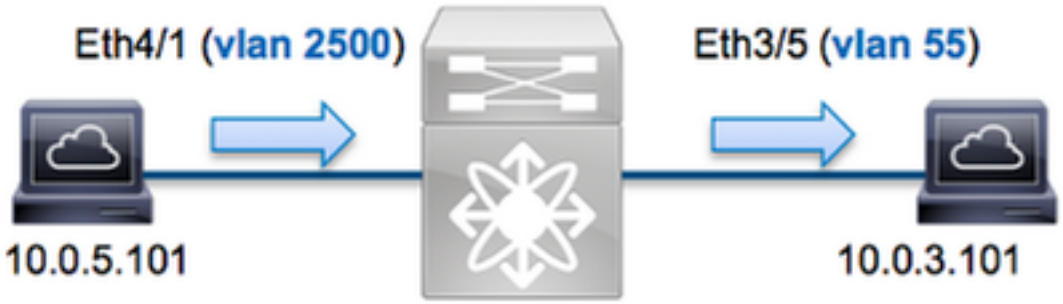
Contents

Introduction

This document describes the steps used in order to perform an ELAM on Cisco Nexus 7700 (N7700) M3 modules, explains the most relevant outputs, and describes how to interpret the results.

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

Topology



In this example, a host on VLAN 2500 (**10.0.5.101**), port **Eth4/1** sends an Internet Control Message Protocol (ICMP) request to a host on VLAN 55 (**10.0.3.101**), port **Eth3/5**. ELAM is used in order to capture this single packet from **10.0.5.101** to **10.0.3.101**. It is important to remember that ELAM allows you to capture a single frame.

In order to perform an ELAM on the N7K, you must first connect to the appropriate module (this requires the network-admin privilege):

```
N7700# attach module 4
Attaching to module 4 ...
module-4#
```

Determine the Ingress Forwarding Engine

Traffic is expected to ingress the switch on port **Eth4/1**. When you check the modules in the system, you see that **Module 4** is an M3 module. It is important to remember that the N7K is fully-distributed, and that the modules, not the supervisor, make the forwarding decisions for dataplane

traffic.

```
N7700# show module
Mod  Ports  Module-Type                          Model              Status
---  -----  ----------------------------------- ------------------ ----------
1    12     100 Gbps Ethernet Module            N77-F312CK-26      ok
3 48 1/10 Gbps Ethernet Module N77-M348XP-23L ok 4    24     10/40 Gbps Ethernet Module
N77-M324FQ-25L     ok
5    0      Supervisor Module-2                 N77-SUP2E          active *
6    0      Supervisor Module-2                 N77-SUP2E          ha-standby
7    24     10/40 Gbps Ethernet Module          N77-F324FQ-25      ok

Mod  Sw               Hw
---  ---------------  ------
1    7.3(0)DX(1)      1.1
3 7.3(0)DX(1) 1.1 4 7.3(0)DX(1) 1.0 5 7.3(0)DX(1) 1.2 6 7.3(0)DX(1) 1.2 7 7.3(0)DX(1) 1.0
```

For M-Series modules, perform the ELAM on the Layer 2 (L2) Forwarding Engine (FE) with internal codename **F4**. Note that the L2 FE Data Bus (DBUS) contains the original header information before the L2 and Layer 3 (L3) lookups, and the Result Bus (RBUS) contains the results after both L3 and L2 lookups.

N7K M3 modules can use multiple FEs for each module, so you must determine the **F4** ASIC that is used for the FE on port **Eth4/1**. Enter this command in order to verify this:

```
module-4# show hardware internal dev-port-map
(some output omitted)
-------------------------------------------------------------- CARD_TYPE: 24 port 40G >Front
Panel ports:24 ------------------------------------------------------------- Device name Dev
role Abbr num_inst: ------------------------------------------------------------- > SLF L3
Driver DEV_LAYER_3_LOOKUP L3LKP 4 > SLF L2FWD driver DEV_LAYER_2_LOOKUP     L2LKP  4
+-----------------------------------------------------------------------+
+----------------+++FRONT PANEL PORT TO ASIC INSTANCE MAP+++------------+
+-----------------------------------------------------------------------+
FP port |  PHYS | MAC_0 | RWR_0 | L2LKP | L3LKP | QUEUE |SWICHF
   1              0       0       0       0       0       0,1
   2              0       0       0       0       0       0,1
   3              0       0       0       0       0       0,1
```

In the output, you can see that port **Eth4/1** is on **F4 (L2LKP)** instance **0**. On the N77-M312CQ-26L module, there are **6** F4 ASICs with 2 ports in each port group. On the N77-M324FQ-25L module, there are **4** F4 ASICs with 6 ports in each port group. The N77-M348XP-23L module has **2** F4 ASICs with 12 ports in each port group.

> **Note**: Just like F-series modules, M3 module ELAM syntax uses 0-based values. This is not the case for M1 and M2 modules, which use 1-based values.

```
module-4# elam asic f4 instance 0
module-4(f4-elam)# layer2
module-4(f4-l2-elam)#
```

Configure the Trigger

The **F4** 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.

With Nexus Operating Systems (NX-OS), you can use the question mark character in order to separate the ELAM trigger:

```
module-4(f4-l2-elam)# trigger dbus ipv4 ingress if ?
```

```
 (some output omitted)
 destination-index Destination-index
destination-ipv4-address Destination ipv4 address
destination-ipv4-mask Destination ipv4 mask
destination-mac-address Destination mac address
 l4-protocol L4 protocol
source-index Source-index
source-ipv4-address Source ipv4 address
source-ipv4-mask Source ipv4 mask
source-mac-address Source mac address
```

For this example, the frame is captured according to the source and destination IPv4 addresses, so only those values are specified.

F4 requires separate triggers for the DBUS and the RBUS.

Here is the DBUS trigger:

```
module-4(f4-l2-elam)# trigger dbus ipv4 ingress if source-ipv4-address
 10.0.5.101 destination-ipv4-address 10.0.3.101
```

Here is the RBUS trigger:

```
module-4(f4-l2-elam)# trigger rbus ingress result if tr 1
```

Start the Capture

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

```
module-4(f4-l2-elam)# start
```

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

```
module-4(f4-l2-elam)# status
ELAM Slot 4 instance 0: L2 DBUS/LBD Configuration: trigger dbus ipv4 ingress if
source-ipv4-address 10.0.5.101 destination-ipv4-address 10.0.3.101
L2 DBUS/LBD: Configured
ELAM Slot 4 instance 0: L2 RBUS Configuration: trigger rbus ingress result if tr 1
L2 RBUS: Configured
L2 BIS: Unconfigured
L2 BPL: Unconfigured
L2 EGR: Unconfigured
L2 PLI: Unconfigured
L2 PLE: Unconfigured
```

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

```
module-4(f4-l2-elam)# status
ELAM Slot 4 instance 1: L2 DBUS/LBD Configuration: trigger dbus ipv4 ingress if
source-ipv4-address 10.0.5.101 destination-ipv4-address 10.0.3.101
L2 DBUS/LBD: Triggered
ELAM Slot 4 instance 1: L2 RBUS Configuration: trigger rbus ingress result if tr 1
L2 RBUS: Triggered
L2 BIS: Unconfigured
L2 BPL: Unconfigured
L2 EGR: Unconfigured
L2 PLI: Unconfigured
L2 PLE: Unconfigured  7
```

Interpret the Results

In order to display the ELAM results, enter the **show dbus** and **show rbus** commands. If there is a high volume of traffic that matches the same triggers, the DBUS and RBUS might trigger on different frames. Therefore, it is important to check the internal sequence numbers on the DBUS and RBUS data in order to ensure that they match:

```
module-4(f4-l2-elam)# show dbus | i seq
port-id : 0x0 sequence-number : 0x868
module-4(f4-l2-elam)# show rbus | i seq
de-bri-rslt-valid : 0x1 sequence-number : 0x868
```

Here is the excerpt from the ELAM data that is most relevant to this example (some output is omitted):

```
module-4(f4-l2-elam)# show dbus
-----------------------------------------------------------------
                      LBD IPV4
-----------------------------------------------------------------
ttl                 : 0xff            l3-packet-length    : 0x54
destination-address: 10.0.3.101
source-address: 10.0.5.101
-----------------------------------------------------------------
packet-length       : 0x66            vlan                : 0x9c4
segid-lsb           : 0x0             source-index        : 0xe05
 destination-mac-address : 8c60.4f07.ac65
 source-mac-address : 8c60.4fb7.3dc2
port-id             : 0x0             sequence-number     : 0x868

module-4(f4-l2-elam)# show rbus
-----------------------------------------------------------------
                      L2 RBUS RSLT CAP DATA
-----------------------------------------------------------------
de-bri-rslt-valid   : 0x1             sequence-number     : 0x868
vlan                : 0x37            rbh                 : 0x65
cos                 : 0x0             destination-index   : 0x9ed
```

With the **DBUS** data, you can verify that the frame is received on VLAN 2500 with a source MAC address of **8c60.4fb6.3dc2** and a destination MAC address of **8c60.4f07.ac65**. You can also see that this is an IPv4 frame that is sourced from **10.0.5.101**, and is destined to **10.0.3.101**.

> **Tip**: There are several other useful fields that are not included in this output, such as Type of Service (TOS) value, IP flags, IP length, and L2 frame length.

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 the N7K:

```
N7700# show system internal pixm info ltl 0xe05

Member info
------------------
Type LTL
--------------------------------
PHY_PORT       Eth4/1
FLOOD_W_FPOE 0xc031
```

The output shows that the **SRC_INDEX** of **0xe05** maps to port **Eth4/1**. This confirms that the frame is received on port **Eth4/1**.

With the **RBUS** data, you can verify that the frame is routed to VLAN 55. Notice that the TTL starts as **0xff** in the **DBUS** data. Additionally, you can confirm the egress port from the **DEST_INDEX**

(destination LTL):

```
N7K# show system internal pixm info ltl 0x9ed
Member info
------------------
Type            LTL
--------------------------------
PHY_PORT       Eth3/5
FLOOD_W_FPOE   0x8017
FLOOD_W_FPOE   0x8016
```

The output shows that the **DEST_INDEX** of **0x9ed** maps to port **Eth3/5**. This confirms that the frame is sent from port **Eth3/5**.

Additional Verification

In order verify how the switch allocates the LTL pool, enter the **show system internal pixm info ltl-region** command. The output from this command is useful in order to understand the purpose of an LTL if it is not matched to a physical port. A good example of this is a **Drop LTL**:

```
N7700# show system internal pixm info ltl 0xcad
0x0cad is Drop DI LTL

N7700# show system internal pixm info ltl-region
(some output omitted) ========================================================== PIXM VDC 1 LTL
MAP Version: 3 Description: LTL Map for Crossbow
========================================================== LTL_TYPE SIZE START END
=============================================================================
LIBLTLMAP_LTL_TYPE_PHY_PORT 3072 0x0 0xbff LIBLTLMAP_LTL_TYPE_SUP_ETH_INBAND 64 0xc00 0xc3f
LIBLTLMAP_LTL_TYPE_UCAST_VPC_VDC_SI 32 0xc40 0xc5f LIBLTLMAP_LTL_TYPE_EXCEPTION_SPAN 32 0xc60
0xc7f LIBLTLMAP_LTL_TYPE_UCAST_GENERIC 48 0xc80 0xcaf ----------------------------------------
------------------------ SUB-TYPE LTL ------------------------------------------------------
---------- LIBLTLMAP_LTL_TYPE_UCAST_GENERIC_NOT_USED 0xcaf
LIBLTLMAP_LTL_TYPE_DROP_DI_WO_HW_BITSET 0xcae LIBLTLMAP_LTL_TYPE_DROP_DI
0xcad
        LIBLTLMAP_LTL_TYPE_SUP_DIAG_SI_V5                0xcac
        LIBLTLMAP_LTL_TYPE_RESERVED_ERSPAN_LTL           0xcab
        ------------------------------------------------------------------
LIBLTLMAP_LTL_TYPE_LC_CPU                          192     0xcb0   0xd6f
LIBLTLMAP_LTL_TYPE_UCAST_RESERVED                  144     0xd70   0xdff
LIBLTLMAP_LTL_TYPE_PC                              1536    0xe00   0x13ff
LIBLTLMAP_LTL_TYPE_DYNAMIC_UCAST                   5120    0x1400  0x27ff
LIBLTLMAP_LTL_TYPE_MCAST_RESERVED                  48      0x2800  0x282f
LIBLTLMAP_LTL_TYPE_DYNAMIC_MCAST                   38848   0x2830  0xbfef
LIBLTLMAP_LTL_TYPE_SAC_FLOOD                       16      0xbff0  0xbfff
LIBLTLMAP_LTL_TYPE_FLOOD_WITH_FPOE                 16384   0xc000  0xffff
```