Catalyst 6500 Series Switches with Supervisor Engine 720 ELAM Procedure

TAC **Document ID: 116643**

Contributed by Andrew Gossett and Yogesh Ramdoss, Cisco TAC Engineers.
Nov 11, 2013

Contents

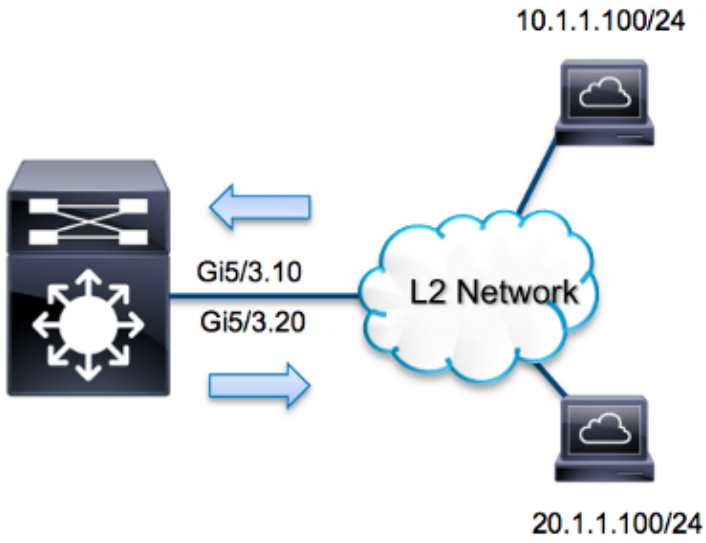
Introduction
Topology
Determine the Ingress Forwarding Engine
Configure the Trigger
Start the Capture
Interpret the Results
Virtual Switching System

Introduction

This document describes the steps used in order to perform an ELAM (Embedded Logic Analyzer Module) capture on Cisco Catalyst 6500 Series switches (6500) that run Supervisor Engine 720 (Sup720), explains the most relevant outputs, and describes how to interpret the results. This example also applies to DFC3−enabled linecards.

Tip: Refer to the ELAM Overview document for an overview on ELAM.

Topology



In this example, the 6500 acts as a *router on a stick* in order to route traffic between hosts on VLAN 10 and VLAN 20. ELAM is used in order to validate that an Internet Control Message Protocol (ICMP) request from host ***10.1.1.100*** received on port ***G5/3*** of VLAN 10 is successfully routed back to ***20.1.1.100*** on port ***G5/3*** of VLAN 20.

Note: For Sup720, each ELAM command begins with this syntax: ***show platform capture elam***.

Determine the Ingress Forwarding Engine

Traffic is expected to ingress the switch on port ***G5/3***. When you check the modules in the system, you see that ***module 5*** is the ***Active*** supervisor. Therefore, you should configure the ELAM on ***module 5***.

```
Sup720#show module 5
Mod Ports Card Type                              Model              Serial No.
--- ----- ---------------------------------------- ------------------ -----------
  5    5  Supervisor Engine 720 10GE (Active)    VS-S720-10G        SAL1429N5ST
```

For Sup720, perform the ELAM on the Layer 2 (L2) Forwarding Engine (FE) with internal codename ***Superman***. Note that the L2 FE Data Bus (DBUS) contains the original header information before the L2 and Layer 3 (L3) lookup, and the Result Bus (RBUS) contains the results after both L3 and L2 lookups. The L3 lookup is performed by the L3 FE with internal codename ***Tycho***.

```
Sup720(config)#service internal
Sup720#show platform capture elam asic superman slot 5
```

Note: The ***service internal*** command is required in order to run an ELAM on Sup720. This configuration simply unlocks the hidden commands.

Configure the Trigger

The ***Superman*** ASIC supports ELAM triggers for IPv4, IPv6, and others. The ELAM trigger must align with the frame type. If the frame is an IPv4 frame, then the trigger must also be IPv4. An IPv4 frame is not captured with an *other* trigger. The same logic applies to IPv6. The most commonly used triggers according to the frame−type are shown in this table:

IPv4	***IPv6***	***All Frame Types***
• SMAC • DMAC • IP_SA • IP_DA • IP_TTL • IP_TOS • L3_PT (ICMP,IGMP,TCP,UDP) ♦ TCP_SPORT, TCP_DPORT ♦ UDP_DPORT, UDP_SPORT ♦ ICMP_TYPE	• SMAC • DMAC • IP6_SA • IP6_DA • IP6_TTL • IP6_CLASS • L3_PT (ICMP, IGMP, TCP, UDP) ♦ IP6_L4DATA	• VLAN • SRC_INDEX • DST_INDEX

Most of these fields should be self−explanatory. For example, ***SMAC*** and ***DMAC*** refer to the Source MAC address and the Destination MAC address, ***IP_SA*** and ***IP_DA*** refer to the Source IPv4 address and the Destination IPv4 address, and ***L3_PT*** refers to the L3 Protocol Type, which can be Internet Control Message Protocol (ICMP), Internet Group Management Protocol (IGMP), TCP, or UDP.

Note: An *other* trigger requires the user to provide the exact hex data and mask for the frame in question, and is outside of the scope of this document.

For this example, the frame is captured according to the source and destination IPv4 address. Remember that ELAM triggers allow various levels of specificity. Therefore, you can use additional fields, such as Time To Live (TTL), Type of Service (TOS), and Layer3 Protocol Type (L3_PT), if needed. The ***Superman*** trigger for this packet is:

```
Sup720# show platform capture elam trigger dbus ipv4
 if ip_sa=10.1.1.100 ip_da=20.1.1.100
```

Start the Capture

Now that the ingress FE is selected and you configured the trigger, you can start the capture:

```
Sup720#show platform capture elam start
```

In order to check the status of the ELAM, enter the ***status*** command:

```
Sup720#show platform capture elam status
Active ELAM info:
Slot Cpu   Asic   Inst Ver PB Elam
---- --- -------- ---- --- -- ----
5    0   ST_SUPER 0    2.2    Y
DBUS trigger: FORMAT=IP L3_PROTOCOL=IPV4 IP_SA=10.1.1.100 IP_DA=20.1.1.100
ELAM capture in progress
```

Once the frame that matches the trigger is received by the FE, the ELAM status shows as ***completed***:

```
Sup720#show platform capture elam status
Active ELAM info:
Slot Cpu   Asic   Inst Ver PB Elam
---- --- -------- ---- --- -- ----
5    0   ST_SUPER 0    2.2    Y
DBUS trigger: FORMAT=IP L3_PROTOCOL=IPV4 IP_SA=10.1.1.100 IP_DA=20.1.1.100
ELAM capture completed
```

Interpret the Results

In order to display the ELAM results, enter the ***data*** command. Here is an excerpt of the ELAM data output that is most relevant to this example:

```
Sup720#show platform capture elam data
(some output omitted)
DBUS:
VLAN ............................ [12] = 10
SRC_INDEX ....................... [19] = 0x102
L3_PROTOCOL ..................... [4] = 0 [IPV4]
L3_PT ........................... [8] = 1 [ICMP]
DMAC ............................ = 0014.f179.b640
SMAC ............................ = 0021.5525.423f
IP_TTL .......................... [8] = 255
IP_SA ........................... = 10.1.1.100
IP_DA ........................... = 20.1.1.100


RBUS:
FLOOD ........................... [1] = 1
DEST_INDEX ...................... [19] = 0x14
VLAN ............................ [12] = 20
IP_TTL .......................... [8] = 254
REWRITE_INFO
 i0  - replace bytes from ofs 0 to ofs 11 with seq
```

```
  '00 05 73 A9 55 41 00 14 F1 79 B6 40'.
```

With the ***DBUS*** data, you can verify that the frame is received on VLAN 10 with a source MAC address of ***0021.5525.423f*** and a destination MAC address of ***0014.f179.b640***. You can also see that this is an IPv4 frame that is sourced from ***10.1.1.100***, and is destined to ***20.1.1.100***.

Tip: There are several other fields that are not included in this output, such as TOS value, IP flags, IP length, and L2 frame length, which are also useful.

In order to verify on which port the frame is received, enter the ***SRC_INDEX*** command (the source Local Target Logic (LTL)). Enter this command in order to map an LTL to a port or group of ports for Sup720:

```
Sup720#remote command switch test mcast ltl-info index 102
index 0x102 contain ports 5/3
```

The output shows that the ***SRC_INDEX*** of ***0x102*** maps to port ***G5/3***. This confirms that the frame is received on port ***G5/3***.

With the ***RBUS*** data, you can verify that the frame is routed to VLAN 20, and that the TTL is decremented from ***255*** in the ***DBUS*** data to ***254*** in the ***RBUS***. The ***REWRITE_INFO*** from the output shows that the FE replaces bytes 0 through 11 (the first 12 bytes) that represent the MAC address rewrite for the destination and source MAC addresses. Additionally, you can verify from the ***DEST_INDEX*** (destination LTL) information where the frame is sent.

Note: The flood bit is set in the RBUS, so the ***DEST_INDEX*** changes from ***0x14*** to ***0x8014***.

```
Sup720#remote command switch test mcast ltl-info index 8014
index 0x8014 contain ports 5/3
```

The output shows that the ***DEST_INDEX*** of ***0x8014*** also maps to port ***G5/3***. This confirms that the frame is sent to port ***G5/3***.

Virtual Switching System

For the Virtual Switching System (VSS), you must correlate the physical port with the virtual slot map. Consider this example, where an attempt is made to map the ports that forward frames that are sent to LTL ***0xb42***.

```
VSS#remote command switch test mcast ltl index b42
index 0xB42 contain ports 20/1, 36/1
```

We can see that the LTL maps to virtual slot numbers ***20*** and ***36***. In order to check the virtual slot map, enter this command:

```
VSS#show switch virtual slot-map
Virtual Slot to Remote Switch/Physical Slot Mapping Table:

Virtual    Remote      Physical   Module
Slot No    Switch No   Slot No    Uptime
---------+-----------+----------+----------
<some output omitted>
  20        1             4        1d07h
  21        1             5        1d08h
  36        2             4        20:03:19
  37        2             5        20:05:44
```

The output shows that ***Slot 20*** maps to ***Switch 1***, ***Module 4***, and that ***Slot 36*** maps to ***Switch 2***, ***Module 4***. Therefore, LTL ***0xb42*** maps to ports ***1/4/1*** and ***2/4/1***. If these ports are members of a port−channel, then only one of the ports forwards the frame according to the configured load−balancing scheme.

Updated: Nov 11, 2013 Document ID: 116643