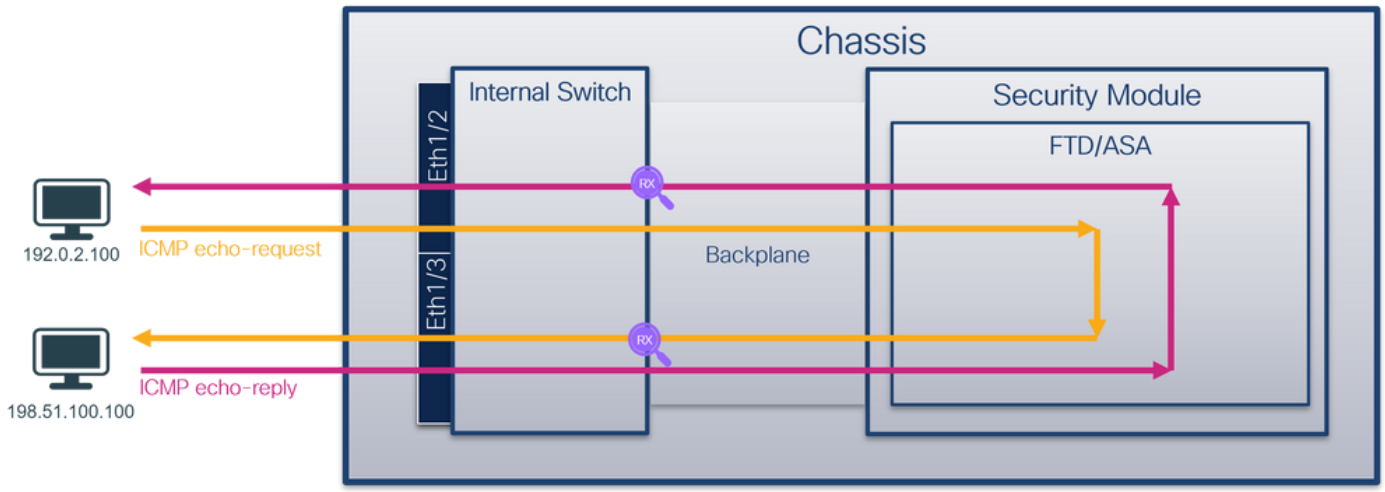
This table summarizes the task:

Task	Capture point	Internal port VLAN in captured packets	Direction	Captured traffic
Configure and verify a packet capture on interface Ethernet1/2	Ethernet1/2	102	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.1
Configure and verify a packet capture on interface Portchannel1 with member interfaces Ethernet1/4 and Ethernet1/5	Ethernet1/4 Ethernet1/5	1001	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.1

Packet Captures on Backplane Interfaces

Use the FCM and CLI to configure and verify a packet capture on backplane interfaces.

Topology, packet flow, and the capture points

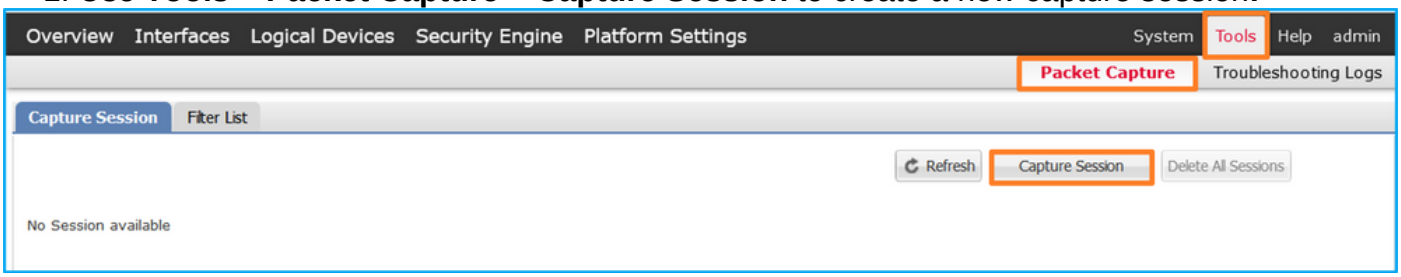


Configuration

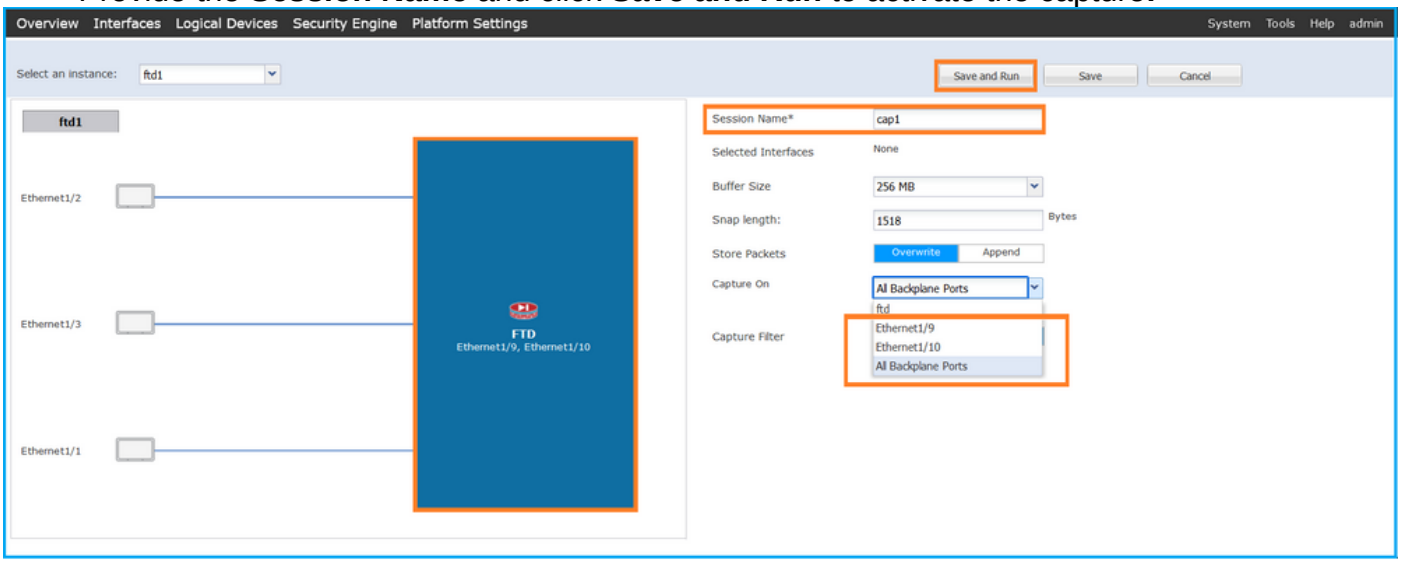
FCM

Follow these steps on FCM to configure packet captures on backplane interfaces:

1. Use **Tools > Packet Capture > Capture Session** to create a new capture session**:**



2. To capture packets on all backplane interfaces, select the application, then **All Backplane Ports** from the **Capture On** the dropdown list. Alternatively, choose the specific backplane interface. In this case, backplane interfaces Ethernet1/9 and Ethernet1/10 are available. Provide the **Session Name** and click **Save and Run** to activate the capture**:**



FXOS CLI

Follow these steps on FXOS CLI to configure packet captures on backplane interfaces:

1. Identify the application type and identifier:

```
firepower# scope ssa
firepower /ssa# show app-instance
App Name   Identifier Slot ID    Admin State Oper State       Running Version Startup Version
Deploy Type Turbo Mode Profile Name Cluster State   Cluster Role
---------- ---------- ---------- ----------- --------------- -------------- -------------- --
--------- ---------- ------------ --------------- ------------
ftd        ftd1       1          Enabled     Online          7.2.0.82       7.2.0.82
Native      No                      Not Applicable  None
```

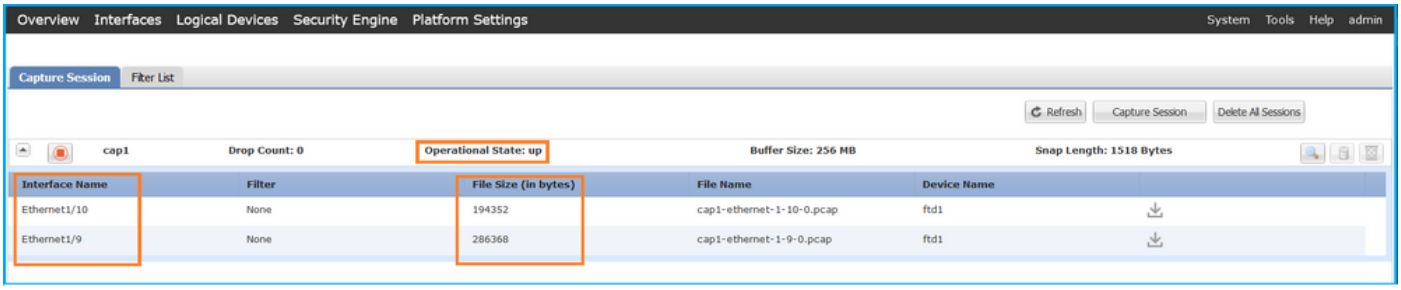
2. Create a capture session:

```
firepower# scope packet-capture
firepower /packet-capture # create session cap1
firepower /packet-capture/session* # create phy-port Eth1/9
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* #  create phy-port Eth1/10
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* # enable
firepower /packet-capture/session* # commit
firepower /packet-capture/session #
```

Verification

FCM

Verify the **Interface Name**, ensure that the **Operational Status** is up and that the **File Size (in bytes)** increases:



FXOS CLI

Verify the capture details in **scope packet-capture**:

```
firepower# scope packet-capture
firepower /packet-capture #  show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
   Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
```

```
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
   Slot Id: 1
    Port Id: 10
    Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-10-0.pcap
    Pcapsize: 1017424  bytes
   Filter:
   Sub Interface: 0
    Application Instance Identifier: ftd1
    Application Name: ftd

    Slot Id: 1
    Port Id: 9
    Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-9-0.pcap
    Pcapsize: 1557432  bytes
   Filter:
   Sub Interface: 0
    Application Instance Identifier: ftd1
    Application Name: ftd
```

Collect capture files

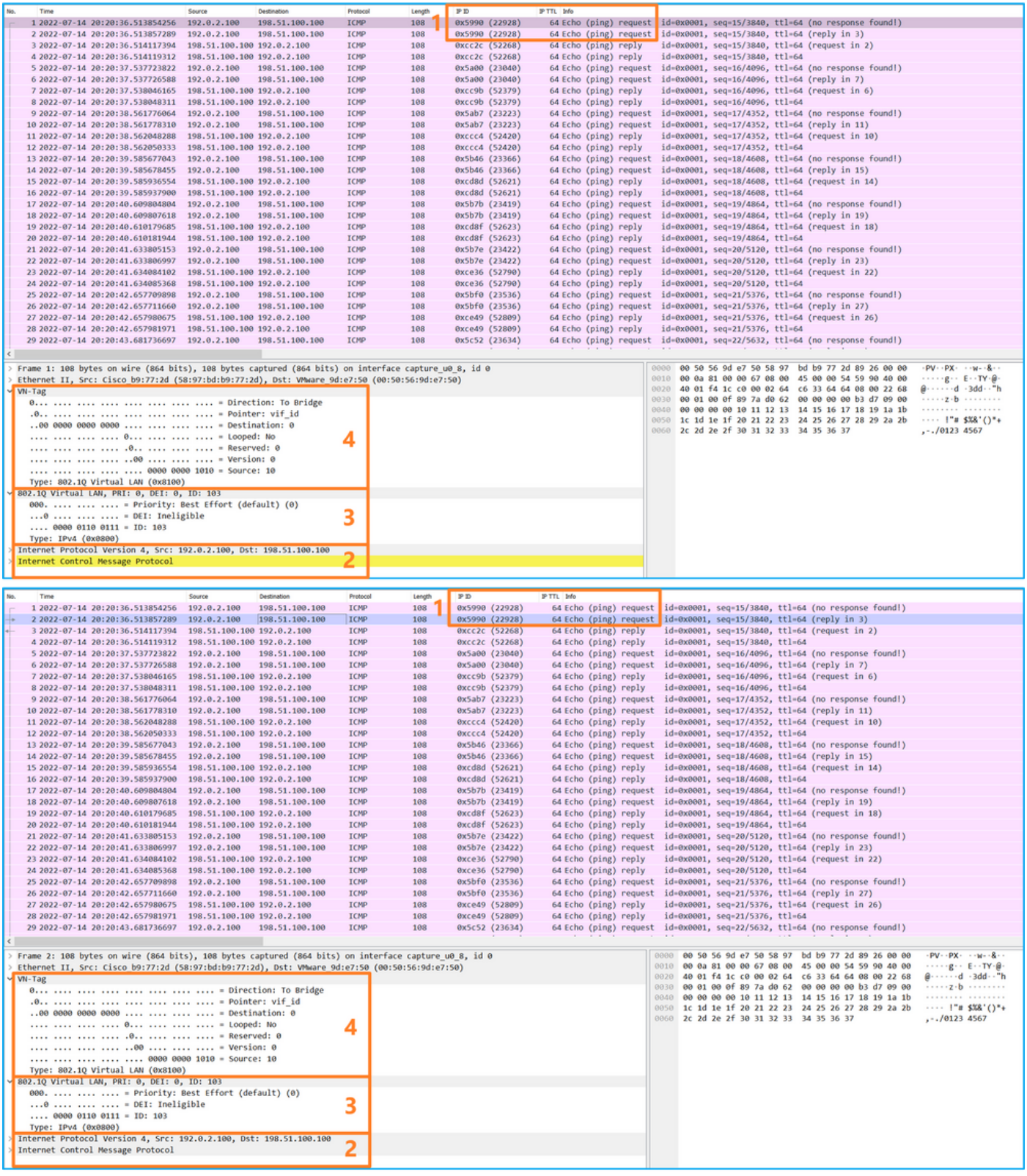
Follow the steps in the section **Collect Firepower 4100/9300 Internal Switch Capture Files**.

Capture file analysis

Use a packet capture file reader application to open the capture files. In the case of more than 1 backplane interface, ensure to open all capture files for each backplane interface. In this case, the packets are captured on the backplane interface Ethernet1/9.

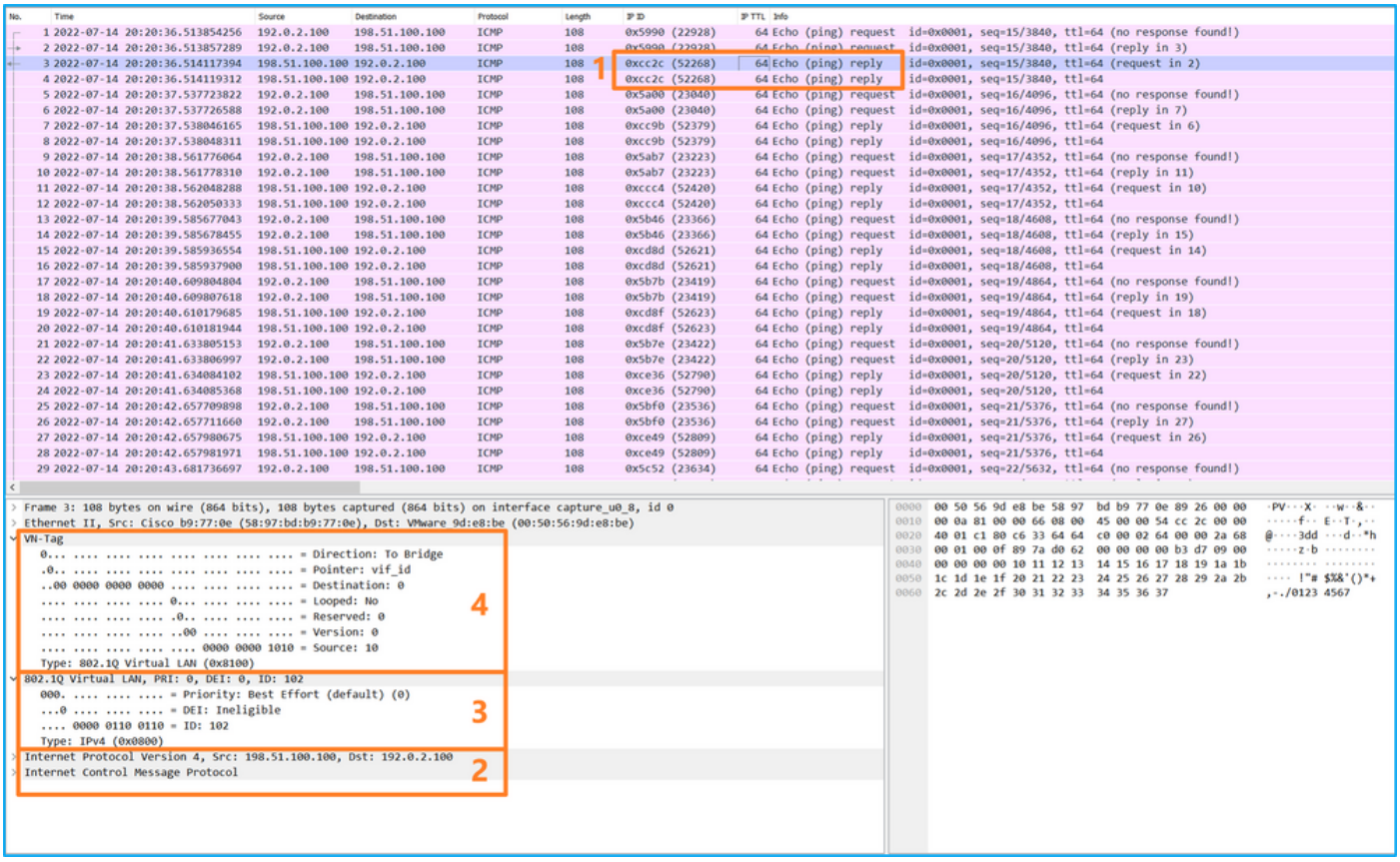
Select the first and the second packets, and check the key points:

1. Each ICMP echo request packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **103** that identifies the egress interface Ethernet1/3.
4. The internal switch inserts an additional VN tag.



Select the third and the fourth packets, and check the key points:

1. Each ICMP echo reply is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the egress interface Ethernet1/2.
4. The internal switch inserts an additional VN tag.



Explanation

When a packet capture on a backplane interface is configured, the switch simultaneously captures each packet twice. In this case, the internal switch receives packets that are already tagged by the application on the security module with the port VLAN tag and the VN tag. The VLAN tag identifies the egress interface that the internal chassis uses to forward the packets to the network. The VLAN tag 103 in ICMP echo request packets identifies Ethernet1/3 as the egress interface, while VLAN tag 102 in ICMP echo reply packets identifies Ethernet1/2 as the egress interface. The internal switch removes the VN tag and the internal interface VLAN tag before the packets are forwarded to the network.

This table summarizes the task:

Task	Capture point	Internal port VLAN in captured packets	Direction	Captured traffic
Configure and verify packet captures on backplane interfaces	Backplane interfaces	102 103	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100 ICMP echo replies from host 198.51.100.100 to host 192.0.2

Packet Captures on Application and Application Ports

Application or application port packet captures are always configured on backplane interfaces and additionally on the front interfaces if the user specifies the application capture direction.

There are mainly 2 use cases:

- Configure packet captures on backplane interfaces for packets that leave a specific front interface. For example, configure packet captures on the backplane interface Ethernet1/9 for

packets that leave interface Ethernet1/2.

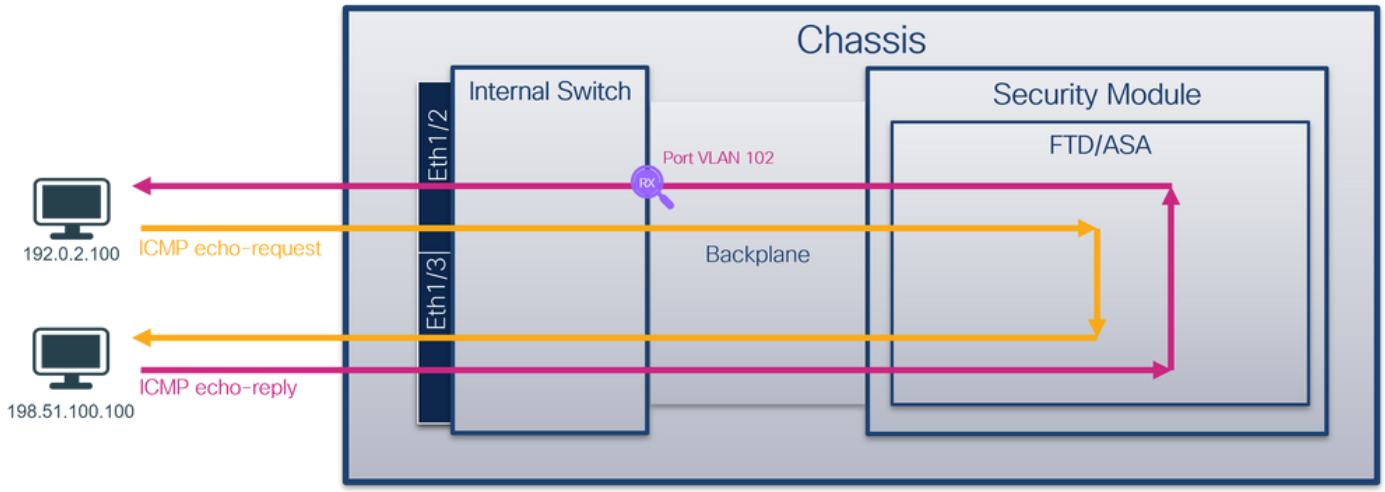
- Configure simultaneous packet captures on a specific front interface and the backplane interfaces. For example, configure simultaneous packet captures on interface Ethernet1/2 and on the backplane interface Ethernet1/9 for packets that leave interface Ethernet1/2.

This section covers both use cases.

Task 1

Use the FCM and CLI to configure and verify a packet capture on the backplane interface. Packets for which the application port Ethernet1/2 is identified as the egress interface are captured. In this case, ICMP replies are captured.

Topology, packet flow, and the capture points

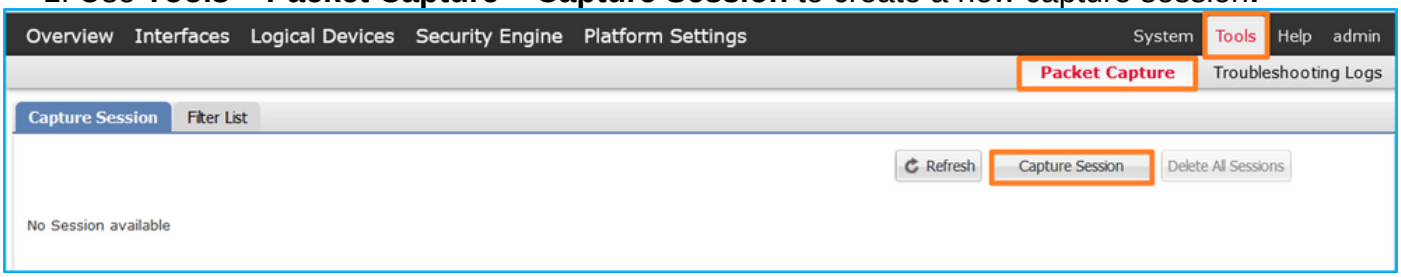


Configuration

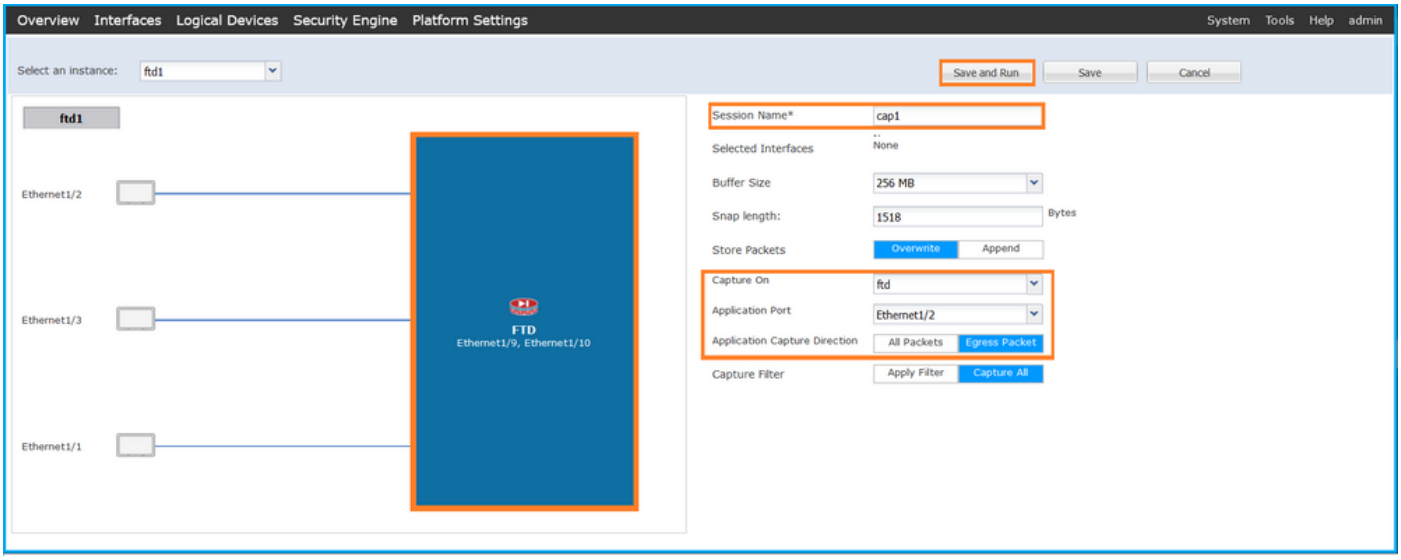
FCM

Follow these steps on FCM to configure a packet capture on the FTD application and the application port Ethernet1/2:

1. Use **Tools > Packet Capture > Capture Session** to create a new capture session**:**



2. Select the application, **Ethernet1/2** in the **Application Port** dropdown list and select **Egress Packet** in the **Application Capture Direction**. Provide the **Session Name** and click **Save and Run** to activate the capture**:**



FXOS CLI

Follow these steps on FXOS CLI to configure packet captures on backplane interfaces:

1. Identify the application type and identifier:

```
firepower# scope ssa
firepower /ssa#  show app-instance
App Name   Identifier Slot ID    Admin State Oper State       Running Version Startup Version
Deploy Type Turbo Mode Profile Name Cluster State   Cluster Role
---------- ---------- ---------- ----------- --------------- --------------- --------------- --
--------- ---------- ------------ -------------- ------------
ftd        ftd1       1          Enabled     Online          7.2.0.82        7.2.0.82
Native      No                      Not Applicable  None
```

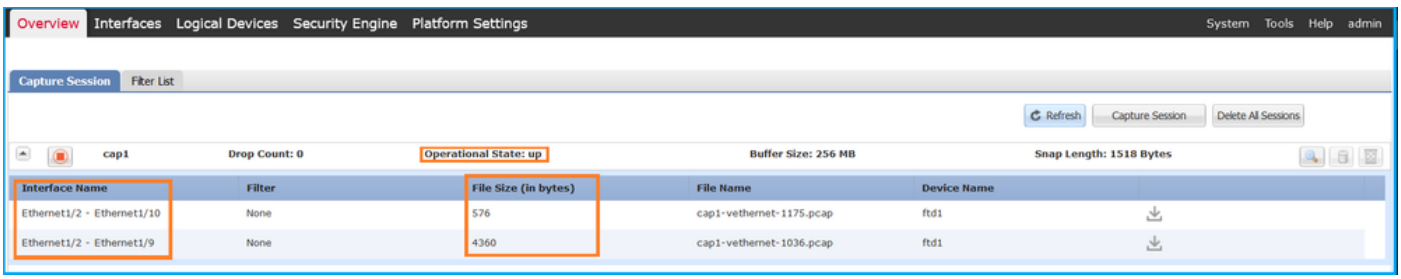
2. Create a capture session:

```
firepower# scope packet-capture
firepower /packet-capture # create session cap1
firepower /packet-capture/session* # create app-port 1 112 Ethernet1/2 ftd
firepower /packet-capture/session/app-port* # set app-identifier ftd1
firepower /packet-capture/session/app-port* # set filter ""
firepower /packet-capture/session/app-port* # set subinterface 0
firepower /packet-capture/session/app-port* # up
firepower /packet-capture/session* # commit
firepower /packet-capture/session #
```

Verification

FCM

Verify the **Interface Name**, ensure that the **Operational Status** is up and that the **File Size (in bytes)** increases:



FXOS CLI

Verify the capture details in **scope packet-capture**:

```
firepower# scope packet-capture
firepower /packet-capture #  show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
    Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Application ports involved in Packet Capture:
    Slot Id: 1
    Link Name: l12
    Port Name: Ethernet1/2
   App Name: ftd
   Sub Interface: 0
    Application Instance Identifier: ftd1

Application ports resolved to:
    Name: vnic1
    Eq Slot Id: 1
    Eq Port Id: 9
    Pcapfile: /workspace/packet-capture/session-1/cap1-vethernet-1036.pcap
    Pcapsize: 53640  bytes
   Vlan: 102
   Filter:

   Name: vnic2
    Eq Slot Id: 1
    Eq Port Id: 10
    Pcapfile: /workspace/packet-capture/session-1/cap1-vethernet-1175.pcap
    Pcapsize: 1824  bytes
   Vlan: 102
   Filter:
```

Collect capture files

Follow the steps in the section **Collect Firepower 4100/9300 Internal Switch Capture Files**.

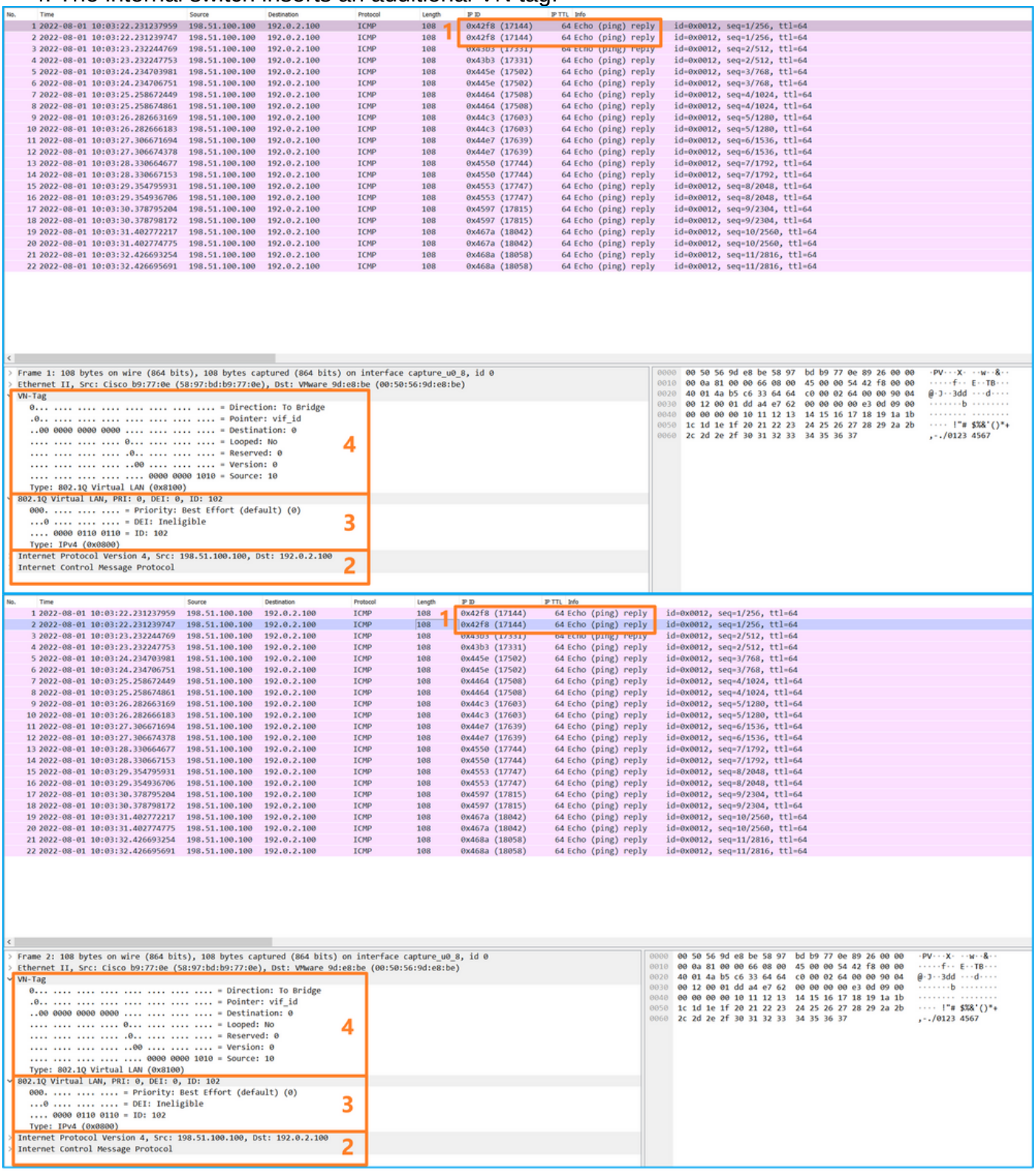
Capture file analysis

Use a packet capture file reader application to open the capture files. In the case of multiple backplane interfaces, ensure to open all capture files for each backplane interface. In this case, the packets are captured on the backplane interface Ethernet1/9.

Select the first and the second packets, and check the key points:

1. Each ICMP echo reply is captured and shown 2 times.

2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the egress interface Ethernet1/2.
4. The internal switch inserts an additional VN tag.



Explanation

In this case, Ethernet1/2 with port VLAN tag 102 is the egress interface for the ICMP echo reply packets.

When the application capture direction is set to **Egress** in the capture options, packets with the

port VLAN tag 102 in the Ethernet header are captured on the backplane interfaces in the ingress direction.

This table summarizes the task:

Task	Capture point	Internal port VLAN in captured packets	Direction	Captured traffic
Configure and verify captures on application and application port Ethernet1/2	Backplane interfaces	102	Ingress only	ICMP echo replies from host 198.51.100.100 to host 192.0.

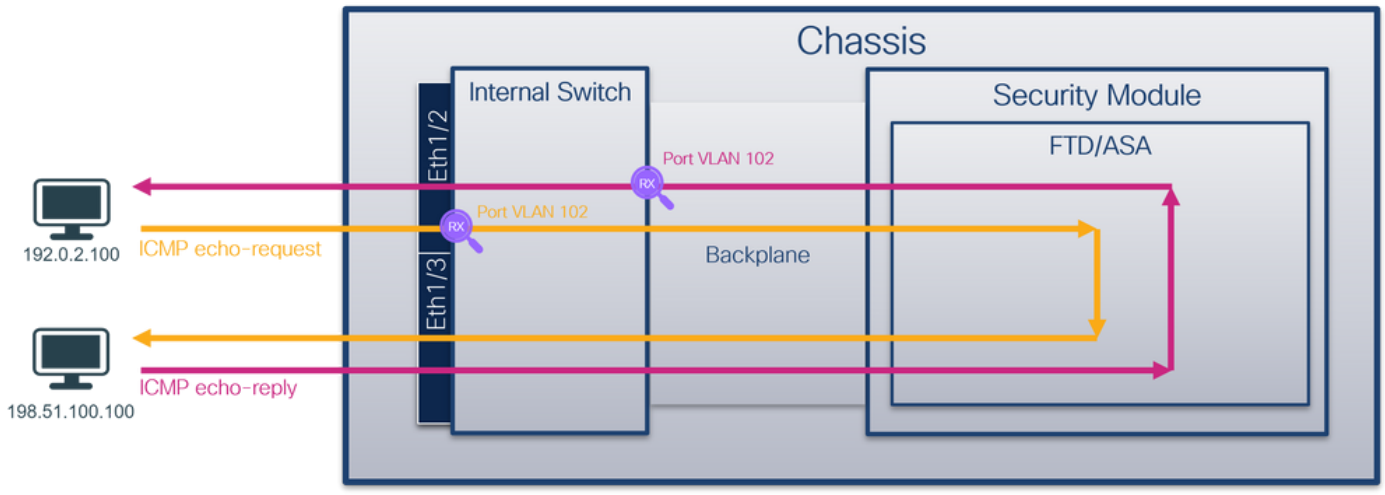
Task 2

Use the FCM and CLI to configure and verify a packet capture on the backplane interface and the front interface Ethernet1/2.

Simultaneous packet captures are configured on:

- Front interface – the packets with the port VLAN 102 on the interface Ethernet1/2 are captured. Captured packets are ICMP echo requests.
- Backplane interfaces – packets for which Ethernet1/2 is identified as the egress interface, or the packets with the port VLAN 102, are captured. Captured packets are ICMP echo replies.

Topology, packet flow, and the capture points

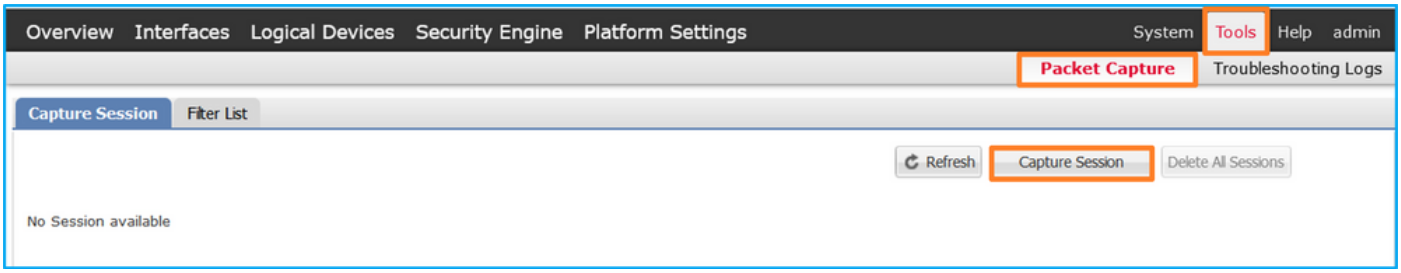


Configuration

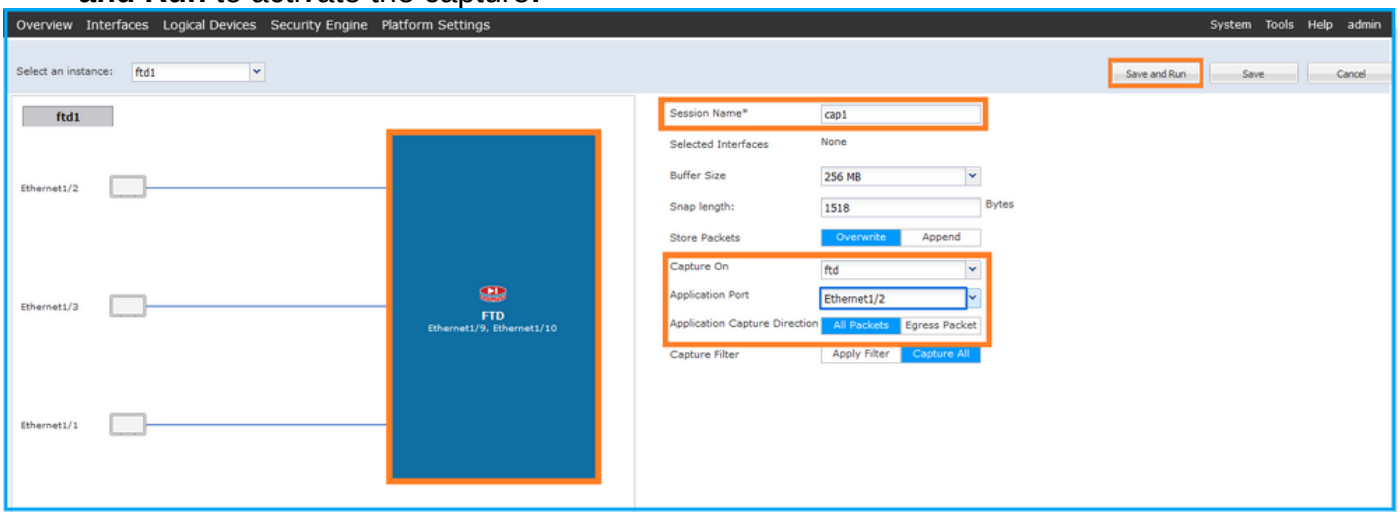
FCM

Follow these steps on FCM to configure a packet capture on the FTD application and the application port Ethernet1/2:

1. Use **Tools > Packet Capture > Capture Session** to create a new capture session**:**



2. Select the FTD application, **Ethernet1/2** in the **Application Port** dropdown list and select **All Packets** in the **Application Capture Direction**. Provide the **Session Name** and click **Save and Run** to activate the capture**:**



FXOS CLI

Follow these steps on FXOS CLI to configure packet captures on backplane interfaces:

1. Identify the application type and identifier:

```
firepower# scope ssa
firepower /ssa#  show app-instance
App Name   Identifier Slot ID    Admin State Oper State       Running Version Startup Version
Deploy Type Turbo Mode Profile Name Cluster State   Cluster Role
---------- ---------- ---------- ----------- --------------- -------------- -------------- --
--------- ---------- ------------ --------------- ------------
ftd        ftd1       1          Enabled     Online          7.2.0.82       7.2.0.82
Native      No                      Not Applicable  None
```

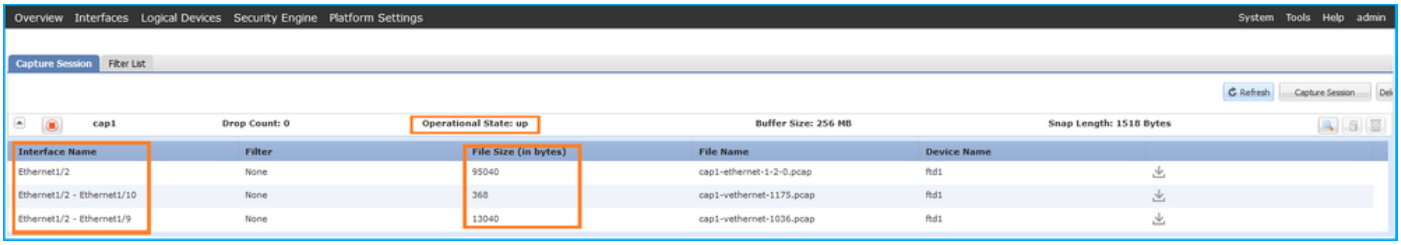
2. Create a capture session:

```
firepower# scope packet-capture
firepower /packet-capture # create session cap1
firepower /packet-capture/session* # create phy-port eth1/2
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # exit
firepower /packet-capture/session* # create app-port 1 link12 Ethernet1/2 ftd
firepower /packet-capture/session/app-port* # set app-identifier ftd1
firepower /packet-capture/session* # enable
firepower /packet-capture/session* # commit
firepower /packet-capture/session # commit
```

Verification

FCM

Verify the **Interface Name**, ensure that the **Operational Status** is up and that the **File Size (in bytes)** increases:



FXOS CLI

Verify the capture details in **scope packet-capture**:

```
firepower# scope packet-capture
firepower /packet-capture #  show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
    Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
    Slot Id: 1
    Port Id: 2
    Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-2-0.pcap
    Pcapsize: 410444  bytes
   Filter:
   Sub Interface: 0
    Application Instance Identifier: ftd1
    Application Name: ftd

Application ports involved in Packet Capture:
   Slot Id: 1
    Link Name: link12
    Port Name: Ethernet1/2
    App Name: ftd
   Sub Interface: 0
    Application Instance Identifier: ftd1

Application ports resolved to:
   Name: vnic1
   Eq Slot Id: 1
    Eq Port Id: 9
    Pcapfile: /workspace/packet-capture/session-1/cap1-vethernet-1036.pcap
    Pcapsize: 128400  bytes
    Vlan: 102
   Filter:
```

```
Name: vnic2
Eq Slot Id: 1
 Eq Port Id: 10
 Pcapfile: /workspace/packet-capture/session-1/cap1-vethernet-1175.pcap
 Pcapsize: 2656  bytes
 Vlan: 102
Filter:
```

Collect capture files

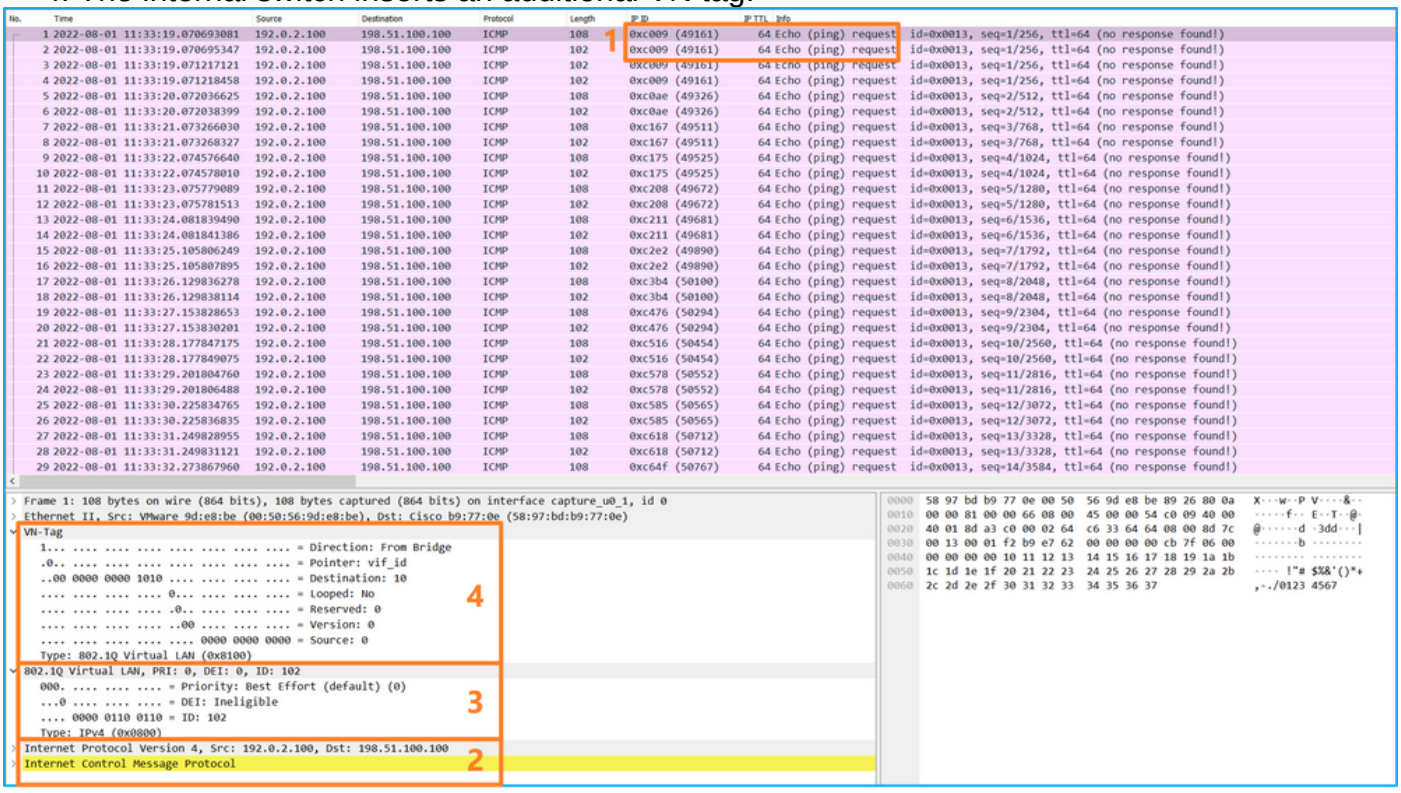
Follow the steps in the section **Collect Firepower 4100/9300 Internal Switch Capture Files**.

Capture file analysis

Use a packet capture file reader application to open the capture files. In the case of multiple backplane interfaces, ensure to open all capture files for each backplane interface. In this case, the packets are captured on the backplane interface Ethernet1/9.

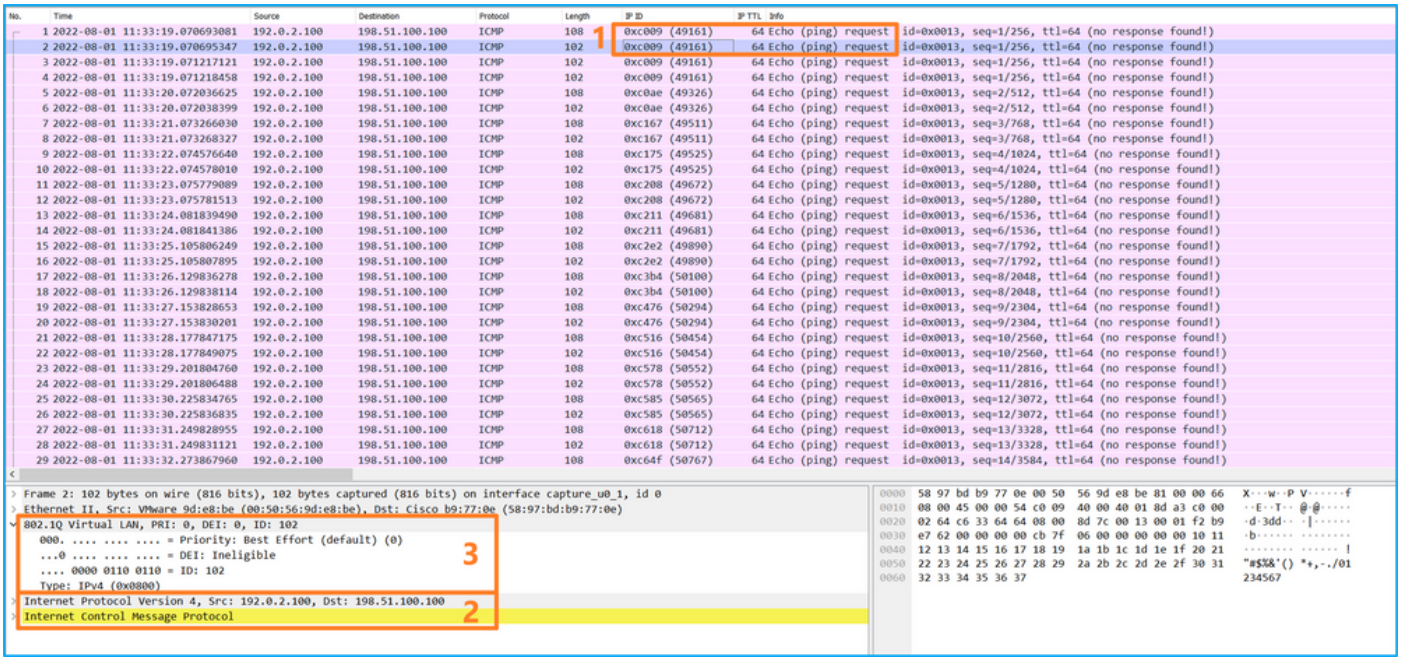
Open the capture file for the interface Ethernet1/2, select the first packet, and check the key points:

1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the ingress interface Ethernet1/2.
4. The internal switch inserts an additional VN tag.



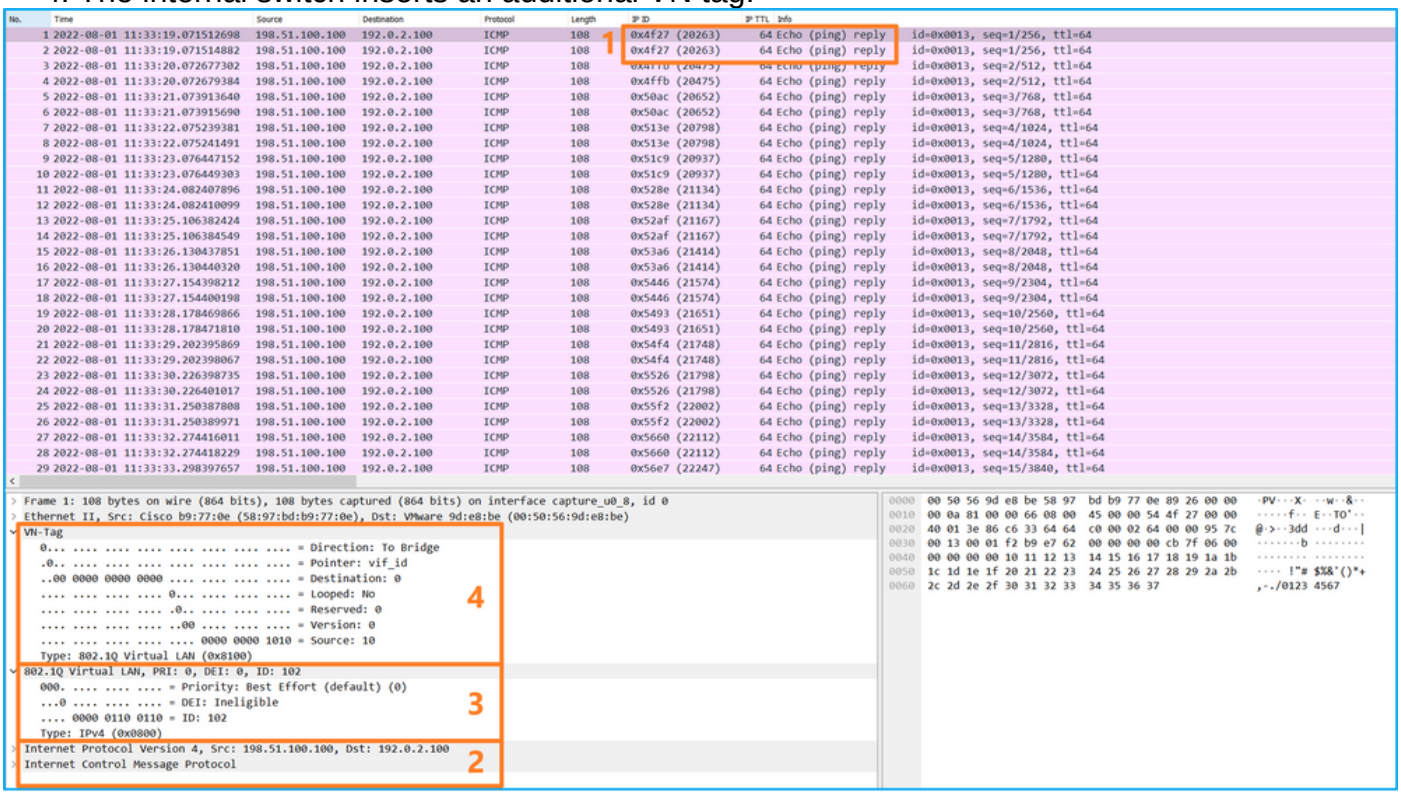
Select the second packet and check the key points:

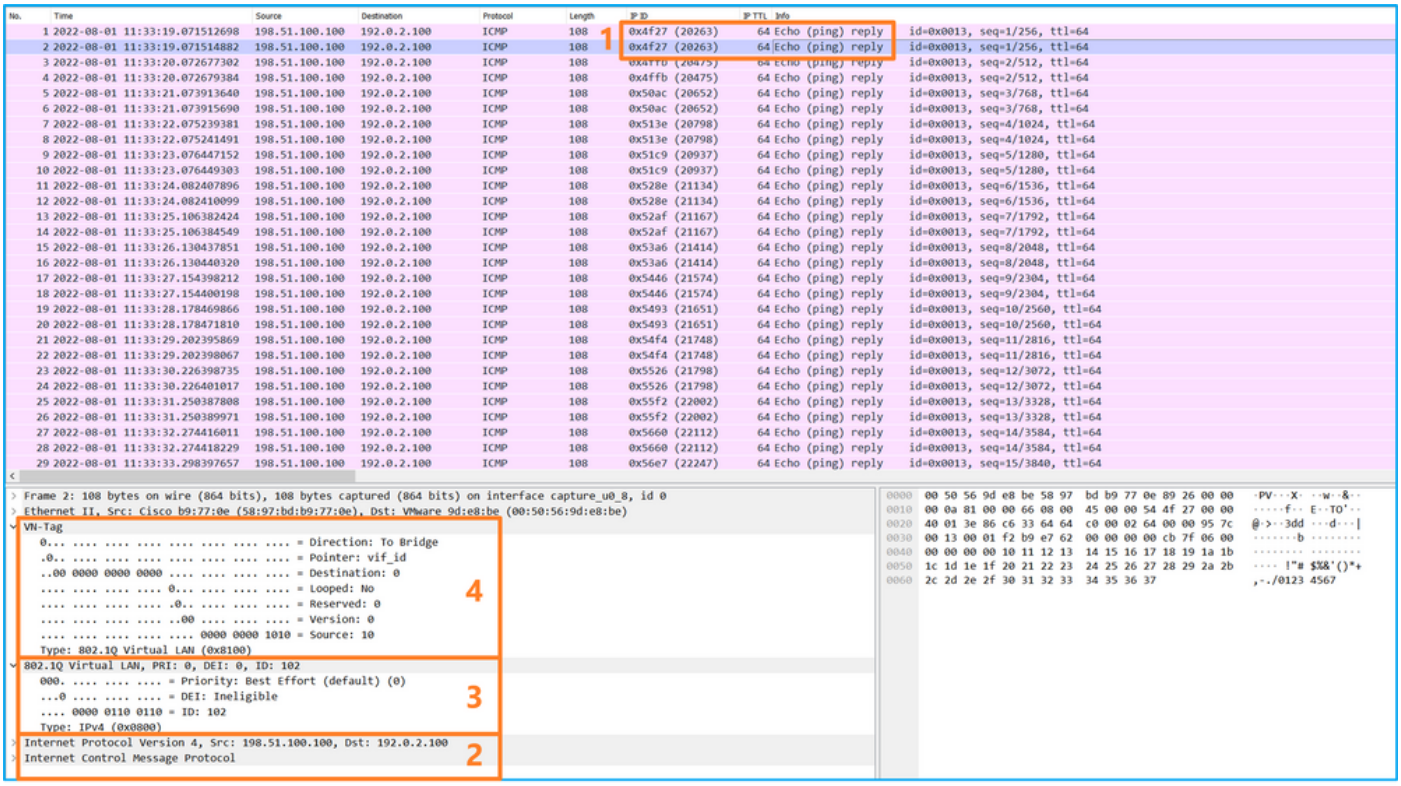
1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the ingress interface Ethernet1/2.



Open the capture file for the interface Ethernet1/9, select the first and the second packets, and check the key points:

1. Each ICMP echo reply is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the egress interface Ethernet1/2.
4. The internal switch inserts an additional VN tag.





Explanation

If the option **All Packets** in the **Application Capture Direction** is selected, 2 simultaneous packet captures related to the selected application port Ethernet1/2 are configured: a capture on the front interface Ethernet1/2 and a capture on selected backplane interfaces.

When a packet capture on a front interface is configured, the switch simultaneously captures each packet twice:

- After the insertion of the port VLAN tag.
- After the insertion of the VN tag.

In the order of operations, the VN tag is inserted at a later stage than the port VLAN tag insertion. But in the capture file, the packet with the VN tag is shown earlier than the packet with the port VLAN tag. In this example, the VLAN tag 102 in ICMP echo request packets identifies Ethernet1/2 as the ingress interface.

When a packet capture on a backplane interface is configured, the switch simultaneously captures each packet twice. The internal switch receives packets that are already tagged by the application on the security module with the port VLAN tag and the VN tag. The port VLAN tag identifies the egress interface that the internal chassis uses to forward the packets to the network. In this example, the VLAN tag 102 in ICMP echo reply packets identifies Ethernet1/2 as the egress interface.

The internal switch removes the VN tag and the internal interface VLAN tag before the packets are forwarded to the network.

This table summarizes the task:

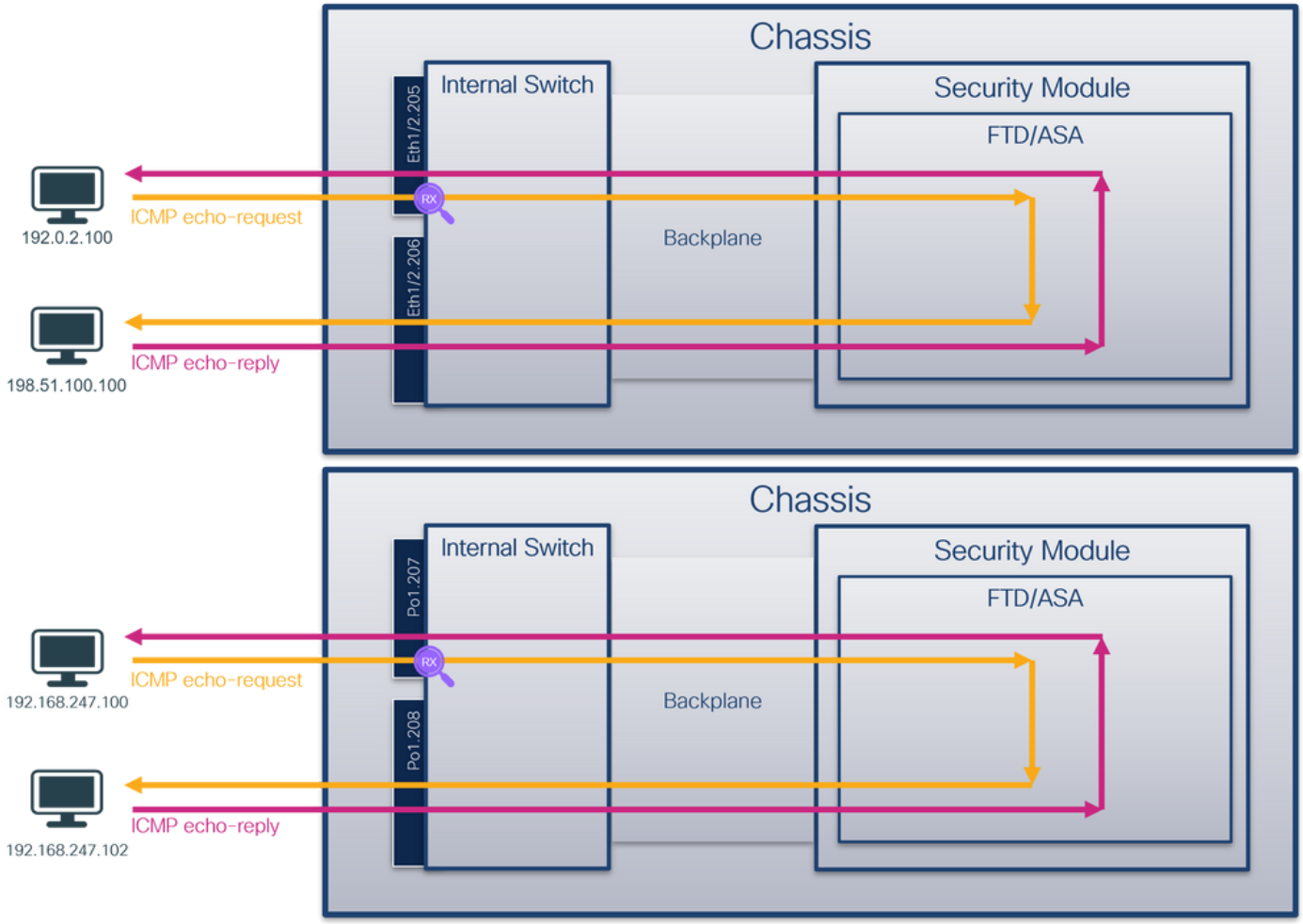
Task	Capture point	Internal port VLAN in captured packets	Direction	Captured traffic
Configure and verify captures	Backplane	102	Ingress	ICMP echo replies from host

on application and application port Ethernet1/2	interfaces Interface Ethernet1/2	102	only Ingress only	198.51.100.100 to host 192.0.2.100 ICMP echo requests from hos 192.0.2.100 to host 198.51.100.100

Packet Capture on a Subinterface of a Physical or Port-channel Interface

Use the FCM and CLI to configure and verify a packet capture on subinterface Ethernet1/2.205 or port-channel subinterface Portchannel1.207. Subinterfaces and captures on subinterfaces are supported only for the FTD application in container mode. In this case, a packet capture on Ethernet1/2.205 and Portchannel1.207 are configured.

Topology, packet flow, and the capture points

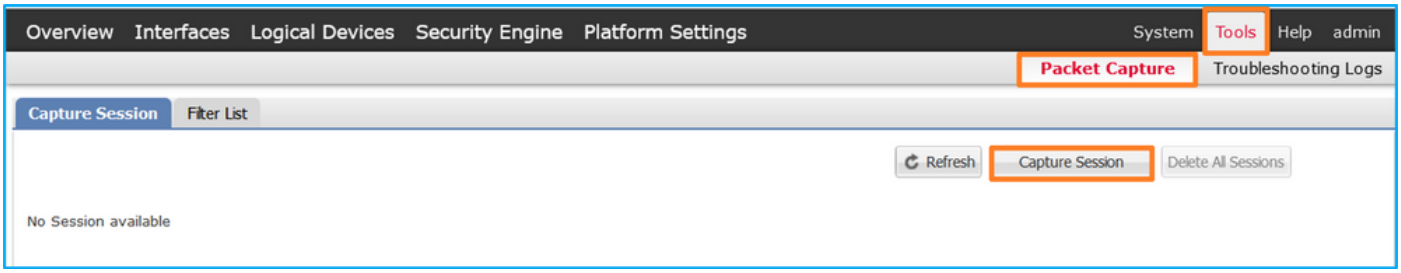


Configuration

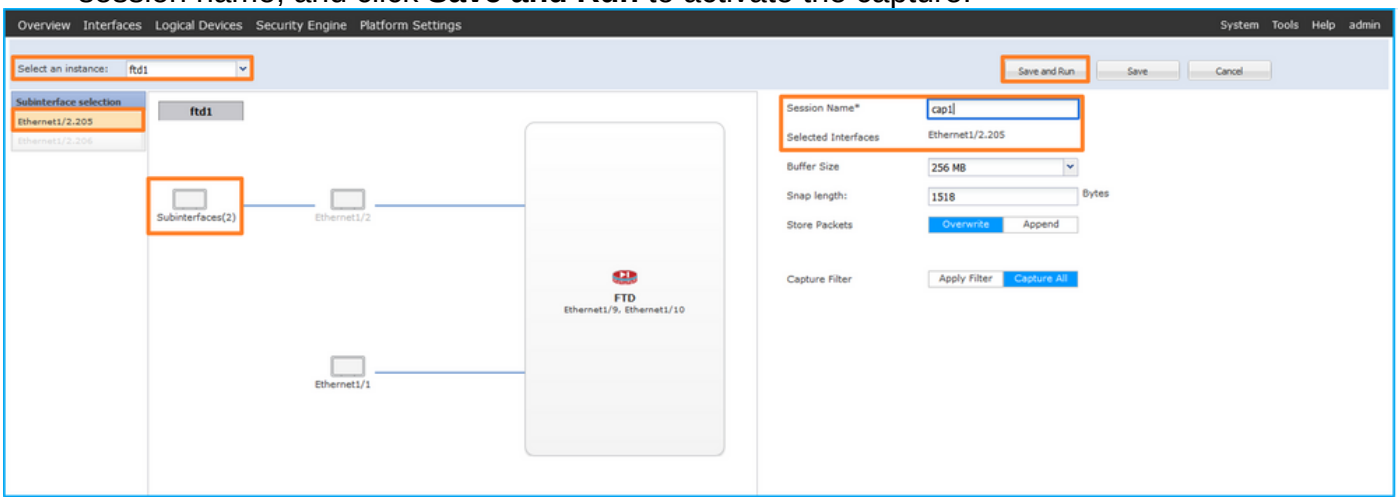
FCM

Follow these steps on FCM to configure a packet capture on the FTD application and the application port Ethernet1/2:

1. Use **Tools > Packet Capture > Capture Session** to create a new capture session**:**



2. Select the specific application instance ftd1, the subinterface Ethernet1/2.205, provide the session name, and click **Save and Run** to activate the capture:



3. In the case of a port-channel subinterface, due to the Cisco bug ID CSCvq33119 subinterfaces are not visible in the FCM. Use the FXOS CLI to configure captures on port-channel subinterfaces.

FXOS CLI

Follow these steps on FXOS CLI to configure a packet capture on subinterfaces Ethernet1/2.205 and Portchannel1.207:

1. Identify the application type and identifier:

```
firepower# scope ssa
firepower /ssa #  show app-instance
App Name   Identifier Slot ID    Admin State Oper State       Running Version Startup Version
Deploy Type Turbo Mode Profile Name Cluster State   Cluster Role
---------- ---------- ---------- ----------- --------------- -------------- -------------- --
--------- ---------- ------------ -------------- ------------
ftd        ftd1       1          Enabled     Online          7.2.0.82       7.2.0.82
Container   No         RP20         Not Applicable  None
ftd        ftd2       1          Enabled     Online          7.2.0.82       7.2.0.82
Container   No         RP20         Not Applicable  None
```

2. In the case of a port-channel interface, identify its member interfaces:

```
firepower# connect fxos
<output skipped>
firepower(fxos)# show port-channel summary
Flags:  D - Down         P - Up in port-channel (members)
        I - Individual   H - Hot-standby (LACP only)
        s - Suspended    r - Module-removed
        S - Switched     R - Routed
        U - Up (port-channel)
        M - Not in use. Min-links not met
```

```
------------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
      Channel
------------------------------------------------------------------------------
1     Po1(SU)     Eth      LACP      Eth1/3(P)    Eth1/3(P)
```

3. Create a capture session:

```
firepower# scope packet-capture
firepower /packet-capture # create session cap1
firepower /packet-capture/session* # create phy-port Eth1/2
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # set subinterface 205
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* # enable
firepower /packet-capture/session* # commit
firepower /packet-capture/session #
```

For port-channel subinterfaces, create a packet capture for each port-channel member interface:

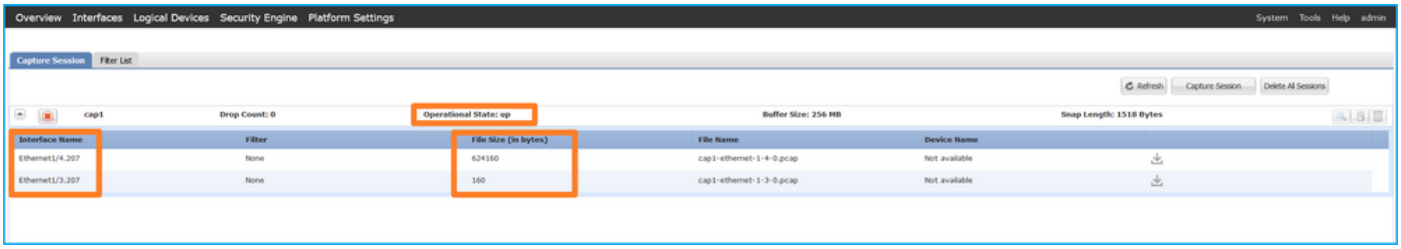
```
firepower#  scope packet-capture
firepower /packet-capture # create filter vlan207
firepower /packet-capture/filter* # set ovlan 207
firepower /packet-capture/filter* # up
firepower /packet-capture* # create session cap1
firepower /packet-capture/session*  create phy-port Eth1/3
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # set subinterface 207
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* # create phy-port Eth1/4
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # set subinterface 207
firepower /packet-capture/session/phy-port* # up
firepower /packet-capture/session* # enable
firepower /packet-capture/session* # commit
firepower /packet-capture/session #
```

Verification

FCM

Verify the **Interface Name**, ensure that the **Operational Status** is up and that the **File Size (in bytes)** increases:

Port-channel subinterface captures configured on FXOS CLI are also visible on FCM; however, they cannot be edited:



FXOS CLI

Verify the capture details in **scope packet-capture**:

```
firepower# scope packet-capture
firepower /packet-capture # show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
    Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
    Slot Id: 1
    Port Id: 2
    Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-2-0.pcap
    Pcapsize: 9324  bytes
   Filter:
    Sub Interface: 205
    Application Instance Identifier: ftd1
    Application Name: ftd
```

Port-channel 1 with member interfaces Ethernet1/3 and Ethernet1/4:

```
firepower# scope packet-capture
firepower /packet-capture # show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
   Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
    Slot Id: 1
```

```
 Port Id: 3
 Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-3-0.pcap
 Pcapsize: 160  bytes
Filter:
 Sub Interface: 207
Application Instance Identifier: ftd1
 Application Name: ftd
Slot Id: 1
 Port Id: 4
 Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-4-0.pcap
 Pcapsize: 624160  bytes
Filter:
Sub Interface: 207
 Application Instance Identifier: ftd1
 Application Name: ftd
```

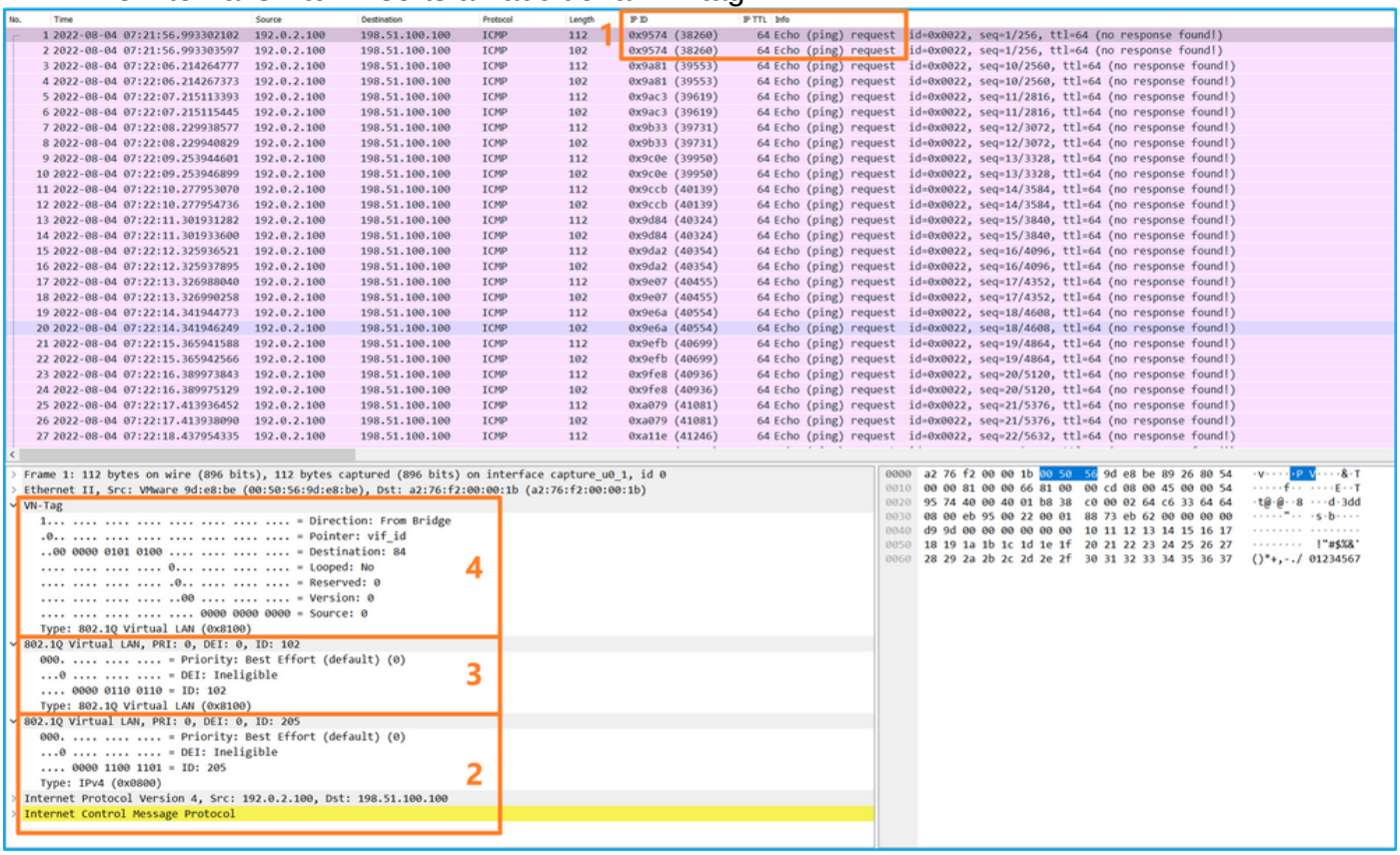
Collect capture files

Follow the steps in the section **Collect Firepower 4100/9300 Internal Switch Capture Files**.

Capture file analysis

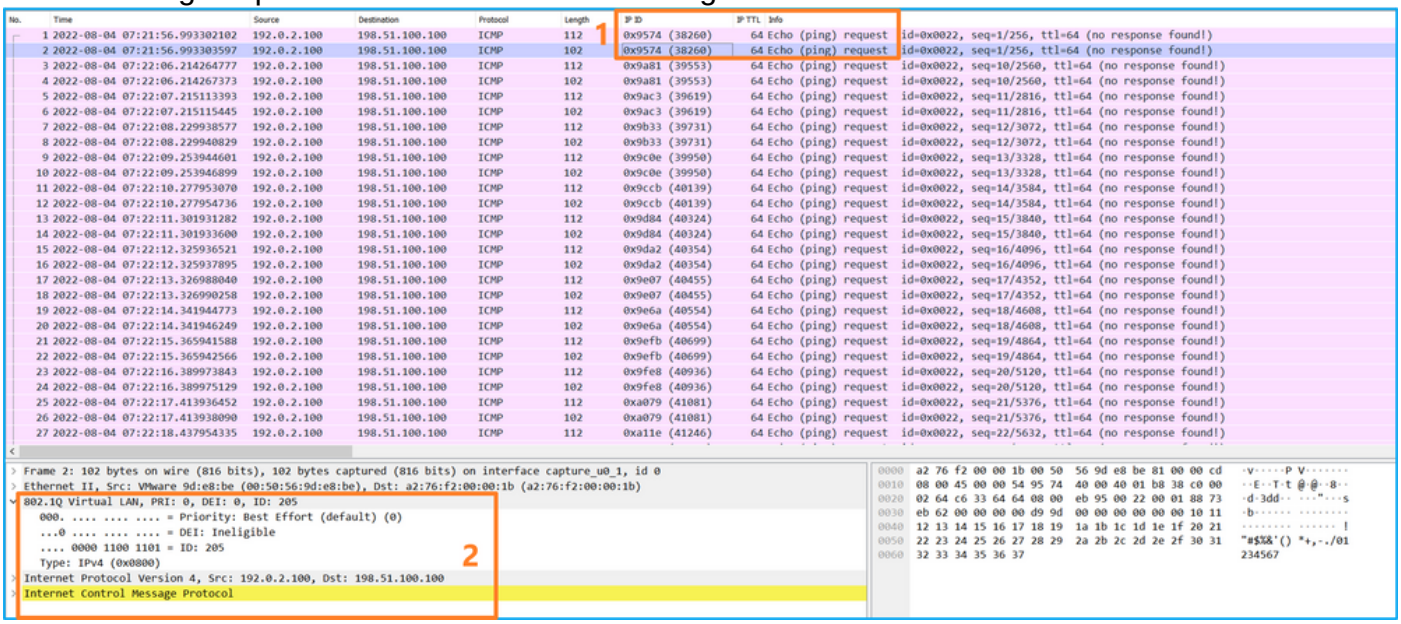
Use a packet capture file reader application to open the capture file. Select the first packet and check the key points:

1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header has the VLAN tag **205**.
3. The internal switch inserts additional port VLAN tag **102** that identifies the ingress interface Ethernet1/2.
4. The internal switch inserts an additional VN tag.



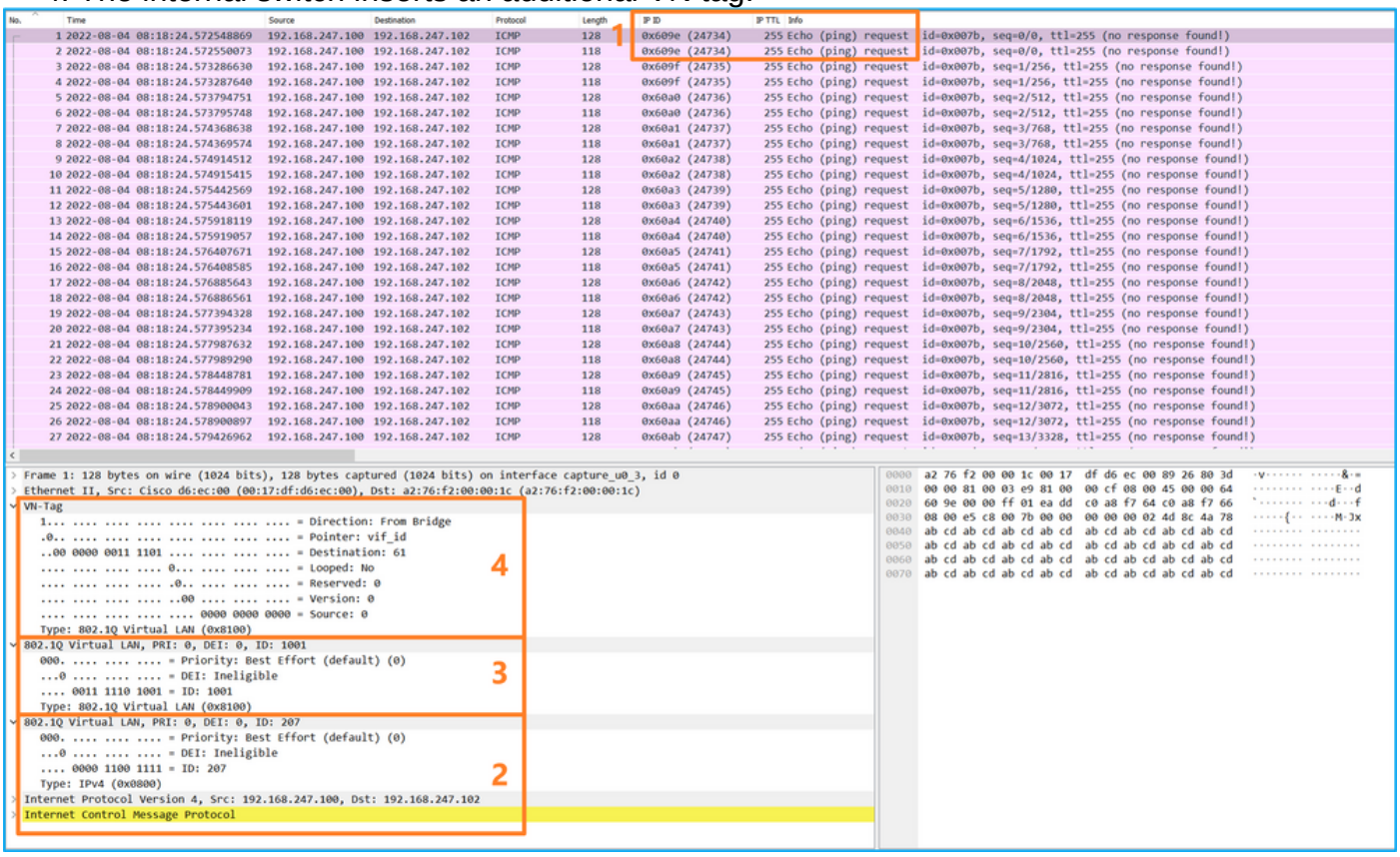
Select the second packet and check the key points:

1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header has the VLAN tag **205**.



Now open the capture files for Portchannel1.207. Select the first packet and check the key points

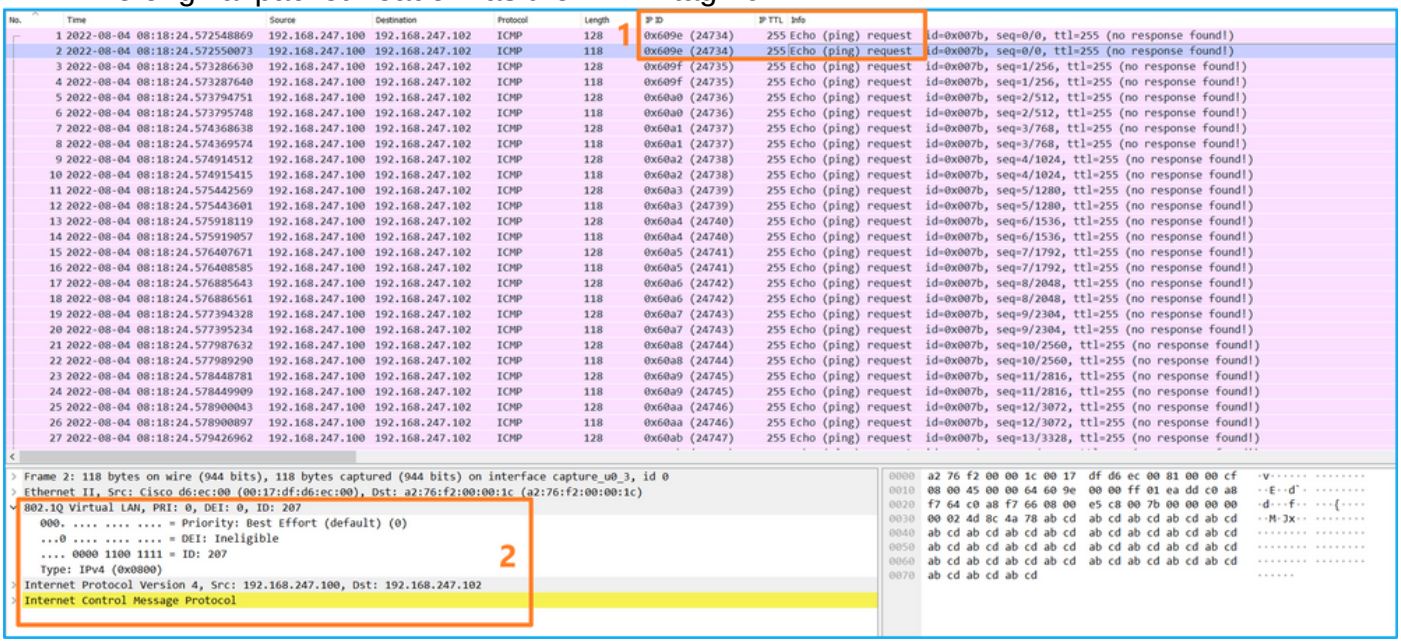
1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header has the VLAN tag **207**.
3. The internal switch inserts an additional port VLAN tag **1001** that identifies the ingress interface Portchannel1.
4. The internal switch inserts an additional VN tag.



Select the second packet and check the key points:

1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.

2. The original packet header has the VLAN tag 207.



Explanation

When a packet capture on a front interface is configured, the switch simultaneously captures each packet twice:

- After the insertion of the port VLAN tag.
- After the insertion of the VN tag.

In the order of operations, the VN tag is inserted at a later stage than the port VLAN tag insertion. But in the capture file, the packet with the VN tag is shown earlier than the packet with the port VLAN tag. Additionally, in the case of subinterfaces, in the capture files, every second packet does not contain the port VLAN tag.

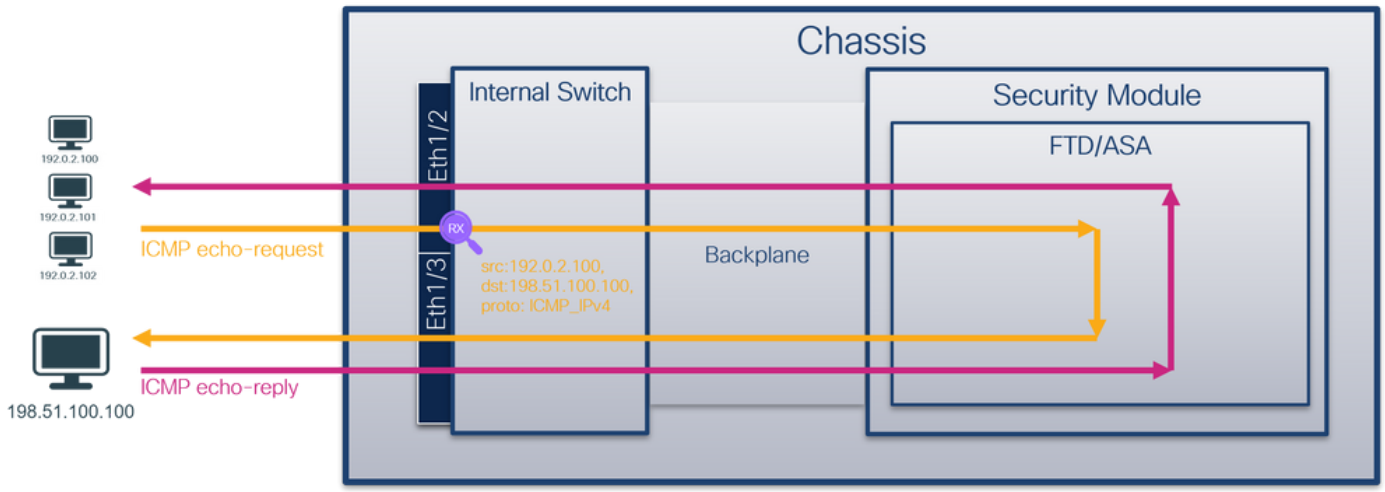
This table summarizes the task:

Task	Capture point	Internal port VLAN in captured packets	Direction	Captured traffic
Configure and verify a packet capture on subinterface Ethernet1/2.205	Ethernet1/2.205	102	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.
Configure and verify a packet capture on Portchannel1 subinterface with member interfaces Ethernet1/3 and Ethernet1/4	Ethernet1/3 Ethernet1/4	1001	Ingress only	ICMP echo requests from 192.168.207.100 to host 192.168.207.102

Packet Capture Filters

Use the FCM and CLI to configure and verify a packet capture on interface Ethernet1/2 with a filter.

Topology, packet flow, and the capture points

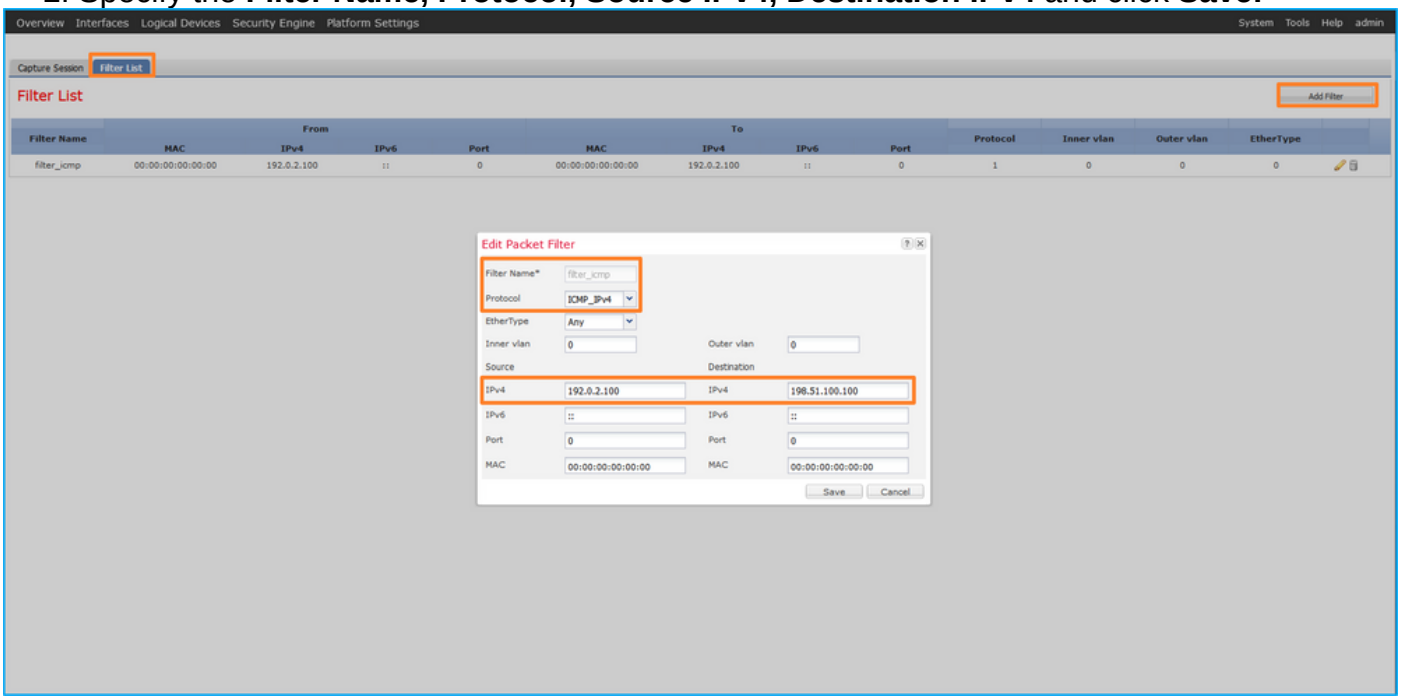


Configuration

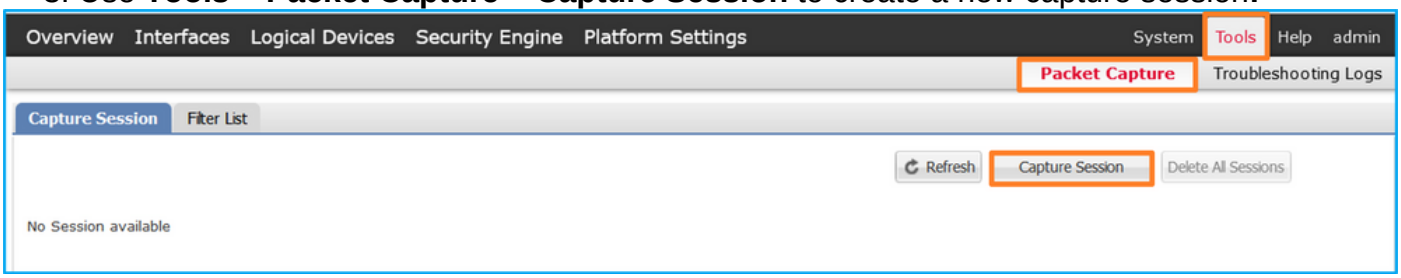
FCM

Follow these steps on FCM to configure a capture filter for ICMP echo request packets from host 192.0.2.100 to host 198.51.100.100 and apply it to packet capture on interface Ethernet1/2:

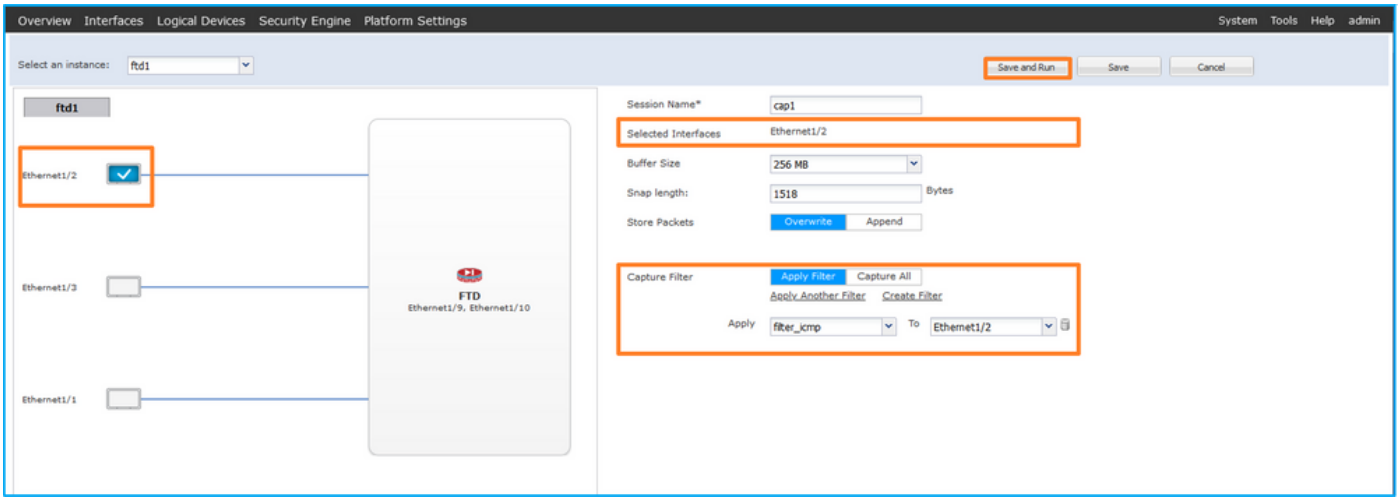
1. Use **Tools > Packet Capture > Filter List > Add Filter** to create a capture filter**.**
2. Specify the **Filter Name, Protocol, Source IPv4, Destination IPv4** and click **Save:**



3. Use **Tools > Packet Capture > Capture Session** to create a new capture session**:**



4. Select Ethernet1/2, provide the **Session Name,** apply the capture filter and click **Save and Run** to activate the capture**:**



FXOS CLI

Follow these steps on FXOS CLI to configure packet captures on backplane interfaces:

1. Identify the application type and identifier:

```
firepower# scope ssa
firepower /ssa#  show app-instance
App Name   Identifier Slot ID    Admin State Oper State       Running Version Startup Version
Deploy Type Turbo Mode Profile Name Cluster State   Cluster Role
---------- ---------- ---------- ----------- --------------- -------------- -------------- --
--------- ---------- ------------ --------------- ------------
ftd        ftd1       1          Enabled     Online          7.2.0.82       7.2.0.82
Native      No                      Not Applicable  None
```

2. Identify the IP protocol number in https://www.iana.org/assignments/protocol-numbers/protocol-numbers.xhtml. In this case, the ICMP protocol number is 1.

3. Create a capture session:

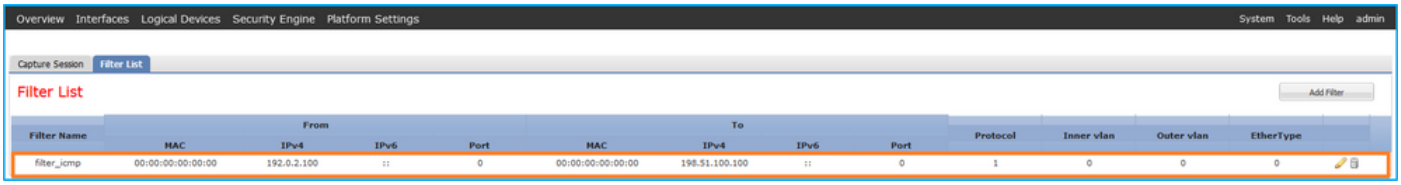
2.

```
firepower# scope packet-capture
firepower /packet-capture # create filter filter_icmp
firepower /packet-capture/filter* # set destip 198.51.100.100
firepower /packet-capture/filter* # set protocol 1
firepower /packet-capture/filter* # set srcip 192.0.2.100
firepower /packet-capture/filter* # exit
firepower /packet-capture* # create session cap1
firepower /packet-capture/session* # create phy-port Ethernet1/2
firepower /packet-capture/session/phy-port* # set app ftd
firepower /packet-capture/session/phy-port* # set app-identifier ftd1
firepower /packet-capture/session/phy-port* # set filter filter_icmp
firepower /packet-capture/session/phy-port* # exit
firepower /packet-capture/session* # enable
firepower /packet-capture/session* # commit
firepower /packet-capture/session #
```

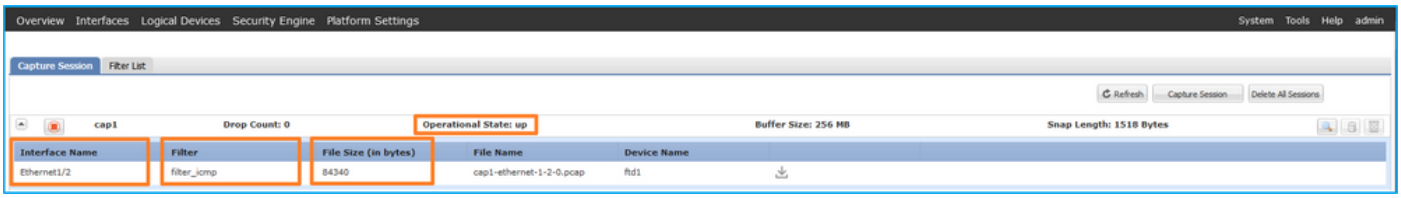
Verification

FCM

Verify the **Interface Name**, ensure that the **Operational Status** is up and that the **File Size (in bytes)** increases:



Verify the **Interface Name**, the **Filter**, ensure the **Operational Status** is up, and the **File Size (in bytes)** increases in **Tools > Packet Capture > Capture Session**:



FXOS CLI

Verify the capture details in **scope packet-capture**:

```
firepower# scope packet-capture
firepower /packet-capture # show filter detail

Configure a filter for packet capture:
   Name: filter_icmp
    Protocol: 1
   Ivlan: 0
   Ovlan: 0
   Src Ip: 192.0.2.100
    Dest Ip: 198.51.100.100
   Src MAC: 00:00:00:00:00:00
   Dest MAC: 00:00:00:00:00:00
   Src Port: 0
   Dest Port: 0
   Ethertype: 0
   Src Ipv6: ::
   Dest Ipv6: ::
firepower /packet-capture # show session cap1

Traffic Monitoring Session:
    Packet Capture Session Name: cap1
   Session: 1
    Admin State: Enabled
    Oper State: Up
    Oper State Reason: Active
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
   Slot Id: 1
    Port Id: 2
    Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-2-0.pcap
    Pcapsize: 213784  bytes
   Filter: filter_icmp
   Sub Interface: 0
    Application Instance Identifier: ftd1
```

```
Application Name: ftd
```

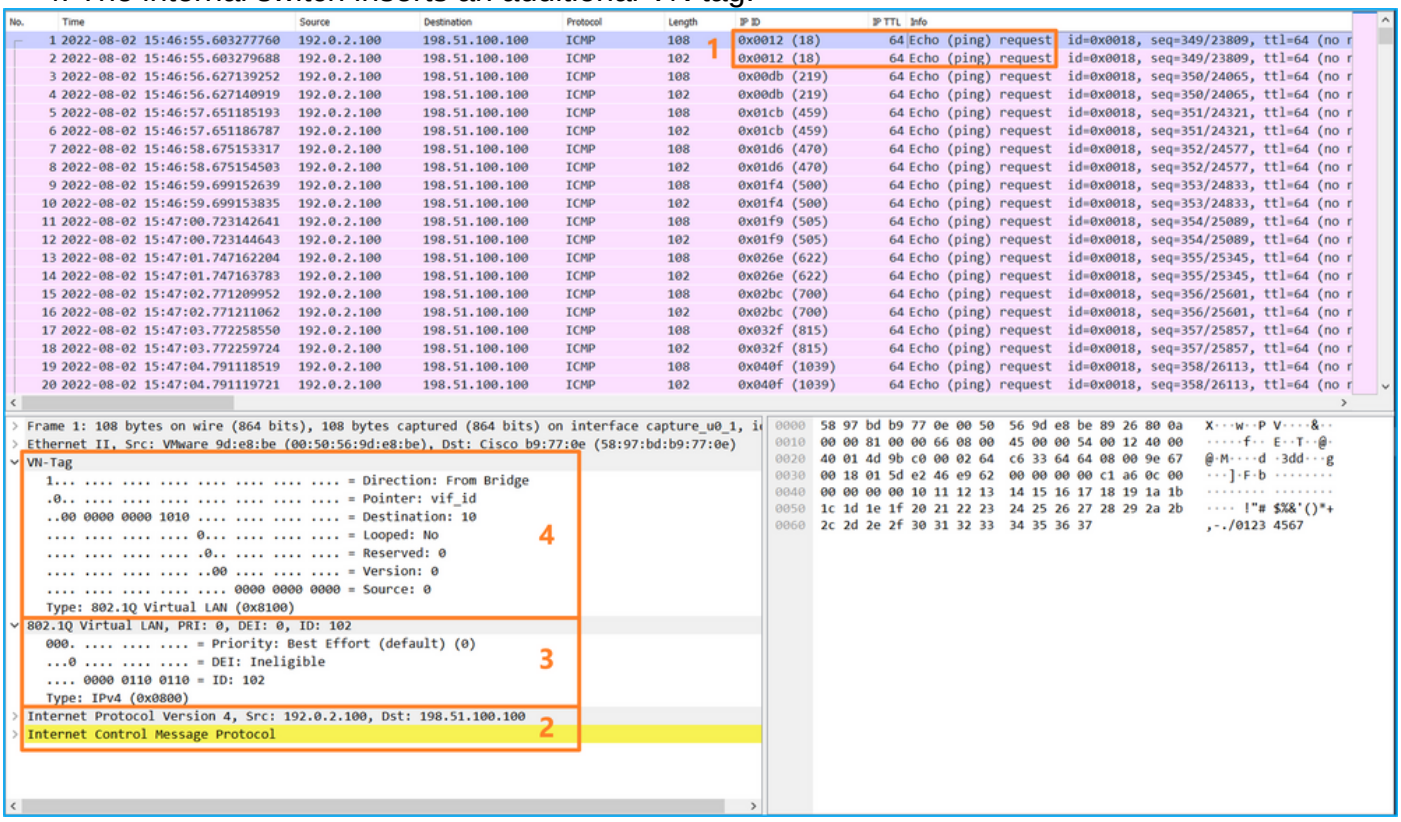
Collect capture files

Follow the steps in the section **Collect Firepower 4100/9300 Internal Switch Capture Files**.

Capture file analysis

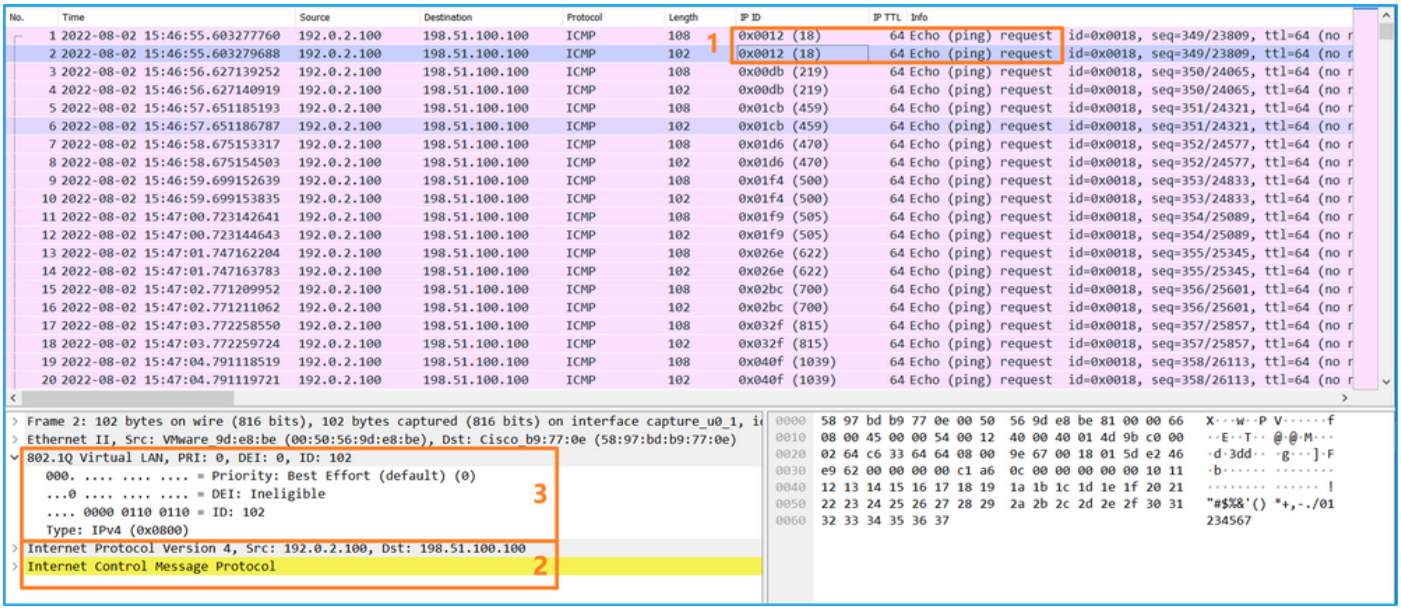
Use a packet capture file reader application to open the capture file. Select the first packet and check the key points

1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the ingress interface Ethernet1/2.
4. The internal switch inserts an additional VN tag.



Select the second packet, and check the key points:

1. Only ICMP echo request packets are captured. Each packet is captured and shown 2 times.
2. The original packet header is without the VLAN tag.
3. The internal switch inserts additional port VLAN tag **102** that identifies the ingress interface Ethernet1/2.



Explanation

When a packet capture on a front interface is configured, the switch simultaneously captures each packet twice:

- After the insertion of the port VLAN tag.
- After the insertion of the VN tag.

In the order of operations, the VN tag is inserted at a later stage than the port VLAN tag insertion. But in the capture file, the packet with the VN tag is shown earlier than the packet with the port VLAN tag.

When a capture filter is applied only the packets that match the filter in the ingress direction are captured.

This table summarizes the task:

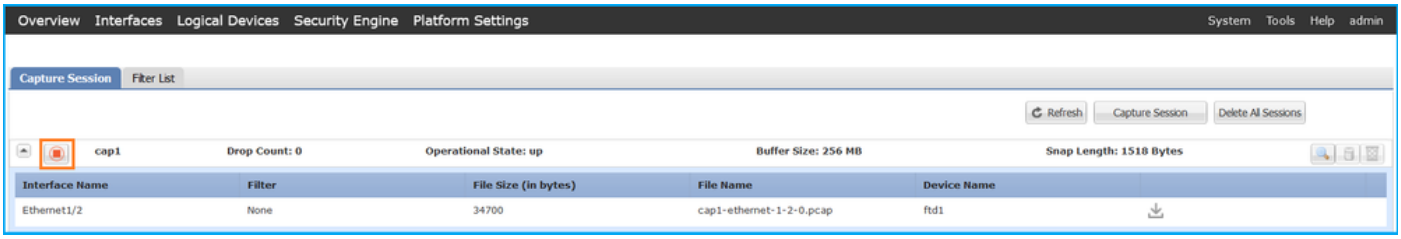
Task	Capture point	Internal port VLAN in captured packets	Direction	User filter	Captured traffic
Configure and verify a packet capture with a filter on the front interface Ethernet1/2	Ethernet1/2	102	Ingress only	Protocol: ICMP Source:192.0.2.100 Destination: 198.51.100.100	ICMP echo requests from h 192.0.2.100 to host 198.51.100.100

Collect Firepower 4100/9300 Internal Switch Capture Files

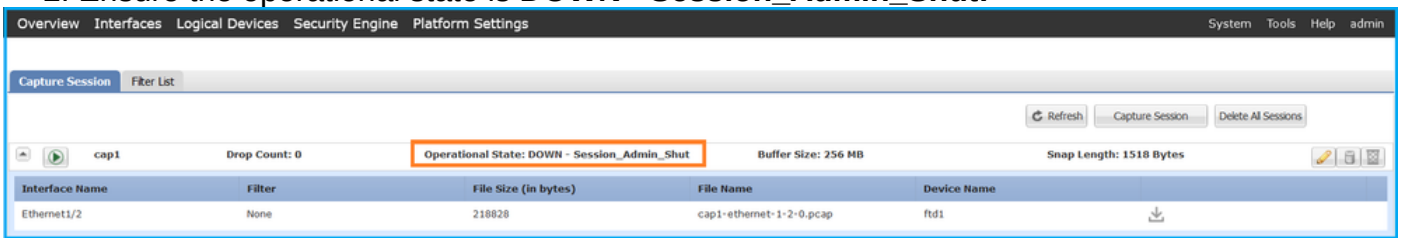
FCM

Follow these steps on FCM to collect internal switch capture files:

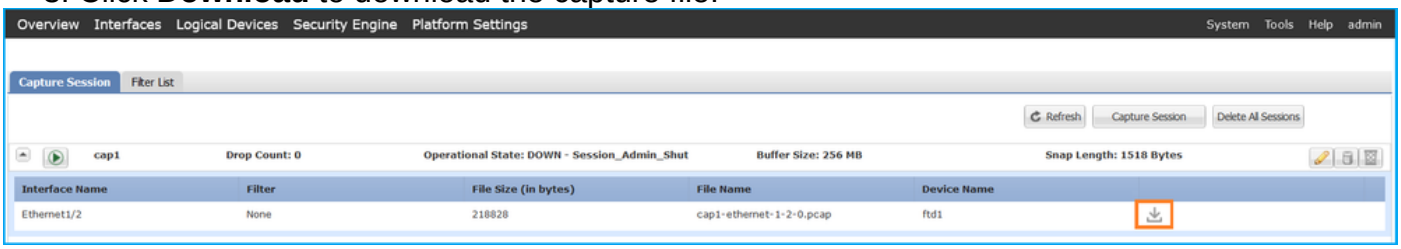
1. Click the **Disable Session** button to stop the active capture:



2. Ensure the operational state is **DOWN - Session_Admin_Shut:**



3. Click **Download** to download the capture file:



In the case of port-channel interfaces, repeat this step for each member interface.

FXOS CLI

Follow these steps on the FXOS CLI to collect capture files:

1. Stop the active capture:

```
firepower# scope packet-capture
firepower /packet-capture # scope session cap1
firepower /packet-capture/session # disable
firepower /packet-capture/session* # commit
firepower /packet-capture/session # up
firepower /packet-capture # show session cap1 detail

Traffic Monitoring Session:
   Packet Capture Session Name: cap1
   Session: 1
    Admin State: Disabled
    Oper State: Down
    Oper State Reason: Admin Disable
   Config Success: Yes
   Config Fail Reason:
   Append Flag: Overwrite
   Session Mem Usage: 256  MB
   Session Pcap Snap Len: 1518  Bytes
   Error Code: 0
   Drop Count: 0

Physical ports involved in Packet Capture:
   Slot Id: 1
   Port Id: 2
   Pcapfile: /workspace/packet-capture/session-1/cap1-ethernet-1-2-0.pcap
```

```
   Pcapsize: 115744  bytes
   Filter:
   Sub Interface: 0
   Application Instance Identifier: ftd1
   Application Name: ftd
```

2. Upload the capture file from the **local-mgmt** command scope:

```
firepower# connect local-mgmt
firepower(local-mgmt)# copy /packet-capture/session-1/cap1-ethernet-1-2-0.pcap ?
 ftp:        Dest File URI
 http:       Dest File URI
 https:      Dest File URI
 scp:        Dest File URI
 sftp:       Dest File URI
 tftp:       Dest File URI
 usbdrive:   Dest File URI
 volatile:   Dest File URI
 workspace:  Dest File URI

firepower(local-mgmt)# copy /packet-capture/session-1/cap1-ethernet-1-2-0.pcap
ftp://ftpuser@10.10.10.1/cap1-ethernet-1-2-0.pcap
Password:
```

In the case of port-channel interfaces, copy the capture file for each member interface.

Guidelines, Limitations, and Best Practices for Internal Switch Packet Capture

For the guidelines and limitations related to Firepower 4100/9300 internal switch capture refer to the *Cisco Firepower 4100/9300 FXOS Chassis Manager Configuration Guide* or *Cisco Firepower 4100/9300 FXOS CLI Configuration Guide*, chapter **Troubleshooting**, section **Packet Capture**.

This is the list of best practices based on the usage of packet capture in TAC cases:

- Be aware of guidelines and limitations.
- Capture packets on all port-channel member interfaces and analyze all capture files.
- Use capture filters.
- Consider the impact of NAT on packet IP addresses when a capture filter is configured.
- Increase or decrease the **Snap Len** that specifies frame size in case it differs from the default value of 1518 bytes. Shorter size results in an increased number of captured packets and vice versa.
- Adjust the **Buffer Size** as needed.
- Be aware of the **Drop Count** on FCM or FXOS CLI. Once the buffer size limit is reached, the drop count counter increases.
- Use the filter **!vntag** on Wireshark to display only packets without the VN-tag. This is useful to hide VN-tagged packets in the front interface packet capture files.
- Use the filter **frame.number&1** on Wireshark to display only odd frames. This is useful to hide duplicate packets in the backplane interface packet capture files.
- In the case of protocols like TCP, Wireshark by default applies colorization rules that display packets with specific conditions in different colors. In the case of internal switch captures due to duplicate packets in capture files, the packet can be colored and marked in a false-positive way. If you analyze packet capture files and apply any filter, then export the displayed packets to a new file and open the new file instead.

Configuration and Verification on Secure Firewall 3100

Unlike Firepower 4100/9300, the internal switch captures on the Secure Firewall 3100 are configured on the application command line interface via the **capture <name> switch** command, where the **switch** option specifies that the captures are configured on the internal switch.

This is the **capture** command with the **switch** option:

```
> capture cap_sw switch ?
 buffer         Configure size of capture buffer, default is 256MB
 ethernet-type  Capture Ethernet packets of a particular type, default is IP
 interface      Capture packets on a specific interface
 ivlan          Inner Vlan
 match          Capture packets based on match criteria
 ovlan          Outer Vlan
 packet-length  Configure maximum length to save from each packet, default is
                64 bytes
 real-time      Display captured packets in real-time. Warning: using this
                option with a slow console connection may result in an
                excessive amount of non-displayed packets due to performance
                limitations.
 stop           Stop packet capture
 trace          Trace the captured packets
 type           Capture packets based on a particular type
 <cr>
```

General steps for packet capture configuration are as follows:

1. Specify an ingress interface:

Switch capture configuration accepts the ingress interface **nameif**. The user can specify data interfaces names, internal uplink, or the management interfaces:

```
> capture capsw switch interface ?
Available interfaces to listen:
 in_data_uplink1  Capture packets on internal data uplink1 interface
 in_mgmt_uplink1  Capture packets on internal mgmt uplink1 interface
 inside           Name of interface Ethernet1/1.205

 management       Name of interface Management1/1
```

2. Specify the ethernet frame EtherType. The default EtherType is IP. The **ethernet-type** option values specify the EtherType:

```
> capture capsw switch interface inside ethernet-type ?
 802.1Q
 <0-65535>  Ethernet type
 arp
 ip
 ip6
 pppoed
 pppoes
 rarp
 sgt
 vlan
```

3. Specify the match conditions. The capture **match** option specifies the match criteria:

```
> capture capsw switch interface inside match ?
 <0-255>  Enter protocol number (0 - 255)
 ah
 eigrp
 esp
 gre
 icmp
 icmp6
 igmp
 igrp
 ip
 ipinip
 ipsec
 mac      Mac-address filter
 nos
 ospf
 pcp
 pim
 pptp
 sctp
 snp
 spi      SPI value
 tcp
 udp
 <cr>
```

4. Specify other optional parameters such as the buffer size, the packet length, and so on.
5. Enable the capture. The command **no capture <name> switch stop** activates the capture**:**

```
> capture capsw switch interface inside match ip
>no capture capsw switch stop
```

6. Verify the capture details:

- Administrative status is **enabled**, and operational status is **up** and active.
- Packet capture file size **Pcapsize** increases.
- The number of captured packets in the output of the **show capture <cap_name>** is non-zero.
- Capture path **Pcapfile.** The captured packets are automatically saved in the **/mnt/disk0/packet-capture/** folder.
- Capture conditions. The software automatically creates capture filters based on capture conditions.

```
> show capture capsw
27 packet captured on disk using switch capture
Reading of capture file from disk is not supported

>show capture capsw  detail
Packet Capture info
  Name:              capsw
 Session:           1
  Admin State:       enabled
  Oper State:        up
 Oper State Reason: Active
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
```

```
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1
Physical port:
 Slot Id:           1
 Port Id:           1
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
  Pcapsize:          18838
 Filter:            capsw-1-1

Packet Capture Filter Info
  Name:              capsw-1-1
 Protocol:          0
 Ivlan:             0
 Ovlan:             205
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0
0 packet captured on disk using switch capture
Reading of capture file from disk is not supported
```

7. Stop the captures when needed:

```
> capture capsw switch stop
>show capture capsw detail
Packet Capture info
  Name:              capsw
 Session:           1
  Admin State:       disabled
  Oper State:        down
  Oper State Reason: Session_Admin_Shut
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0
Total Physical ports involved in Packet Capture: 1

Physical port:
 Slot Id:           1
 Port Id:           1
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
 Pcapsize:          24
 Filter:            capsw-1-1

Packet Capture Filter Info
 Name:              capsw-1-1
 Protocol:          0
 Ivlan:             0
 Ovlan:             205
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
```

```
Dest Ipv6:          ::
Src MAC:            00:00:00:00:00:00
Dest MAC:           00:00:00:00:00:00
Src Port:           0
Dest Port:          0
Ethertype:          0

Total Physical breakout ports involved in Packet Capture: 0
0 packet captured on disk using switch capture
Reading of capture file from disk is not supported
```

8. Collect the capture files. Follow the steps in the section **Collect Secure Firewall 3100 Internal Switch Capture Files**.

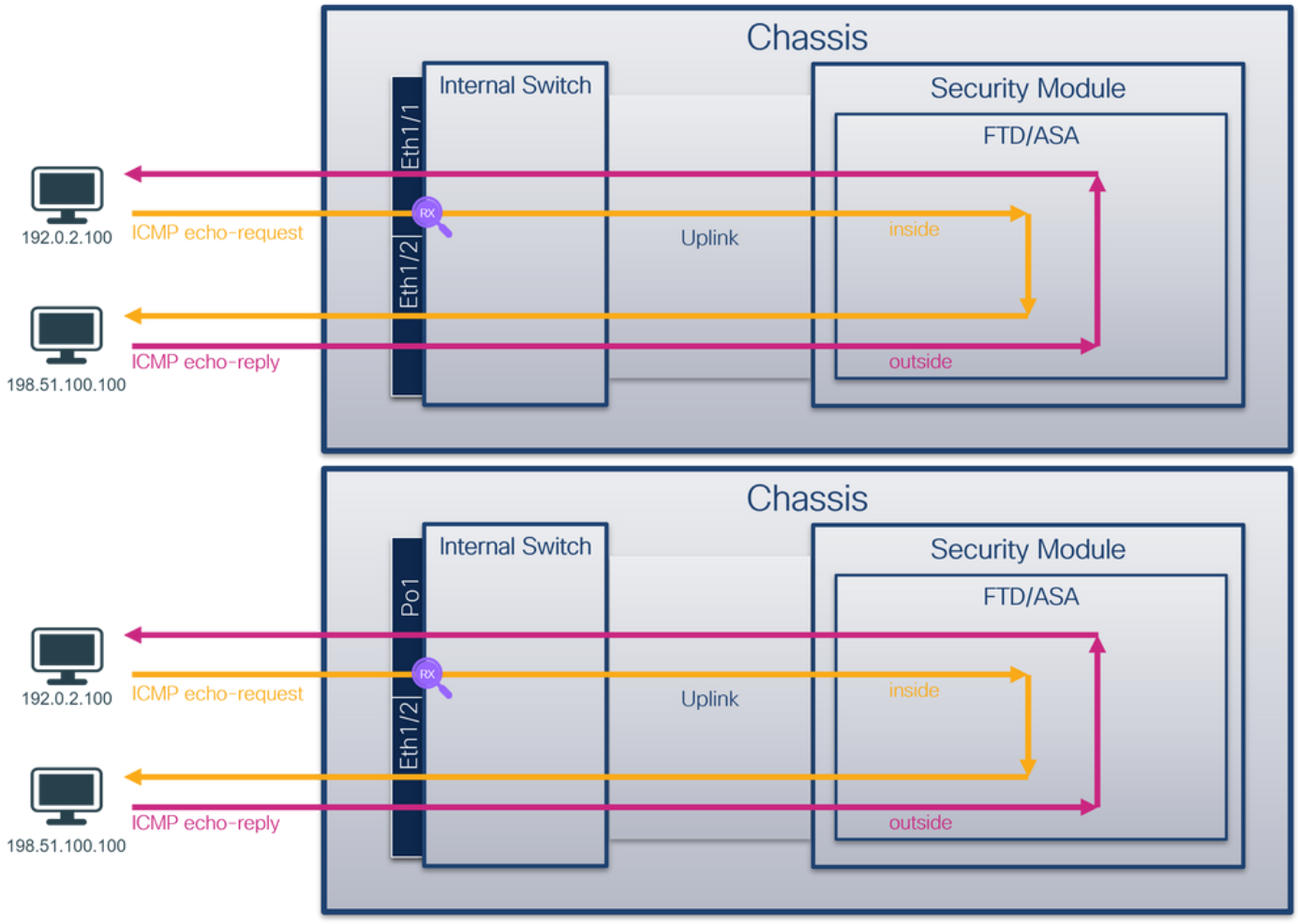
In version 7.2, the internal switch capture configuration is not supported on the FMC or FDM. In the case of ASA software version 9.18(1) and later, internal switch captures can be configured in ASDM versions 7.18.1.x and later.

These scenarios cover common use cases of Secure Firewall 3100 internal switch captures.

Packet Capture on a Physical or Port-channel Interface

Use the FTD or ASA CLI to configure and verify a packet capture on interface Ethernet1/1 or Portchannel1 interface. Both interfaces have the nameif **inside**.

Topology, packet flow, and the capture points



Configuration

Follow these steps on ASA or FTD CLI to configure a packet capture on interface Ethernet1/1 or Port-channel1:

1. Verify the nameif:

```
> show nameif
Interface                  Name                       Security
Ethernet1/1                inside                     0
Ethernet1/2                outside                    0
Management1/1              diagnostic                 0

> show nameif
Interface                  Name                       Security
Port-channel1              inside                     0
Ethernet1/2                outside                    0
Management1/1              diagnostic                 0
```

2. Create a capture session:

```
> capture capsw switch interface inside
```

3. Enable the capture session:

```
> no capture capsw switch stop
```

Verification

Verify the capture session name, administrative and operational state, interface slot, and identifier. Ensure the **Pcapsize** value in bytes increases and the number of captured packets is non-zero:

```
> show capture capsw detail
Packet Capture info
  Name:              capsw
 Session:           1
  Admin State:       enabled
  Oper State:        up
  Oper State Reason: Active
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1

Physical port:
  Slot Id:           1
  Port Id:           1
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
  Pcapsize:          12653
 Filter:            capsw-1-1

Packet Capture Filter Info
 Name:              capsw-1-1
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
```

```
 Src Ip:           0.0.0.0
 Dest Ip:          0.0.0.0
 Src Ipv6:         ::
 Dest Ipv6:        ::
 Src MAC:          00:00:00:00:00:00
 Dest MAC:         00:00:00:00:00:00
 Src Port:         0
 Dest Port:        0
 Ethertype:        0

Total Physical breakout ports involved in Packet Capture: 0

79 packets captured on disk using switch capture

Reading of capture file from disk is not supported
```

In the case of Port-channel1 the capture is configured on all member interfaces:

```
> show capture capsw detail
Packet Capture info
  Name:              capsw
 Session:           1
  Admin State:       enabled
  Oper State:        up
  Oper State Reason: Active
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 2

Physical port:
  Slot Id:           1
  Port Id:           4
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-4-0.pcap
  Pcapsize:          28824
  Filter:            capsw-1-4

Packet Capture Filter Info
 Name:              capsw-1-4
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Physical port:
  Slot Id:           1
  Port Id:           3
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-3-0.pcap
  Pcapsize:          18399
 Filter:            capsw-1-3
```

```
Packet Capture Filter Info
 Name:              capsw-1-3
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0

56 packet captured on disk using switch capture

Reading of capture file from disk is not supported
```

The port-channel member interfaces can be verified in the FXOS **local-mgmt** command shell via the **show portchannel summary** command**:**

```
> connect fxos
…
KSEC-FPR3100-1 connect local-mgmt
KSEC-FPR3100-1(local-mgmt) show portchannel summary
Flags:  D - Down        P - Up in port-channel (members)
I - Individual  H - Hot-standby (LACP only)
s - Suspended   r - Module-removed
S - Switched    R - Routed
U - Up (port-channel)
M - Not in use. Min-links not met
--------------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
      Channel
--------------------------------------------------------------------------------
1     Po1(U)      Eth      LACP      Eth1/3(P)    Eth1/4(P)

LACP KeepAlive Timer:
--------------------------------------------------------------------------------
      Channel  PeerKeepAliveTimerFast
--------------------------------------------------------------------------------
1     Po1(U)      False

Cluster LACP Status:
--------------------------------------------------------------------------------
      Channel  ClusterSpanned  ClusterDetach  ClusterUnitID  ClusterSysID
--------------------------------------------------------------------------------
1     Po1(U)      False          False          0              clust
```

To access the FXOS on ASA, run the **connect fxos admin** command. In the case of multi-context, run the command in the admin context.

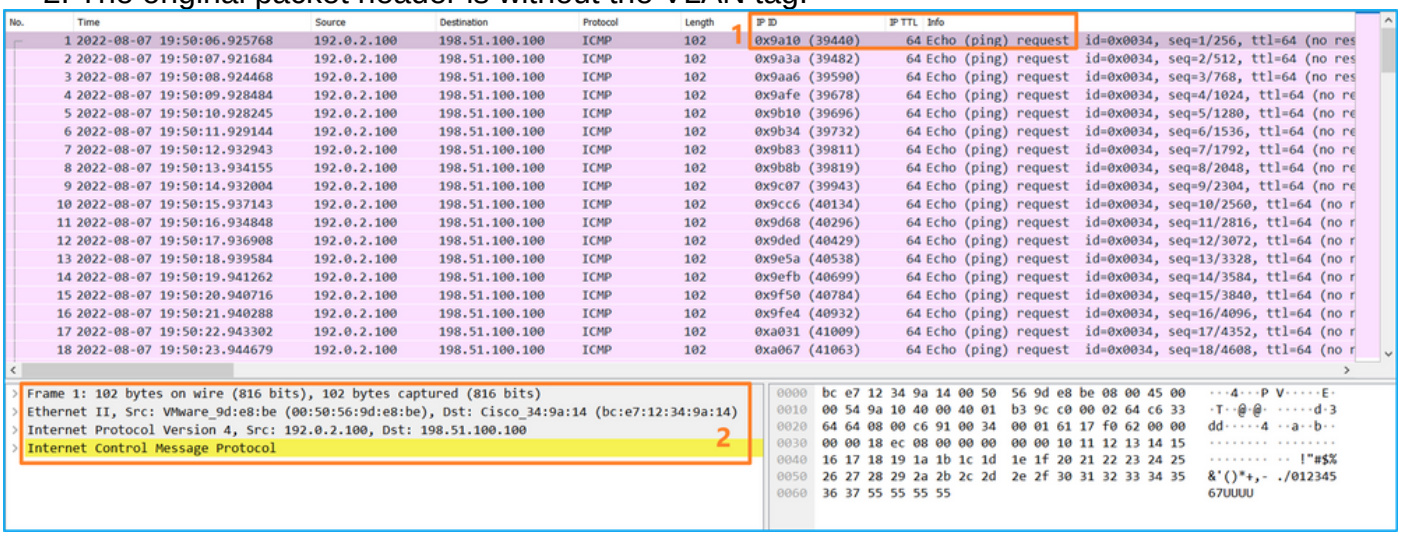
Collect capture files

Follow the steps in the section **Collect Secure Firewall 3100 Internal Switch Capture Files**.

Capture file analysis

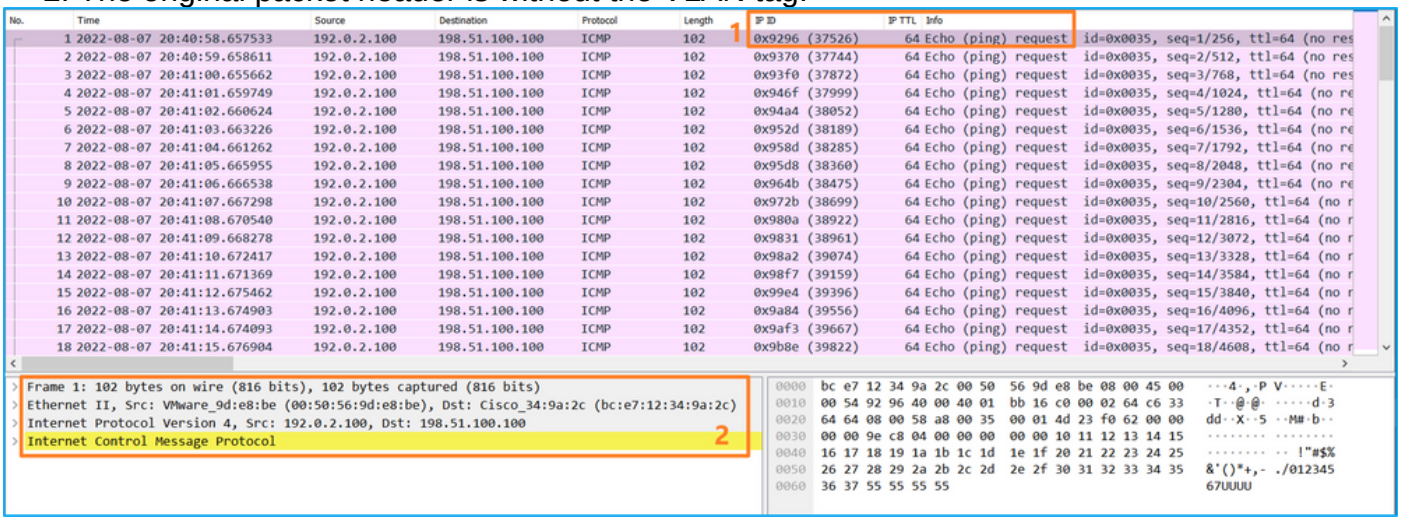
Use a packet capture file reader application to open the capture files for Ethernet1/1. Select the first packet and check the key points:

1. Only ICMP echo request packets are captured.
2. The original packet header is without the VLAN tag.



Open the capture files for Portchannel1 member interfaces. Select the first packet and check the key points:

1. Only ICMP echo request packets are captured.
2. The original packet header is without the VLAN tag.



Explanation

The switch captures are configured on interfaces Ethernet1/1 or Portchannel1.

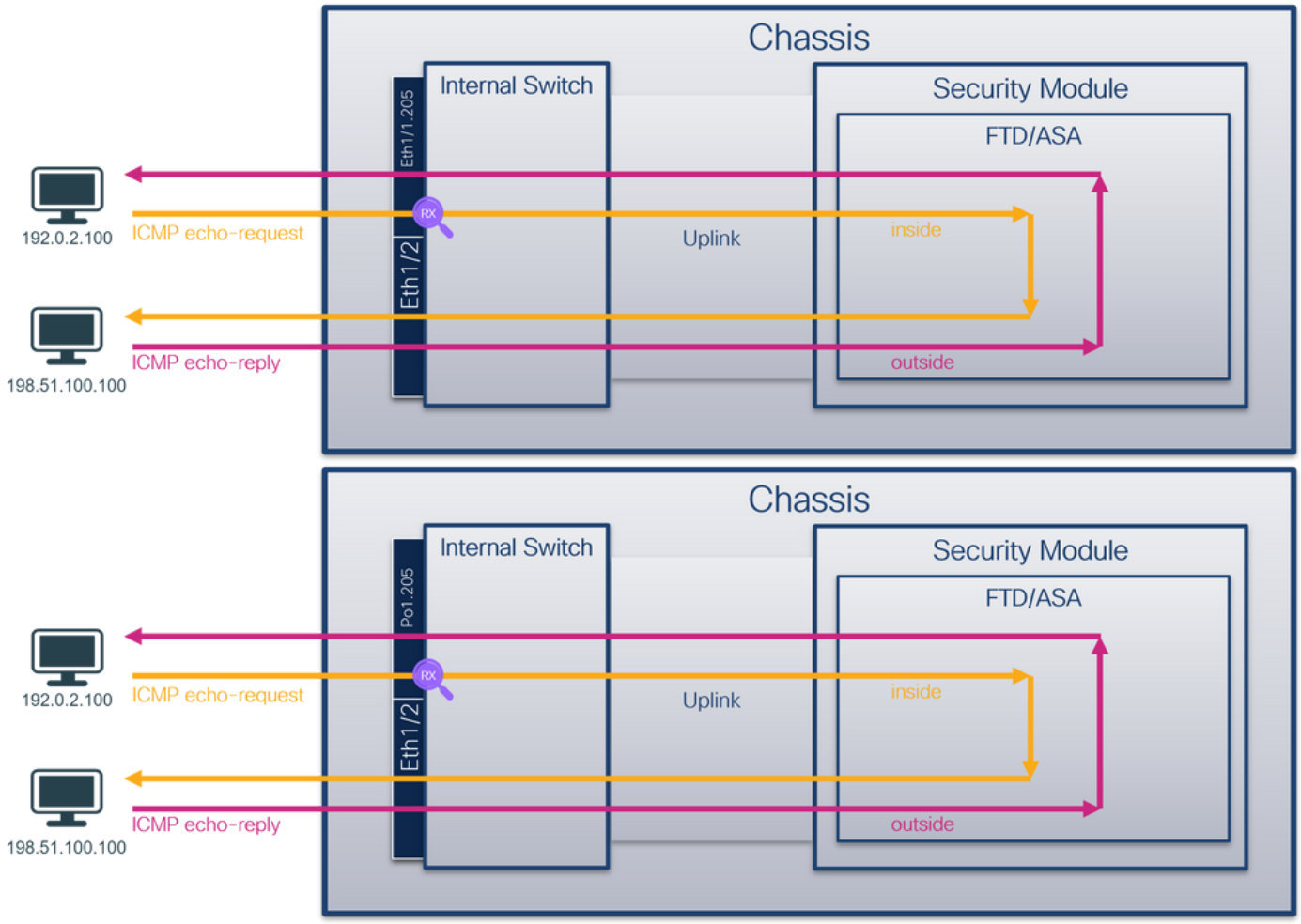
This table summarizes the task:

Task	Capture point	Internal filter	Direction	Captured traffic
Configure and verify a packet capture on interface Ethernet1/1	Ethernet1/1	None	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.10
Configure and verify a packet capture on interface Portchannel1 with member interfaces Ethernet1/3 and Ethernet1/4	Ethernet1/3 Ethernet1/4	None	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.10

Packet Capture on a Subinterface of a Physical or Port-channel Interface

Use the FTD or ASA CLI to configure and verify a packet capture on subinterfaces Ethernet1/1.205 or Portchannel1.205. Both subinterfaces have the nameif **inside**.

Topology, packet flow, and the capture points



Configuration

Follow these steps on ASA or FTD CLI to configure a packet capture on interface Ethernet1/1 or Port-channel1:

1. Verify the nameif:

```
> show nameif
Interface                  Name                       Security
Ethernet1/1.205            inside                     0
Ethernet1/2                outside                    0
Management1/1              diagnostic                 0

> show nameif
Interface                  Name                       Security
Port-channel1.205          inside                     0
Ethernet1/2                outside                    0
Management1/1              diagnostic                 0
```

2. Create a capture session:

```
> capture capsw switch interface inside
```

3. Enable the capture session:

```
> no capture capsw switch stop
```

Verification

Verify the capture session name, administrative and operational state, interface slot, and identifier. Ensure the **Pcapsize** value in bytes increases and the number of captured packets is non-zero:

```
> show capture capsw detail
Packet Capture info
  Name:               capsw
 Session:            1
  Admin State:        enabled
  Oper State:         up
  Oper State Reason: Active
 Config Success:     yes
 Config Fail Reason:
 Append Flag:        overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:         0
 Drop Count:         0

Total Physical ports involved in Packet Capture: 1

Physical port:
  Slot Id:            1
  Port Id:            1
 Pcapfile:           /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
  Pcapsize:           6360
 Filter:             capsw-1-1

Packet Capture Filter Info
  Name:               capsw-1-1
 Protocol:           0
 Ivlan:              0
  Ovlan:              205
 Src Ip:             0.0.0.0
 Dest Ip:            0.0.0.0
 Src Ipv6:           ::
 Dest Ipv6:          ::
 Src MAC:            00:00:00:00:00:00
 Dest MAC:           00:00:00:00:00:00
 Src Port:           0
 Dest Port:          0
 Ethertype:          0

Total Physical breakout ports involved in Packet Capture: 0

46 packets captured on disk using switch capture

Reading of capture file from disk is not supported
```

In this case, a filter with outer VLAN **Ovlan=205** is created and applied to the interface.

In the case of Port-channel1 the capture with a filter **Ovlan=205** is configured on all member interfaces:

```
> show capture capsw detail
Packet Capture info
  Name:               capsw
 Session:            1
  Admin State:        enabled
  Oper State:         up
  Oper State Reason: Active
 Config Success:     yes
 Config Fail Reason:
 Append Flag:        overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:         0
 Drop Count:         0

Total Physical ports involved in Packet Capture: 2

Physical port:
  Slot Id:            1
  Port Id:            4
 Pcapfile:           /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-4-0.pcap
  Pcapsize:           23442
  Filter:             capsw-1-4

Packet Capture Filter Info
 Name:               capsw-1-4
 Protocol:           0
  Ivlan:              0
  Ovlan:              205
 Src Ip:             0.0.0.0
 Dest Ip:            0.0.0.0
 Src Ipv6:           ::
 Dest Ipv6:          ::
 Src MAC:            00:00:00:00:00:00
 Dest MAC:           00:00:00:00:00:00
 Src Port:           0
 Dest Port:          0
 Ethertype:          0

Physical port:
  Slot Id:            1
  Port Id:            3
 Pcapfile:           /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-3-0.pcap
  Pcapsize:           5600
 Filter:             capsw-1-3

Packet Capture Filter Info
 Name:               capsw-1-3
 Protocol:           0
 Ivlan:              0
  Ovlan:              205
 Src Ip:             0.0.0.0
 Dest Ip:            0.0.0.0
 Src Ipv6:           ::
  Dest Ipv6:          ::
 Src MAC:            00:00:00:00:00:00
 Dest MAC:           00:00:00:00:00:00
 Src Port:           0
 Dest Port:          0
 Ethertype:          0

Total Physical breakout ports involved in Packet Capture: 0
```

```
49 packet captured on disk using switch capture

Reading of capture file from disk is not supported
```

The port-channel member interfaces can be verified in the FXOS **local-mgmt** command shell via the **show portchannel summary** command**:**

```
> connect fxos
…
KSEC-FPR3100-1 connect local-mgmt
KSEC-FPR3100-1(local-mgmt) show portchannel summary
Flags:  D - Down        P - Up in port-channel (members)
I - Individual  H - Hot-standby (LACP only)
s - Suspended   r - Module-removed
S - Switched    R - Routed
U - Up (port-channel)
M - Not in use. Min-links not met
--------------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
     Channel
--------------------------------------------------------------------------------
1     Po1(U)      Eth      LACP      Eth1/3(P)    Eth1/4(P)

LACP KeepAlive Timer:
--------------------------------------------------------------------------------
     Channel  PeerKeepAliveTimerFast
--------------------------------------------------------------------------------
1     Po1(U)      False

Cluster LACP Status:
--------------------------------------------------------------------------------
     Channel  ClusterSpanned  ClusterDetach  ClusterUnitID  ClusterSysID
--------------------------------------------------------------------------------
1     Po1(U)      False          False          0            clust
```

To access the FXOS on ASA, run the **connect fxos admin** command. In the case of multi-context, run this command in the admin context.

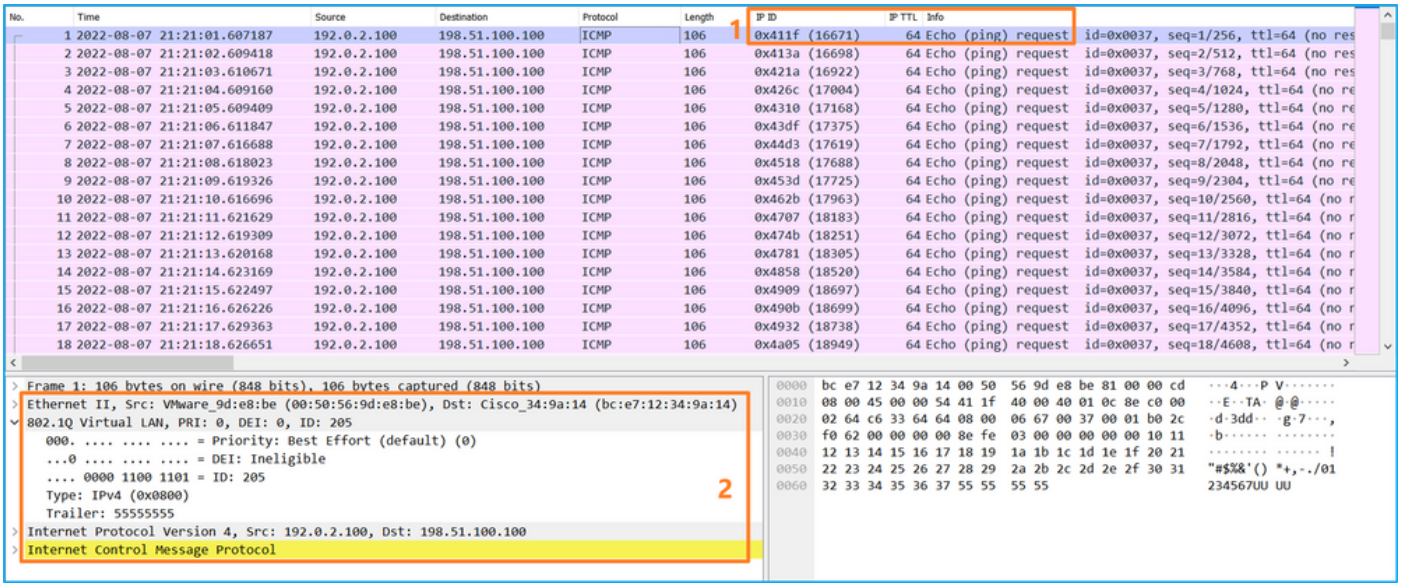
Collect capture files

Follow the steps in the section **Collect Secure Firewall 3100 Internal Switch Capture Files**.

Capture file analysis

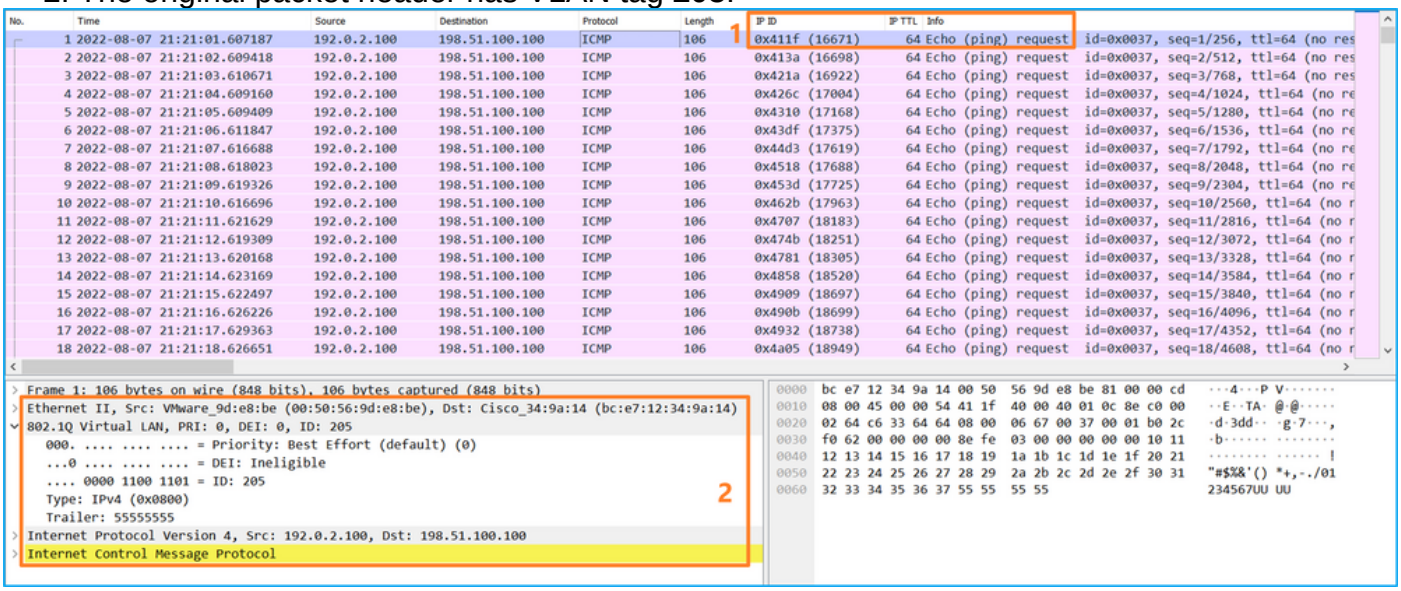
Use a packet capture file reader application to open the capture files for Ethernet1/1.205. Select the first packet and check the key points:

1. Only ICMP echo request packets are captured.
2. The original packet header has VLAN tag **205**.



Open the capture files for Portchannel1 member interfaces. Select the first packet and check the key points:

1. Only ICMP echo request packets are captured.
2. The original packet header has VLAN tag **205**.



Explanation

The switch captures are configured on subinterfaces Ethernet1/1.205 or Portchannel1.205 with a filter that matches outer VLAN 205.

This table summarizes the task:

Task	Capture point	Internal filter	Direction	Captured traffic
Configure and verify a packet capture on subinterface Ethernet1/1.205	Ethernet 1/1	Outer VLAN 205	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.1
Configure and verify a packet capture on subinterface Portchannel1.205 with member interfaces Ethernet1/3 and Ethernet1/4	Ethernet 1/3	Outer VLAN 205	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.1

Packet Capture on Internal Interfaces

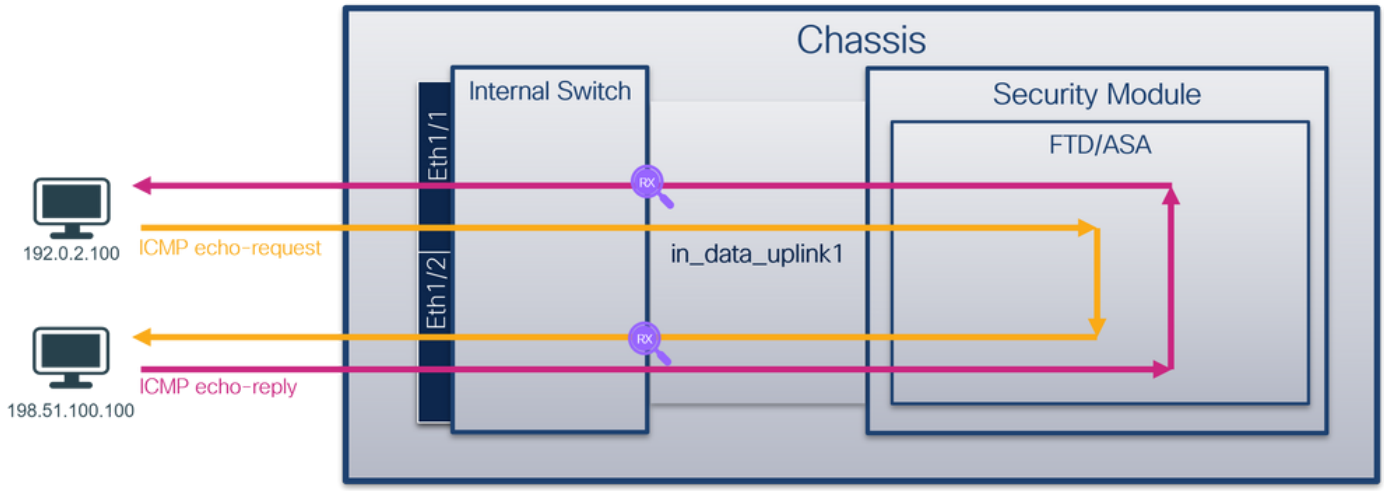
The Secure Firewall has 2 internal interfaces:

- **in_data_uplink1** - connects the application to the internal switch.
- **in_mgmt_uplink1** - provides a dedicated packet path for management connections, such as SSH to the management interface, or the management connection, also known as the sftunnel, between the FMC and the FTD.

Task 1

Use the FTD or ASA CLI to configure and verify a packet capture on the uplink interface **in_data_uplink1.**

Topology, packet flow, and the capture points



Configuration

Follow these steps on ASA or FTD CLI to configure a packet capture on interface **in_data_uplink1**:

1. Create a capture session:

```
> capture capsw switch interface in_data_uplink1
```

2. Enable the capture session:

```
> no capture capsw switch stop
```

Verification

Verify the capture session name, administrative and operational state, interface slot, and identifier. Ensure the **Pcapsize** value in bytes increases and the number of captured packets is non-zero:

```
>  show capture capsw detail
Packet Capture info
  Name:              capsw
 Session:           1
  Admin State:       enabled
  Oper State:        up
```

```
  Oper State Reason: Active
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1

Physical port:
  Slot Id:           1
  Port Id:           18
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-data-uplink1.pcap
  Pcapsize:          7704
 Filter:            capsw-1-18

Packet Capture Filter Info
 Name:              capsw-1-18
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0

66 packets captured on disk using switch capture

Reading of capture file from disk is not supported
```

In this case, a capture is created on the interface with an internal ID **18** which is the in_data_uplink1 interface on the Secure Firewall 3130. The **show portmanager switch status** command in the FXOS **local-mgmt** command shell shows the interface IDs**:**

```
> connect fxos
…
KSEC-FPR3100-1 connect local-mgmt
KSEC-FPR3100-1(local-mgmt) show portmanager switch status
Dev/Port         Mode        Link   Speed  Duplex  Loopback Mode  Port Manager
---------  ---------------  -----  -----  ------  -------------  ------------
0/1             SGMII         Up     1G     Full    None           Link-Up
0/2             SGMII         Up     1G     Full    None           Link-Up
0/3             SGMII         Up     1G     Full    None           Link-Up
0/4             SGMII         Up     1G     Full    None           Link-Up
0/5             SGMII        Down    1G     Half    None           Mac-Link-Down
0/6             SGMII        Down    1G     Half    None           Mac-Link-Down
0/7             SGMII        Down    1G     Half    None           Mac-Link-Down
0/8             SGMII        Down    1G     Half    None           Mac-Link-Down
0/9          1000_BaseX      Down    1G     Full    None           Link-Down
0/10         1000_BaseX      Down    1G     Full    None           Link-Down
0/11         1000_BaseX      Down    1G     Full    None           Link-Down
0/12         1000_BaseX      Down    1G     Full    None           Link-Down
0/13         1000_BaseX      Down    1G     Full    None           Link-Down
0/14         1000_BaseX      Down    1G     Full    None           Link-Down
```

0/15	1000_BaseX	Down	1G	Full	None	Link-Down
0/16	1000_BaseX	Down	1G	Full	None	Link-Down
0/17	1000_BaseX	Up	1G	Full	None	Link-Up
0/18	**KR2**	**Up**	**50G**	**Full**	**None**	**Link-Up**
0/19	KR	Up	25G	Full	None	Link-Up
0/20	KR	Up	25G	Full	None	Link-Up
0/21	KR4	Down	40G	Full	None	Link-Down
0/22	n/a	Down	n/a	Full	N/A	Reset
0/23	n/a	Down	n/a	Full	N/A	Reset
0/24	n/a	Down	n/a	Full	N/A	Reset
0/25	1000_BaseX	Down	1G	Full	None	Link-Down
0/26	n/a	Down	n/a	Full	N/A	Reset
0/27	n/a	Down	n/a	Full	N/A	Reset
0/28	n/a	Down	n/a	Full	N/A	Reset
0/29	1000_BaseX	Down	1G	Full	None	Link-Down
0/30	n/a	Down	n/a	Full	N/A	Reset
0/31	n/a	Down	n/a	Full	N/A	Reset
0/32	n/a	Down	n/a	Full	N/A	Reset
0/33	1000_BaseX	Down	1G	Full	None	Link-Down
0/34	n/a	Down	n/a	Full	N/A	Reset
0/35	n/a	Down	n/a	Full	N/A	Reset
0/36	n/a	Down	n/a	Full	N/A	Reset

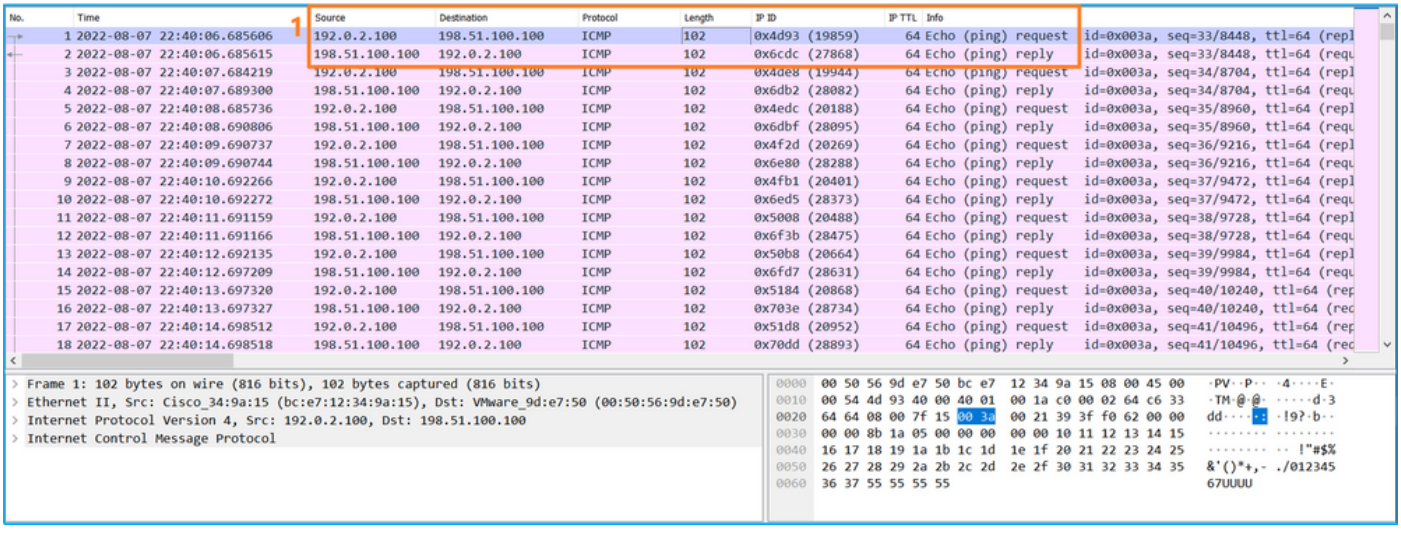
To access the FXOS on ASA, run the **connect fxos admin** command. In the case of multi-context, run this command in the admin context.

Collect capture files

Follow the steps in the section **Collect Secure Firewall 3100 Internal Switch Capture Files**.

Capture file analysis

Use a packet capture file reader application to open the capture files for interface in_data_uplink1. Check the key point - in this case, ICMP echo request and echo reply packets are captured. These are the packets sent from the application to the internal switch.



Explanation

When a switch capture on the uplink interface is configured, only packets sent from the application to the internal switch are captured. Packets sent to the application are not captured.

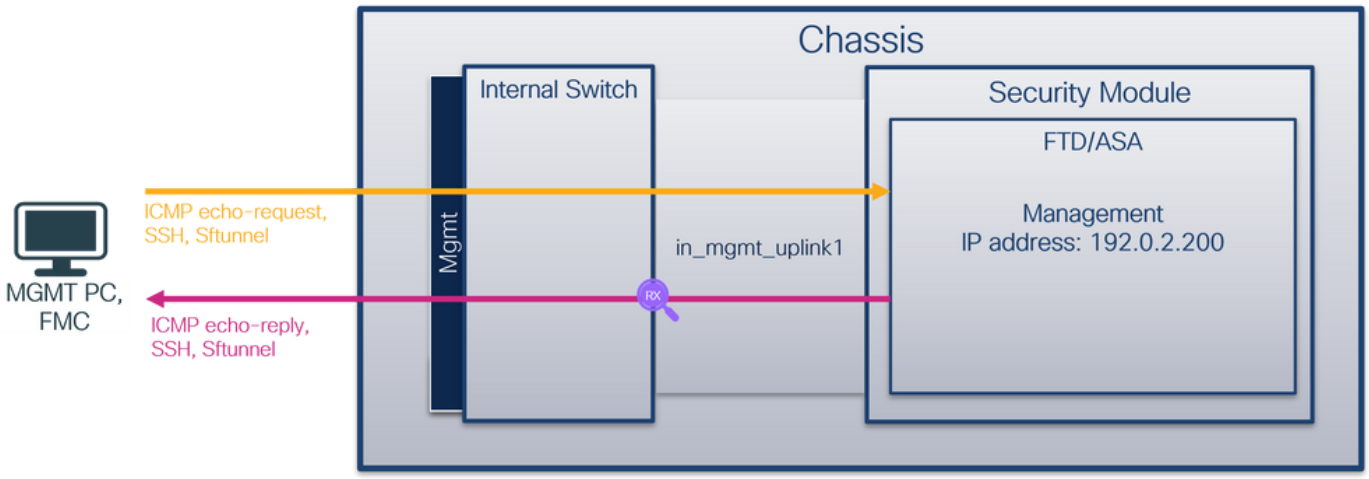
This table summarizes the task:

Task	Capture point	Internal filter	Direction	Captured traffic
Configure and verify a packet capture on the uplink interface in_data_uplink1	in_data_uplink1	None	Ingress only	ICMP echo requests from host 192.0.2.100 to host 198.51.100.1 ICMP echo replies from host 198.51.100.100 to host 192.0.2.1

Task 2

Use the FTD or ASA CLI to configure and verify a packet capture on the uplink interface **in_mgmt_uplink1.** Only the packets of management plane connections are captured.

Topology, packet flow, and the capture points



Configuration

Follow these steps on ASA or FTD CLI to configure a packet capture on interface **in_mgmt_uplink1**:

1. Create a capture session:

```
> capture capsw switch interface in_mgmt_uplink1
```

2. Enable the capture session:

```
> no capture capsw switch stop
```

Verification

Verify the capture session name, administrative and operational state, interface slot, and identifier. Ensure the **Pcapsize** value in bytes increases and the number of captured packets is non-zero:

```
> show capture capsw detail
Packet Capture info
 Name:              capsw
 Session:           1
 Admin State:       enabled
  Oper State:        up
  Oper State Reason: Active
 Config Success:    yes
 Config Fail Reason:
```

```
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1

Physical port:
  Slot Id:           1
  Port Id:           19
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-mgmt-uplink1.pcap
 Pcapsize:          137248
 Filter:            capsw-1-19

Packet Capture Filter Info
 Name:              capsw-1-19
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0

281 packets captured on disk using switch capture

Reading of capture file from disk is not supported
```

In this case, a capture is created on the interface with an internal ID 19 which is the **in_mgmt_uplink1** interface on the Secure Firewall 3130. The **show portmanager switch status** command in the FXOS **local-mgmt** command shell shows the interface IDs:

```
> connect fxos
…
KSEC-FPR3100-1 connect local-mgmt
KSEC-FPR3100-1(local-mgmt) show portmanager switch status
Dev/Port         Mode        Link   Speed  Duplex  Loopback Mode  Port Manager
---------  ----------------  -----  -----  ------  -------------  ------------
0/1             SGMII         Up     1G     Full    None           Link-Up
0/2             SGMII         Up     1G     Full    None           Link-Up
0/3             SGMII         Up     1G     Full    None           Link-Up
0/4             SGMII         Up     1G     Full    None           Link-Up
0/5             SGMII        Down    1G     Half    None           Mac-Link-Down
0/6             SGMII        Down    1G     Half    None           Mac-Link-Down
0/7             SGMII        Down    1G     Half    None           Mac-Link-Down
0/8             SGMII        Down    1G     Half    None           Mac-Link-Down
0/9           1000_BaseX     Down    1G     Full    None           Link-Down
0/10          1000_BaseX     Down    1G     Full    None           Link-Down
0/11          1000_BaseX     Down    1G     Full    None           Link-Down
0/12          1000_BaseX     Down    1G     Full    None           Link-Down
0/13          1000_BaseX     Down    1G     Full    None           Link-Down
0/14          1000_BaseX     Down    1G     Full    None           Link-Down
0/15          1000_BaseX     Down    1G     Full    None           Link-Down
0/16          1000_BaseX     Down    1G     Full    None           Link-Down
0/17          1000_BaseX      Up     1G     Full    None           Link-Up
```

0/18	KR2	Up	50G	Full	None	Link-Up
0/19	**KR**	**Up**	**25G**	**Full**	**None**	**Link-Up**
0/20	KR	Up	25G	Full	None	Link-Up
0/21	KR4	Down	40G	Full	None	Link-Down
0/22	n/a	Down	n/a	Full	N/A	Reset
0/23	n/a	Down	n/a	Full	N/A	Reset
0/24	n/a	Down	n/a	Full	N/A	Reset
0/25	1000_BaseX	Down	1G	Full	None	Link-Down
0/26	n/a	Down	n/a	Full	N/A	Reset
0/27	n/a	Down	n/a	Full	N/A	Reset
0/28	n/a	Down	n/a	Full	N/A	Reset
0/29	1000_BaseX	Down	1G	Full	None	Link-Down
0/30	n/a	Down	n/a	Full	N/A	Reset
0/31	n/a	Down	n/a	Full	N/A	Reset
0/32	n/a	Down	n/a	Full	N/A	Reset
0/33	1000_BaseX	Down	1G	Full	None	Link-Down
0/34	n/a	Down	n/a	Full	N/A	Reset
0/35	n/a	Down	n/a	Full	N/A	Reset
0/36	n/a	Down	n/a	Full	N/A	Reset

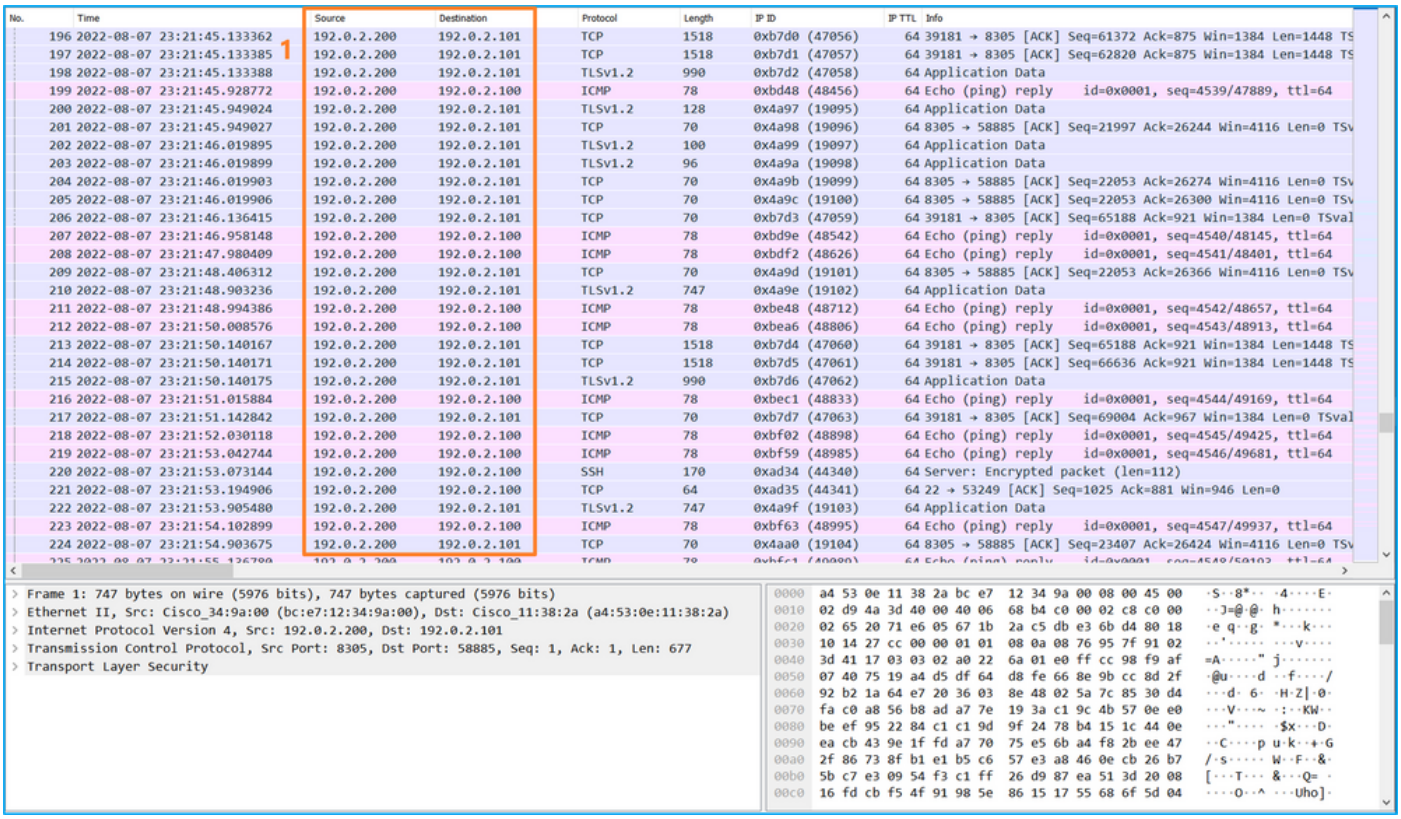
To access the FXOS on ASA, run the **connect fxos admin** command. In the case of multi-context, run this command in the admin context.

Collect capture files

Follow the steps in the section **Collect Secure Firewall 3100 Internal Switch Capture Files.**

Capture file analysis

Use a packet capture file reader application to open the capture files for interface **in_mgmt_uplink1**. Check the key point - in this case only the packets from the management IP address 192.0.2.200 are shown. Examples are SSH, Sftunnel or ICMP echo reply packets. These are the packets sent from the application management interface to the network through the internal switch.



Explanation

When a switch capture on the management uplink interface is configured, only ingress packets sent from the application management interface are captured. Packets destined for the application management interface are not captured.

This table summarizes the task:

Task	Capture point	Internal filter	Direction	Captured traffic
Configure and verify a packet capture on the management uplink interface	in_mgmt_uplink1	None	Ingress only (from the management interface to the network through the internal switch)	ICMP echo replies from FTD managemer address 192.0.2.200 to host 192.0.2.100 Sftunnel from FTD management IP addre 192.0.2.200 to FMC IP address 192.0.2.1 SSH from FTD management IP address 192.0.2.200 to host 192.0.2.100

Packet Capture Filters

Internal switch packet capture filters are configured the same way as the data plane captures. Use the **ethernet-type** and **match** options to configure filters.

Configuration

Follow these steps on ASA or FTD CLI to configure a packet capture with a filter that matches ARP frames or ICMP packets from host 198.51.100.100 on interface Ethernet1/1:

1. Verify the nameif:

```
> show nameif
Interface                  Name                       Security
Ethernet1/1                inside                     0
Ethernet1/2                outside                    0
Management1/1              diagnostic                 0
```

2. Create a capture session for ARP or ICMP:

```
> capture capsw switch interface inside ethernet-type arp

> capture capsw switch interface inside match icmp 198.51.100.100
```

Verification

Verify the capture session name and the filter. The Ethertype value is **2054** in decimal and **0x0806** in hexadecimal:

```
> show capture capsw detail
Packet Capture info
 Name:              capsw
 Session:           1
 Admin State:       disabled
 Oper State:        down
 Oper State Reason: Session_Admin_Shut
 Config Success:    yes
```

```
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1

Physical port:
 Slot Id:           1
 Port Id:           1
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
 Pcapsize:          0
 Filter:            capsw-1-1

Packet Capture Filter Info
  Name:              capsw-1-1
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         2054

Total Physical breakout ports involved in Packet Capture: 0

0 packet captured on disk using switch capture

Reading of capture file from disk is not supported
```

This is the verification of the filter for ICMP. IP protocol 1 is the ICMP:

```
> show capture capsw detail
Packet Capture info
 Name:              capsw
 Session:           1
 Admin State:       disabled
 Oper State:        down
 Oper State Reason: Session_Admin_Shut
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1

Physical port:
 Slot Id:           1
 Port Id:           1
 Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
 Pcapsize:          0
 Filter:            capsw-1-1
```

```
Packet Capture Filter Info
  Name:              capsw-1-1
 Protocol:          1
 Ivlan:             0
 Ovlan:             0
 Src Ip:            198.51.100.100
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0

0 packets captured on disk using switch capture

Reading of capture file from disk is not supported
```

Collect Secure Firewall 3100 Internal Switch Capture Files

Use ASA or FTD CLI to collect internal switch capture files. On FTD, the capture file can also be exported via the CLI **copy** command to destinations reachable via the data or diagnostic interfaces.

Alternatively, the file can be copied to **/ngfw/var/common** in expert mode and downloaded from FMC via the **File Download** option.

In the case of port-channel interfaces ensure to collect packet capture files from all member interfaces.

ASA

Follow these steps on to collect internal switch capture files on ASA CLI:

1. Stop the capture:

```
asa# capture capsw switch stop
```

2. Verify the capture session is stopped and note the capture file name.

```
asa# show capture capsw detail
Packet Capture info
 Name:              capsw
 Session:           1
 Admin State:       disabled
  Oper State:        down
  Oper State Reason: Session_Admin_Shut
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1
```

```
Physical port:
 Slot Id:           1
 Port Id:           1
  Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
 Pcapsize:          139826
 Filter:            capsw-1-1

Packet Capture Filter Info
 Name:              capsw-1-1
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0

886 packets captured on disk using switch capture

Reading of capture file from disk is not supported
```

3. Use the CLI **copy** command to export the file to remote destinations:

```
asa# copy flash:/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap ?
 cluster:        Copy to cluster: file system
 disk0:          Copy to disk0: file system
 disk1:          Copy to disk1: file system
 flash:          Copy to flash: file system
 ftp:            Copy to ftp: file system
 running-config  Update (merge with) current system configuration
 scp:            Copy to scp: file system
 smb:            Copy to smb: file system
 startup-config  Copy to startup configuration
 system:         Copy to system: file system
 tftp:           Copy to tftp: file system

asa# copy flash:/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap tftp://198.51.100.10/
Source filename [/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap]?
Destination filename [sess-1-capsw-ethernet-1-1-0.pcap]?
Copy in progress...C
139826 bytes copied in 0.532 secs
```

FTD

Follow these steps to collect internal switch capture files on FTD CLI and copy them to servers reachable via data or diagnostic interfaces:

1. Go to diagnostic CLI:

```
> system support diagnostic-cli
Attaching to Diagnostic CLI ... Click 'Ctrl+a then d' to detach.
Type help or '?' for a list of available commands.
```

```
firepower> enable
Password: <-- Enter
firepower#
```

2. Stop the capture:

```
firepower# capture capi switch stop
```

3. Verify the capture session is stopped and note the capture file name:

```
firepower# show capture capsw detail
Packet Capture info
 Name:              capsw
 Session:           1
 Admin State:       disabled
  Oper State:        down
  Oper State Reason: Session_Admin_Shut
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1
Physical port:
 Slot Id:           1
 Port Id:           1
  Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
 Pcapsize:          139826
 Filter:            capsw-1-1

Packet Capture Filter Info
 Name:              capsw-1-1
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0

886 packets captured on disk using switch capture

Reading of capture file from disk is not supported
```

4. Use the CLI **copy** command to export the file to remote destinations.

```
firepower# copy flash:/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap ?
 cluster:        Copy to cluster: file system
 disk0:          Copy to disk0: file system
 disk1:          Copy to disk1: file system
 flash:          Copy to flash: file system
```

```
 ftp:            Copy to ftp: file system
 running-config  Update (merge with) current system configuration
 scp:            Copy to scp: file system
 smb:            Copy to smb: file system
 startup-config  Copy to startup configuration
 system:         Copy to system: file system
 tftp:           Copy to tftp: file system

firepower# copy flash:/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap tftp://198.51.100.10/
Source filename [/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap]?
Destination filename [sess-1-capsw-ethernet-1-1-0.pcap]?
Copy in progress...C
139826 bytes copied in 0.532 secs
```

Follow these steps on to collect capture files from FMC via the **File Download** option:

1. Stop the capture:

```
> capture capsw switch stop
```

2. Verify the capture session is stopped and note the file name and full capture file path:

```
> show capture capsw detail
Packet Capture info
 Name:              capsw
 Session:           1
 Admin State:       disabled
  Oper State:        down
  Oper State Reason: Session_Admin_Shut
 Config Success:    yes
 Config Fail Reason:
 Append Flag:       overwrite
 Session Mem Usage: 256
 Session Pcap Snap Len: 1518
 Error Code:        0
 Drop Count:        0

Total Physical ports involved in Packet Capture: 1

Physical port:
 Slot Id:           1
 Port Id:           1
  Pcapfile:          /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
 Pcapsize:          139826
Filter:            capsw-1-1

Packet Capture Filter Info
 Name:              capsw-1-1
 Protocol:          0
 Ivlan:             0
 Ovlan:             0
 Src Ip:            0.0.0.0
 Dest Ip:           0.0.0.0
 Src Ipv6:          ::
 Dest Ipv6:         ::
 Src MAC:           00:00:00:00:00:00
 Dest MAC:          00:00:00:00:00:00
 Src Port:          0
 Dest Port:         0
 Ethertype:         0

Total Physical breakout ports involved in Packet Capture: 0
```

```
886 packets captured on disk using switch capture
Reading of capture file from disk is not supported
```

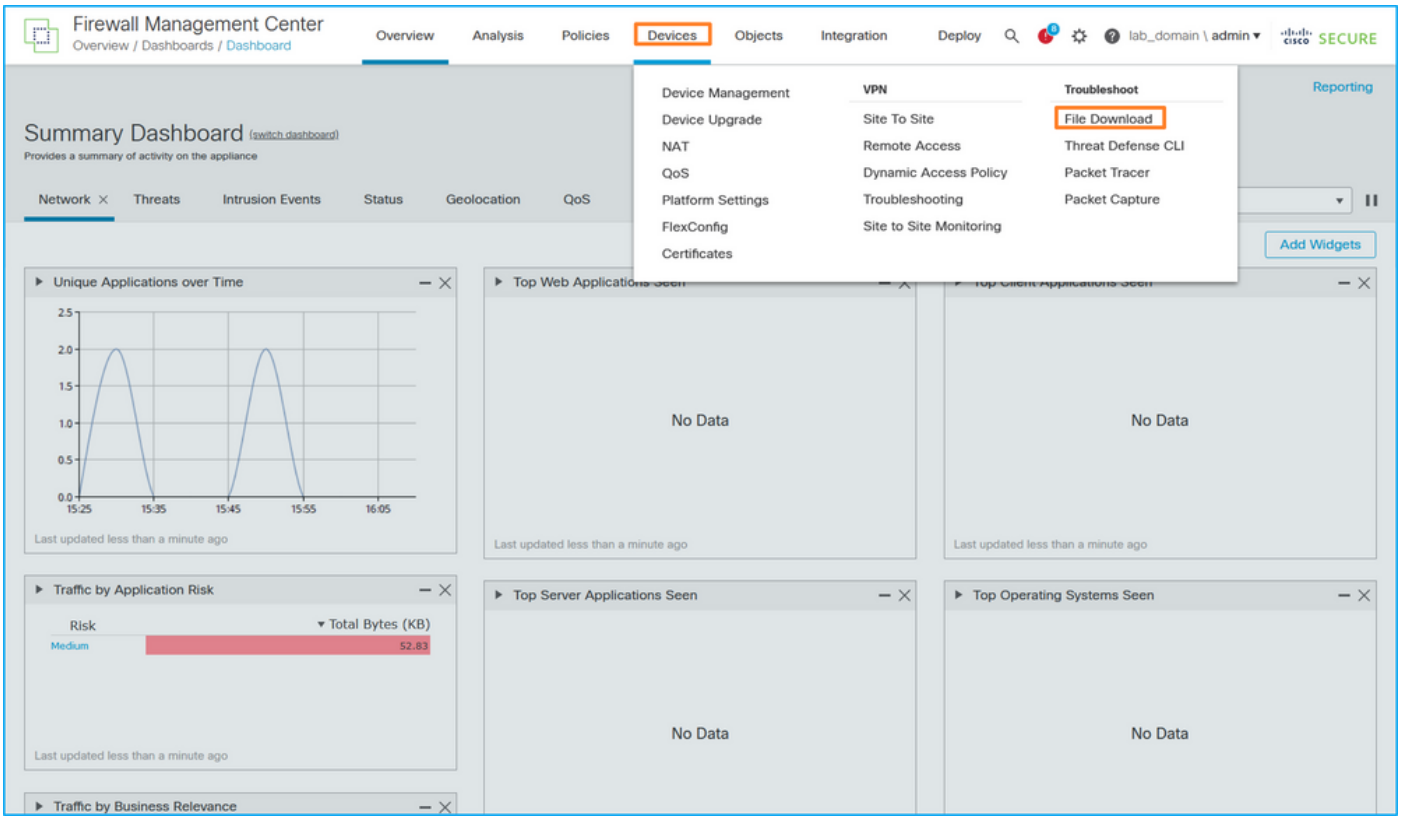
3. Go to expert mode and switch to root mode:

```
> expert
admin@firepower:~$ sudo su
root@firepower:/home/admin
```

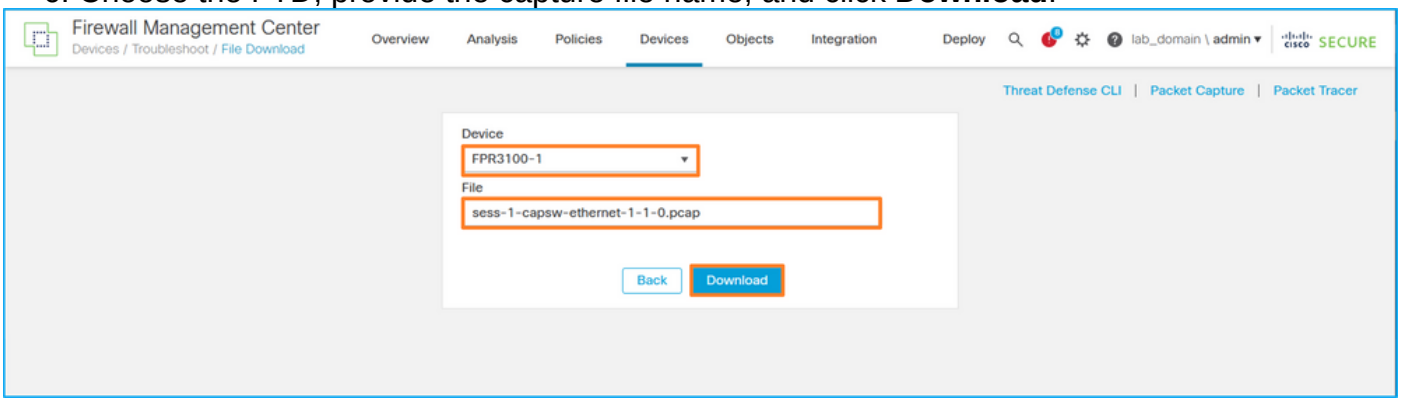
4. Copy the capture file to **/ngfw/var/common/:**

```
root@KSEC-FPR3100-1:/home/admin cp /mnt/disk0/packet-capture/sess-1-capsw-ethernet-1-1-0.pcap
/ngfw/var/common/
root@KSEC-FPR3100-1:/home/admin ls -l /ngfw/var/common/sess*
-rwxr-xr-x 1 root admin 139826 Aug  7 20:14 /ngfw/var/common/sess-1-capsw-ethernet-1-1-0.pcap
-rwxr-xr-x 1 root admin     24 Aug  6 21:58 /ngfw/var/common/sess-1-capsw-ethernet-1-3-0.pcap
```

5. On FMC choose **Devices > File Download**:



6. Choose the FTD, provide the capture file name, and click **Download**:



Guidelines, Limitations, and Best Practices for Internal Switch Packet Capture

Guidelines and limitations:

- Multiple switch capture configuration sessions are supported, but only 1 switch capture session can be active at a time. An attempt to enable 2 or more capture sessions results in an error "**ERROR: Failed to enable session, as limit of maximum 1 active packet capture sessions reached**".
- An active switch capture cannot be deleted.
- Switch captures cannot be read on the application. The user must export the files.
- Certain data plane capture options such as **dump, decode, packet-number, trace,** and others are not supported for switch captures.
- In the case of multi-context ASA, the switch captures on data interfaces are configured in user contexts. The switch captures on interfaces in_data_uplink1, and in_mgmt_uplink1 are supported only in the admin context.

This is the list of best practices based on the usage of packet capture in TAC cases:

- Be aware of guidelines and limitations.
- Use capture filters.
- Consider the impact of NAT on packet IP addresses when a capture filter is configured.
- Increase or decrease the **packet-length** that specifies frame size, in case it differs from the default value of 1518 bytes. Shorter size results in an increased number of captured packets and vice versa.
- Adjust the **buffer** size as needed.
- Be aware of the **Drop Count** in the output of the **show cap <cap_name> detail** command. Once the buffer size limit is reached, the drop count counter increases.

Related Information

- Firepower 4100/9300 Chassis Manager and FXOS CLI Configuration Guides
- Cisco Secure Firewall 3100 Getting Started Guide
- Cisco Firepower 4100/9300 FXOS Command Reference