



The bridge to possible

NXOS Troubleshooting

Expand Your Toolset with Feature Rich Nexus 9000

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Agenda

- Introduction
- Unveiling the tools
- Real-world Applications and Success Stories
- Summary



The bridge to possible

Tools Reviewed Today

Tool #1: Ethalyzer

Tool #2: SPAN-to-CPU

Tool #3: ELAM

Tool #4: Consistency Checker

Tool #5: Show troubleshoot

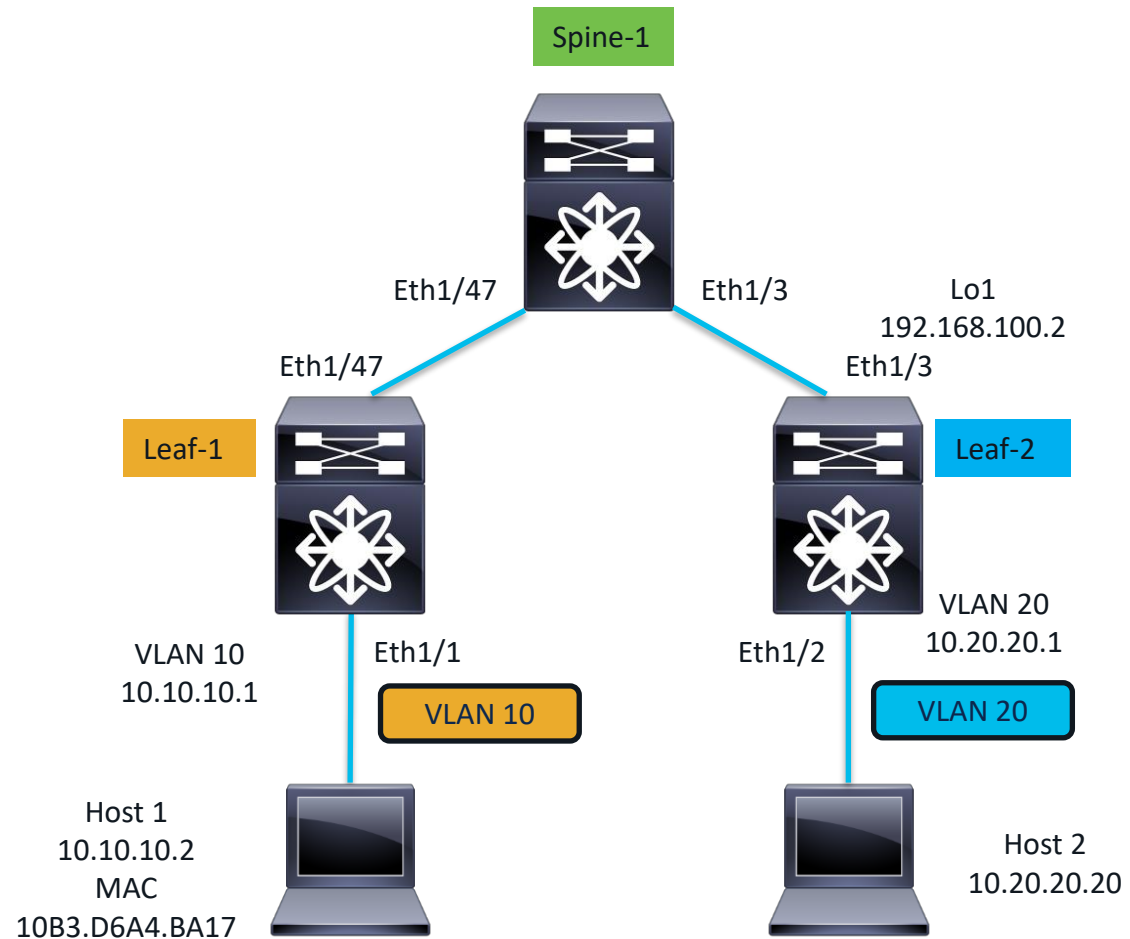
Tool #6: iCAM

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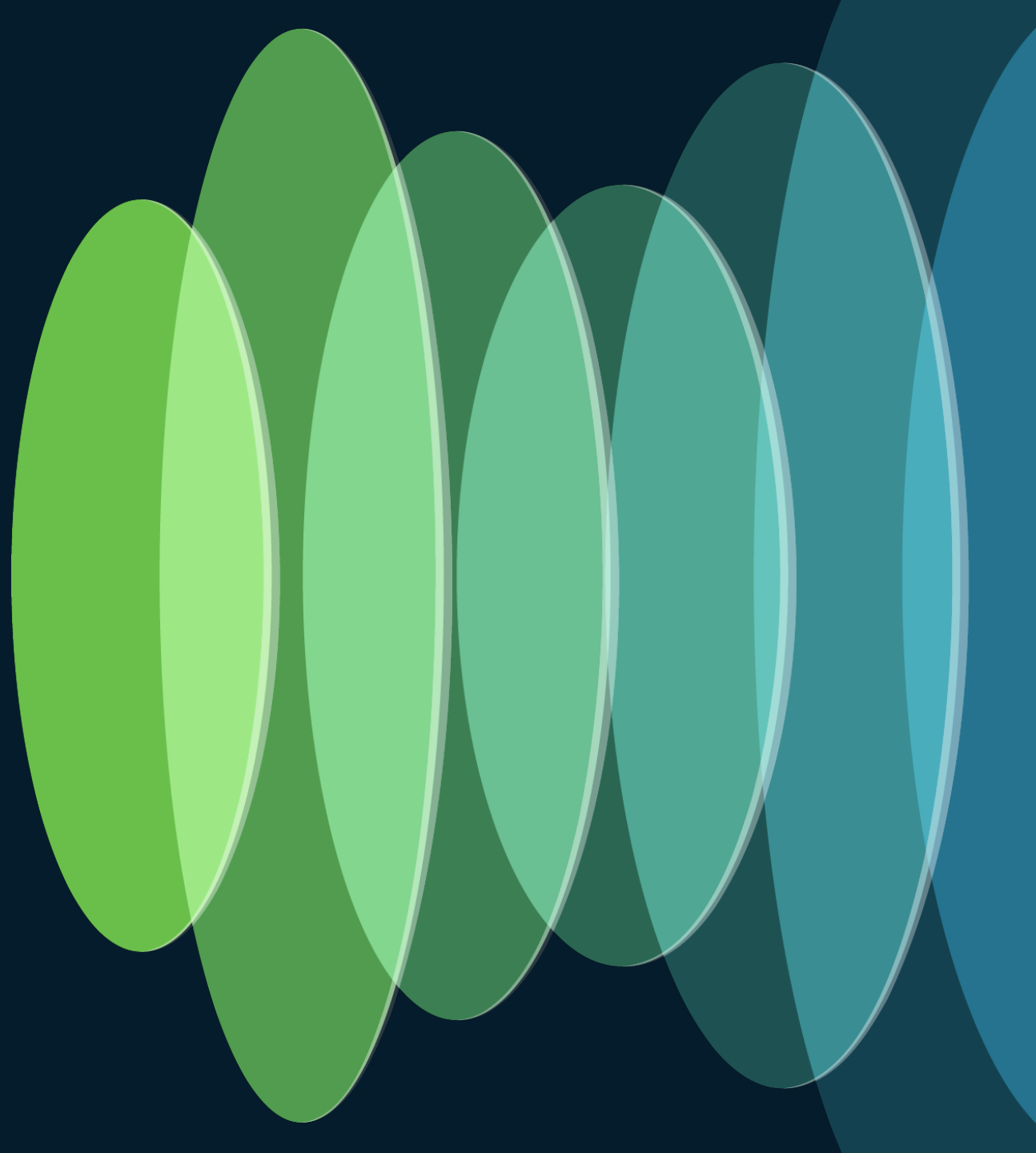
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Network Topology



Tool #1: Ethalyzer



Ethalyzer

Packet Capture Tool

- Captures traffic going to and from CPU of Nexus switch.

Syntax

```
Leaf-1#Ethalyzer local interface [Interface-type] [display-filer|capture-filter] limit-captured-frame [size] write  
bootflash:Filename.pcap detail
```

Interface-types : inband, mgmt, front-panel, port-channel

Detail : Gives detailed packet view

Decode-internal : Let you see which interface the packet received or sent

Capture-ring-buffer : Let you save the capture in multiple files

Limit-capture-frame : Let you limits capture size. 0 means unlimited packet capture size.

Ethalyzer

Packet Capture Tool

Capture-filter : Captures on the packet we asked to capture

Display-filter : Captures all packets but display only we ask to display

Interface-types : inband, mgmt, front-panel, port-channel

Inband Interface – Front panel ports

Mgmt Interface – Mgmt0 port

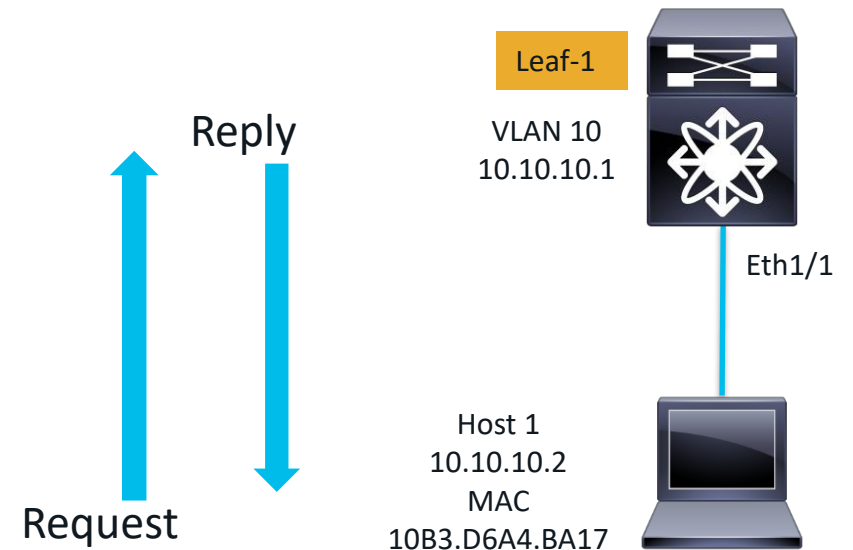
Front-panel Interface- Only captures control-plane traffic coming on front panel ports.

Limit-capture-frame : Let you define capture frame size. 0 means unlimited packet capture size.

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 1: Capture ICMP



```
Leaf-1# ethalyzer local interface inband display-filter "icmp" limit-captured-frames 0
```

```
Capturing on 'ps-inb'
```

```
4 2024-04-18 15:33:48.226147776 10.10.10.2 → 10.10.10.1 ICMP 102 Echo (ping) request id=0x0a59, seq=0/0, ttl=255
5 2024-04-18 15:33:48.226507747 10.10.10.1 → 10.10.10.2 ICMP 102 Echo (ping) reply id=0x0a59, seq=0/0, ttl=255 (request in 4)
```

```
2
```

```
Leaf-1#
```

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 2: Capture ICMP with Decode-internal

```
Leaf-1# ethalyzer local interface inband decode-internal display-filter "icmp" limit-captured-frames 0
```

```
-----Output omitted for brevity-----
```

```
Dest Port: 17 (0x11)
```

```
-----Output omitted for brevity-----
```

Decode Internal

Packet Leaving
This port

```
Nexus9K-1# show interface hardware-mappings
```

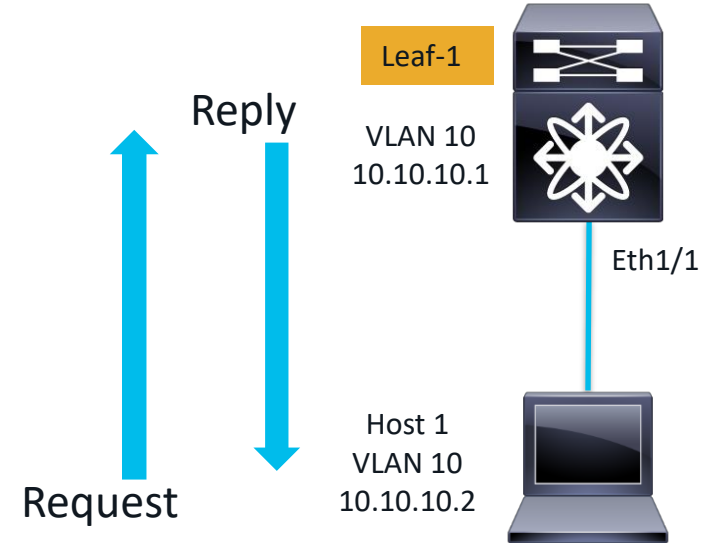
Name	Ifindex	Smod	Unit	HPort	FPort	NPort	VPort	Slice	SPort	SrcId	MacId	MacSP	VIF	Block	BlkSrcID
Eth1/1	1a000200	1	0	17	255	4	-1	0	17	34	4	2	5	0	34

Maps to E1/1

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 3: Capture ARP



```
Leaf-1# ethalyzer local interface inband display-filter "arp" limit-captured-frames 0
```

```
Capturing on 'ps-inb'
```

```
23 2024-04-18 16:08:07.492460719 10:B3:D6:A4:BA:17 → ff:ff:ff:ff:ff:ff ARP 64 Who has 10.10.10.1? Tell 10.10.10.2
```

```
24 2024-04-18 16:08:07.492902971 e4:1f:7b:2f:a5:c7 → 10:B3:D6:A4:BA:17 ARP 64 10.10.10.1 is at e4:1f:7b:2f:a5:c7
```

```
2
```

```
Leaf-1#
```

ARP Request
Received

ARP Reply

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 4: Capture ARP with more filters

ARP filter based
on sender IP

```
Leaf-1# ethalyzer local interface inband display-filter "arp.src.proto_ipv4==10.10.10.2" limit-captured-frames 0
```

Capturing on 'ps-inb'

```
10 2024-04-18 16:16:36.974236159 10:B3:D6:A4:BA:17→ ff:ff:ff:ff:ff:ff ARP 64 Who has 10.10.10.1? Tell 10.10.10.2
```

```
1
```

```
Leaf-1 #
```

ARP filter based
on Target IP

```
Leaf-1#ethalyzer local interface inband display-filter "arp.dst.proto_ipv4==10.10.10.1" limit-captured-frames 0
```

Capturing on 'ps-inb'

```
7 2024-04-18 16:17:50.166112161 10:B3:D6:A4:BA:17→ ff:ff:ff:ff:ff:ff ARP 64 Who has 10.10.10.1? Tell 10.10.10.2
```

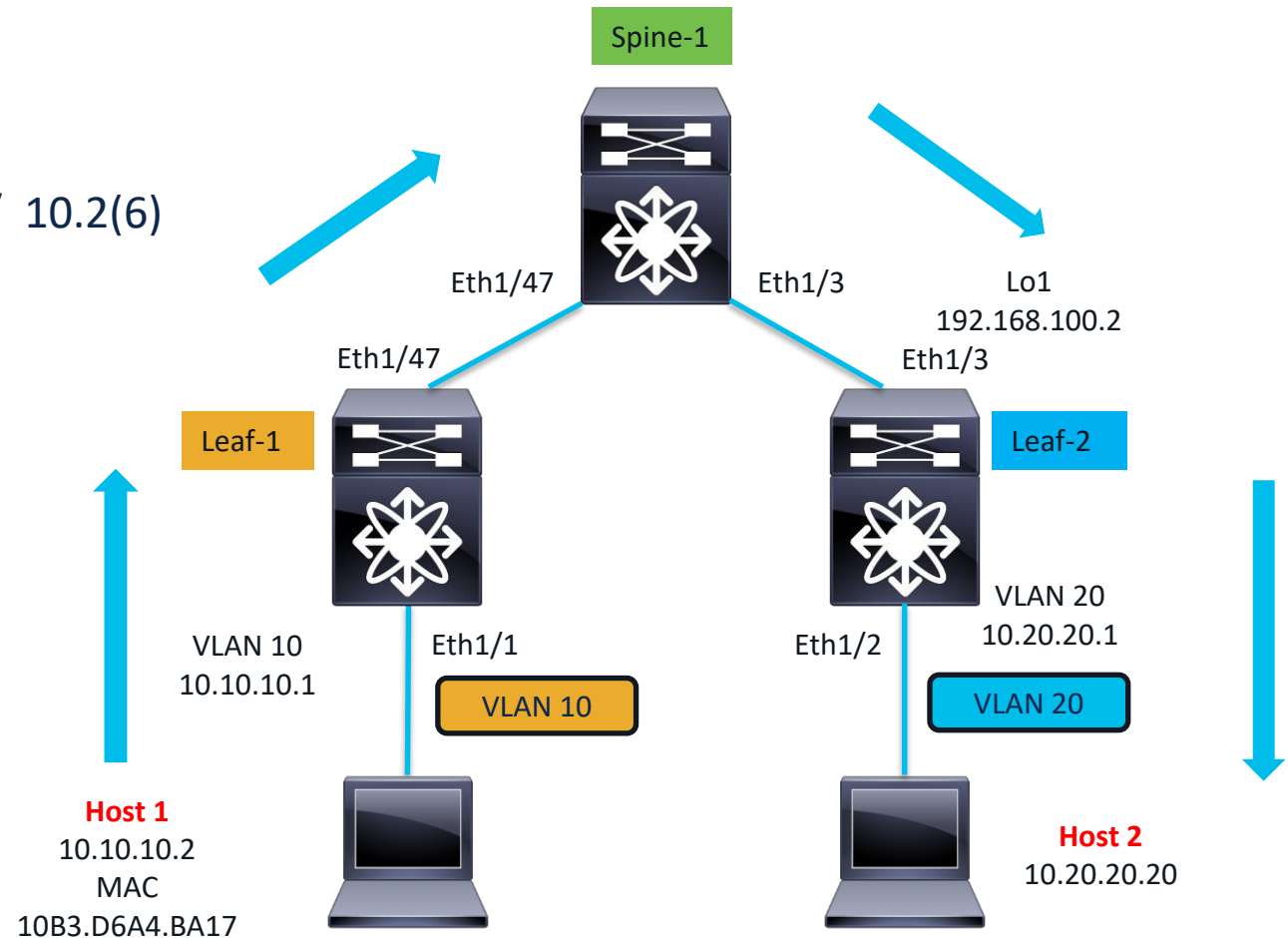
```
1
```

```
Leaf-1#
```

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 5: Check if packets are getting software Switched



Leaf-1# ethalyzer local interface inband display-filter "icmp" limit-captured-frames 0

Capturing on 'ps-inb'

4 2024-04-18 15:33:48.226147776 10.10.10.2 → 10.20.20.20 ICMP 102 Echo (ping) request id=0x0a59, seq=0/0, ttl=255

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 6: Troubleshooting BGP neighbor flap using ethalyzer

Leaf-1# ethalyzer local interface inband display-filter "ip.addr==10.10.10.1 && ip.addr==10.10.10.2" limit-captured-frames 0

Capturing on 'ps-inb'

```
34 2024-04-18 17:22:46 10.10.10.2 → 10.10.10.1 TCP 78 51278 → 179 [SYN] Seq=0 Win=29200 Len=0 MSS=1460
35 2024-04-18 17:22:46 10.10.10.1 → 10.10.10.2 TCP 78 179 → 51278 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0
MSS=1460
36 2024-04-18 17:22:46 10.10.10.2 → 10.10.10.1 TCP 70 51278 → 179 [ACK] Seq=1 Ack=1 Win=29200
Len=0 TSval=22641527
37 2024-04-18 17:22:46 10.10.10.1 → 10.10.10.2 BGP 146 OPEN Message
44 2024-04-18 17:22:47 10.10.10.1 → 10.10.10.2 BGP 118 UPDATE Message, KEEPALIVE Message
45 2024-04-18 17:22:47 10.10.10.2 → 10.10.10.1 BGP 166 UPDATE Message, KEEPALIVE Message, UPDATE Message
46 2024-04-18 17:22:47 10.10.10.1 → 10.10.10.2 TCP 70 179 → 51278 [ACK] Seq=144 Ack=192 Win=65536 Len=0
```

Syn

Syn Ack

Ack

Update

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 6: Troubleshooting BGP neighbor flap using ethalyzer

Leaf-1# ethalyzer local interface inbound-hi display-filter "bgp && ip.addr==10.20.20.1" limit-captured frames 0

Capturing on inband

2024-05-04 21:51:28.977444 10.10.10.1 -> 10.20.20.1 BGP OPEN Message

2024-05-04 21:51:29.979955 10.10.10.1 -> 10.20.20.1 BGP KEEPALIVE Message

2024-05-04 21:51:30.996699 10.10.10.1 -> 10.20.20.1 BGP [TCP Retransmission] KEEPALIVE Message

2024-05-04 21:51:31.106224 10.10.10.1 -> 10.20.20.1 BGP UPDATE Message, UPDATE Message, UPDATE Message, UPDATE Message, UPDATE Message

Update packet
dropped

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)

Example use case 7: Capture COPP dropped traffic

Leaf-1# show policy-map interface control-plane class ciscolive-copp-class-l3uc-data

Control Plane

Service-policy input: ciscolive-copp-policy-strict

class-map **ciscolive-copp-class-l3uc-data** (match-any)

match exception glean

set cos 1

police cir 10 bps , bc 10 bytes

module 1 :

transmitted 246600 bytes;

5-minute offered rate 664 bytes/sec

conformed 2400 peak-rate bytes/sec

at Fri Apr 19 15:30:48 2024

dropped 135580910 bytes;

5-min violate rate 364001 byte/sec

violated 1386246 peak-rate byte/sec

at Fri Apr 19 15:30:01 2024

Nexus9K-1#

Class name

Glean

Drops

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 7: Capture COPP dropped traffic

```
Leaf-1# show system internal access-list copp stats stage1 | in ciscolive-copp-class-l3uc-data
```

```
=====
Queue                Name                Transmitted(bytes)    Dropped(bytes)
-----
36 ciscolive-copp-class-l3uc-data    8808070              293202890
```

Leaf-1#

Queue
Number

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example use case 7: Capture COPP dropped traffic

Filter Base on
Queue Number

```
Leaf-1# ethalyzer local interface inband decode-internal display-filter "cisco.blob.sup_qnum==36" limit-  
captured-frames 0
```

-----Output omitted for brevity-----

Internet Protocol Version 4, Src: 10.10.10.2, Dst: 10.20.10.3

0100 = Version: 4

Time to live: 255

Protocol: ICMP (1)

Header checksum: 0x0503 [validation disabled]

[Header checksum status: Unverified]

Source: 10.10.10.2

Destination: 10.20.10.3

Detailed about
the packet

-----Output omitted for brevity-----

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Saving Capture and Ring Buffer

Save to
bootflash

```
Leaf-1# ethalyzer local interface inband limit-captured-frames 100 write bootflash:cpucap.pcap
```

```
Capturing on inband  
100
```

```
Leaf-1# ethalyzer local interface inband limit-captured-frames 0 capture-ring-buffer filesize 100 write bootflash:ringcap.pcap
```

```
Capturing on inband  
5616
```

```
Leaf-1# dir | in pcap
```

```
11710 Apr 19 14:26:08 2024 cpucap.pcap  
102452 Apr 19 14:26:34 2024 ringcap_00001_20240419142633.pcap  
102480 Apr 19 14:26:36 2024 ringcap_00002_20240419142634.pcap  
102448 Apr 19 14:26:36 2024 ringcap_00003_20240419142636.pcap  
102452 Apr 19 14:26:39 2024 ringcap_00004_20240419142636.pcap  
102452 Apr 19 14:26:41 2024 ringcap_00005_20240419142639.pcap  
102448 Apr 19 14:26:41 2024 ringcap_00006_20240419142641.pcap  
47700 Apr 19 14:26:42 2024 ringcap_00007_20240419142641.pcap
```

```
Leaf-1#
```

Capture ring buffer

Ethalyzer

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Reading the capture locally

Local Read

Leaf-1# ethalyzer local read cpucap.pcap limit-captured-frames 0

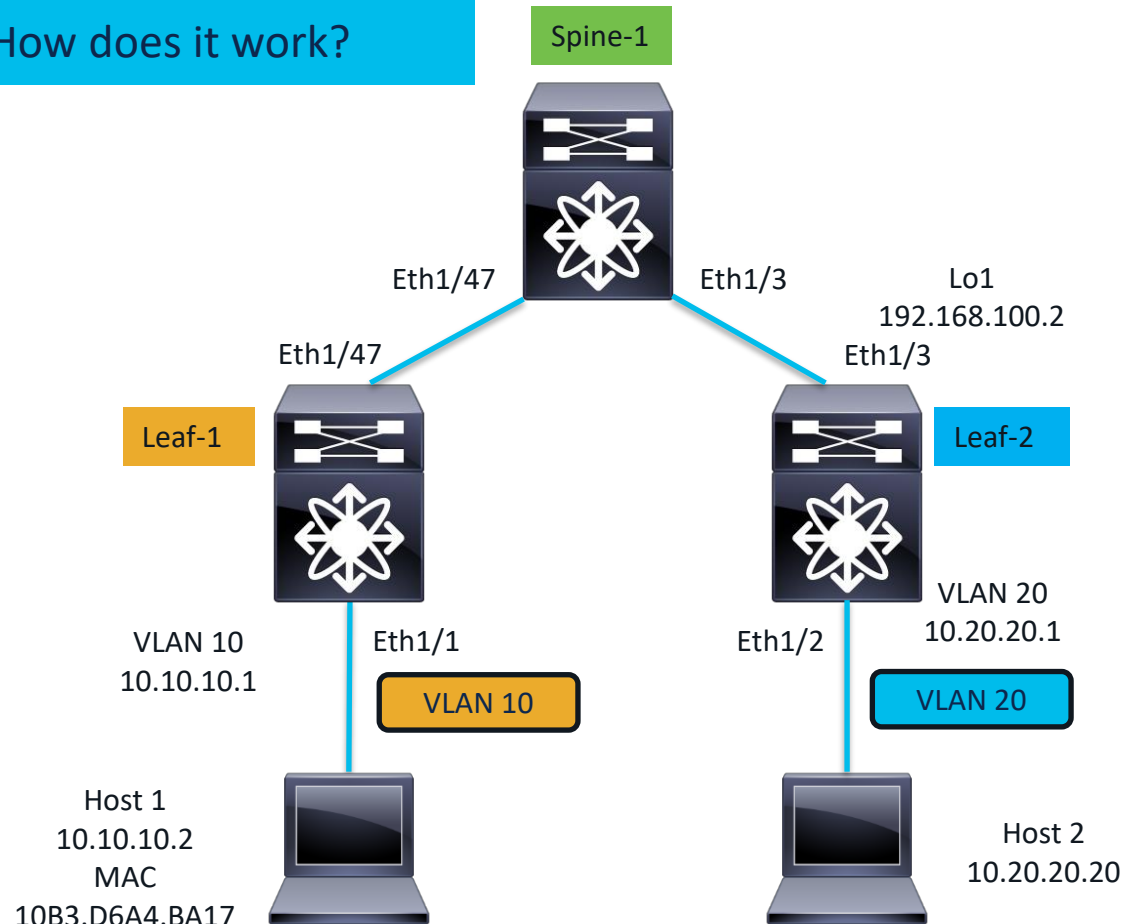
```
2024-04-19 14:26:08.419367 10.10.10.2 -> 10.10.10.1 ICMP Echo (ping) request
2024-04-19 14:26:08.419749 10.10.10.1 -> 10.10.10.2 ICMP Echo (ping) reply
2024-04-19 14:26:08.420323 10.10.10.2 -> 10.10.10.1 ICMP Echo (ping) request
2024-04-19 14:26:08.420473 10.10.10.1 -> 10.10.10.2 ICMP Echo (ping) reply
2024-04-19 14:26:08.420945 10.10.10.2 -> 10.10.10.1 ICMP Echo (ping) request
2024-04-19 14:26:08.421073 10.10.10.1 -> 10.10.10.2 ICMP Echo (ping) reply
2024-04-19 14:26:08.421520 10.10.10.2 -> 10.10.10.1 ICMP Echo (ping) request
```

Tool #2: SPAN-to-CPU

SPAN-to-CPU

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

How does it work?



- Capture passthrough traffic
- SPAN Replication is done in hardware with no impact to CPU
- SPAN-to-CPU packets are rate-limited. Default rate-limit is 50 pps. “show hardware rate-limiter span”
- You can change this setting using command “hardware rate-limiter span”
- Filter using access-list, VLAN

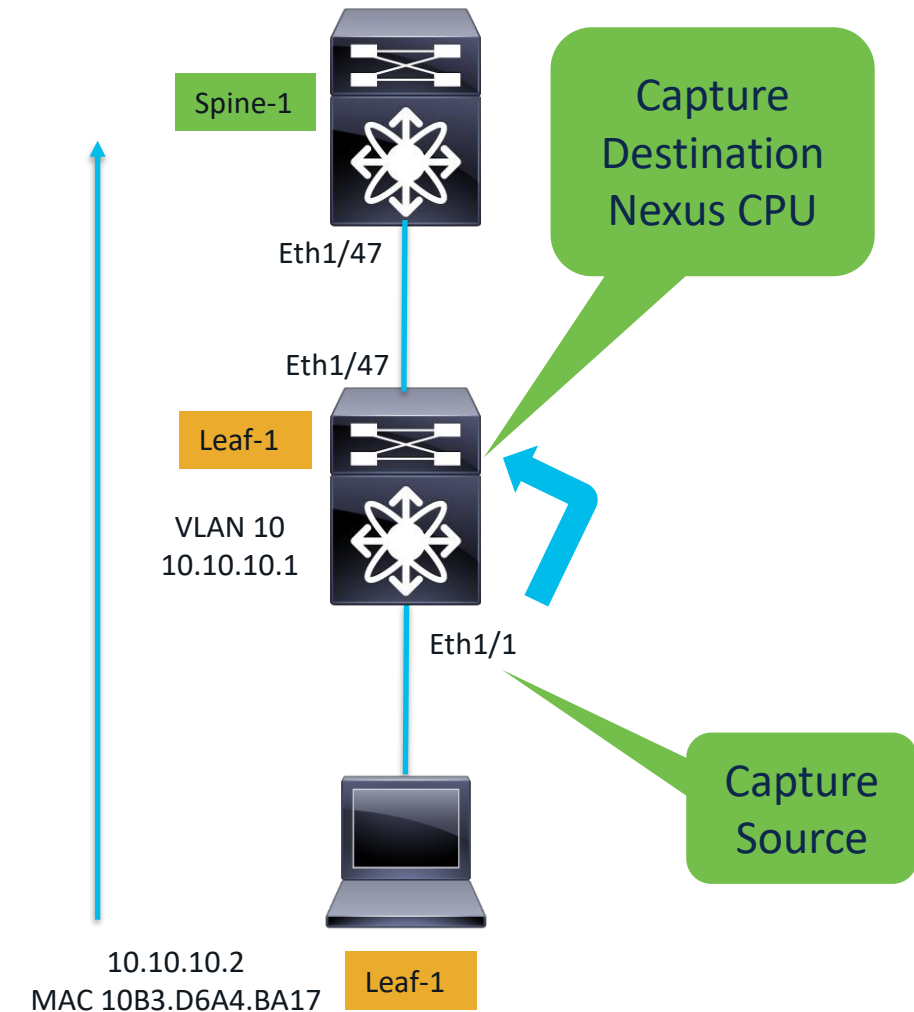
SPAN-to-CPU

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Configuration

```
Leaf-1# show run monitor
monitor session 1
source interface Ethernet1/1 both
destination interface sup-eth0
filter vlan 10 (We can either filter on VLAN or ACL)
filter access-group test
no shut
```

Leaf-1#



Span to CPU

Real Word Example [platform N9K-C93180YC-FX / 10.2(6)]

Example

Mirror

Leaf-1# ethanalyzer local interface inband mirror display-filter "icmp" limit-captured-frames 0

Capturing on 'ps-inb'

```
10 2024-04-19 19:48:32.118031065 10.10.10.2 → 10.20.20.20 ICMP 102 Echo (ping) request id=0x544c, seq=0/0
2024-04-19 19:48:32.118438013 10.20.20.20 → 10.10.10.2 ICMP 102 Echo (ping) reply id=0x544c, seq=0/0
```

Leaf-1#

SPAN-to-CPU

Changing default Span Rate

Leaf-1#show hardware rate-limiter span

Module: 1

R-L Class	Config	Allowed	Dropped	Total
span	50	0	0	0

Default
50 pps

Leaf-1#(config)# hardware rate-limiter span 100

Changing rate

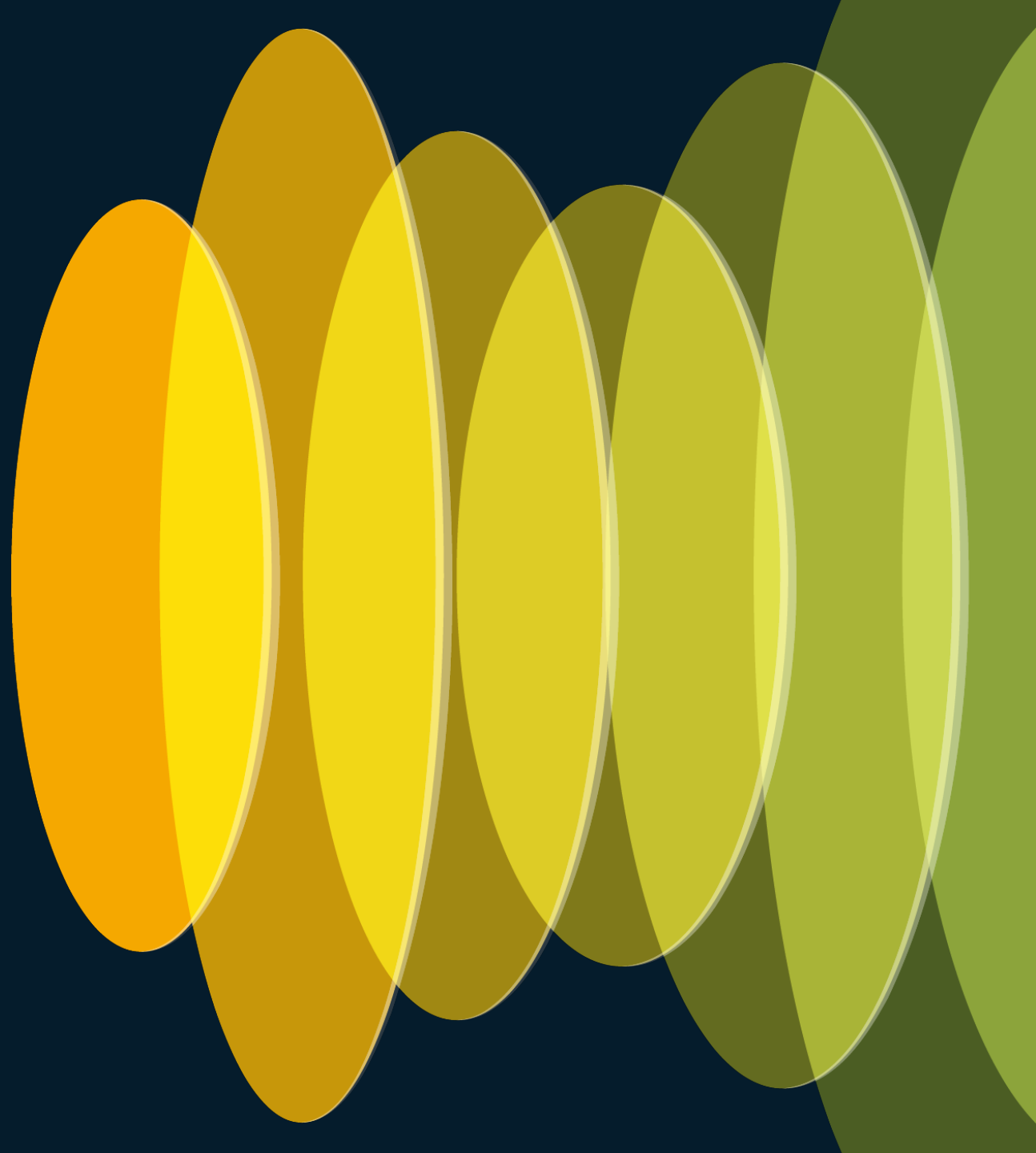
Leaf-1# show hardware rate-limiter span

Module: 1

R-L Class	Config	Allowed	Dropped	Total
span	100	0	0	0

New Value 100
pps

Tool #3: ELAM



ELAM

Packet Capture and Forwarding Verification Tool

- “Embedded Logic Analyzer Module”
- Captures a single packet on ingress going to switch’s control plane or through the switch in the data plane
- Capture occurs just above the ASIC level of the switch (very close to the wire)
- Supported on all Cloud scale Nexus 9k switches
 - Not supported on first generation or –R Series Nexus 9ks

ELAM

Nexus 9k Generations/Model Types

- First Generation: **9300-TX/PX/PQ, 9400-TX/PX/PQ, 9500-TX/PX/PQ**
- Cloud scale: **9200, 9300-EX/FX/FXP/FX2/FX3/GX/GX2/H, 9400, 9700-EX/FX/GX**
- R Series (Fretta): **9600-R/RX/R2**

ELAM

Syntax, Top of Rack

```
switch# debug platform internal tah elam  
  
switch(TAH-elam)# trig init [slice <A>] [in-select <B>] [use-src-id <C>]  
  
switch(TAH-elam-inselB)# set [inner | outer] [packet type] [options fields]  
  
switch(TAH-elam-inselB)# start  
  
switch(TAH-elam-inselB)# report
```

- **A**: Slice # of the ASIC
- **B**: #'s that indicate potential OSI layers and headers/encapsulation
- **C**: Source interface ID of the packet

ELAM

In-Select Options and Trigger options

switch(TAH-elam)# trig init in-select ?

- 10 {outer l4, inner l4, ieth} **Less Common, generally used for checking L4 info**
- 19 {udf_vec}
- 6 {outer l2, outer l3, outer l4} **Most Common, used for normal IPv4/IPv6, ARP and more**
- 7 {inner l2, inner l3, inner l4} **Less Common, can be used for L2 flows or VXLAN**
- 8 {outer l2, inner l2, ieth}
- 9 {outer l3, inner l3} **More Commonly used with encapsulated traffic (VXLAN, MPLS)**

ELAM

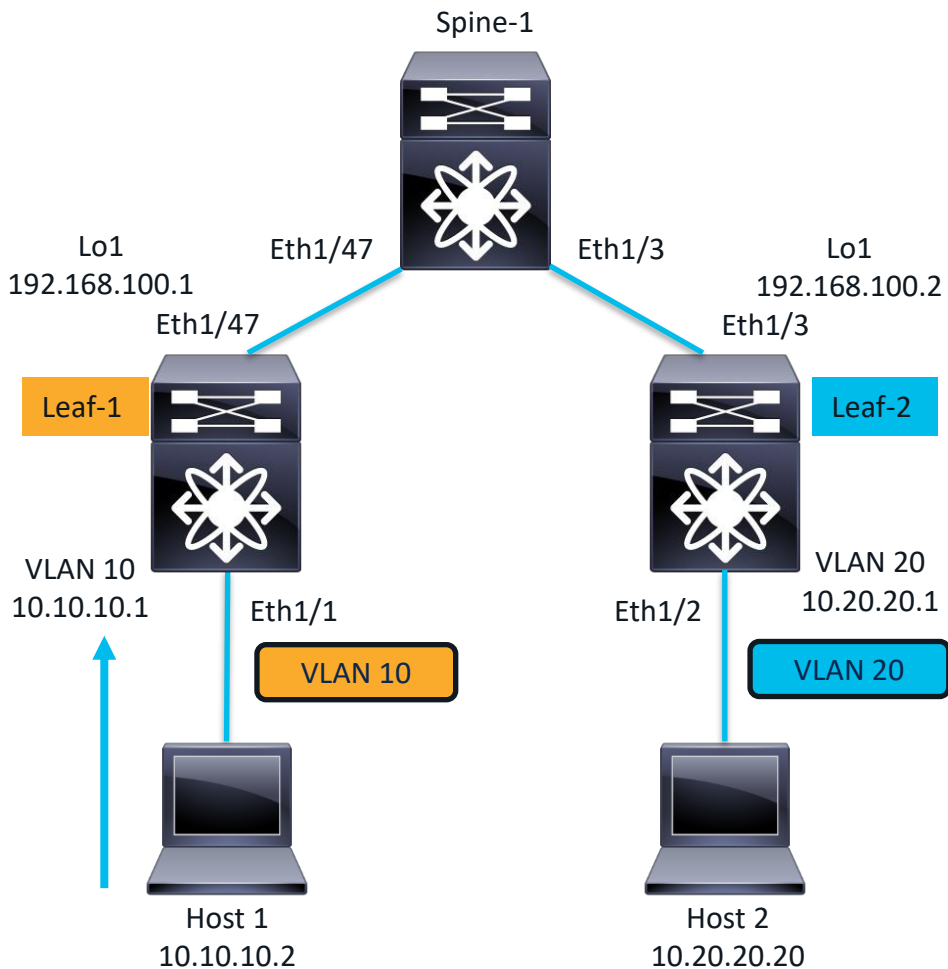
In-Select Options and Trigger options

```
switch(TAH-elam-insel6)# set [inner | outer] [packet type] [options fields]
```

- **Inner/Outer:** Inner or Outer frame/packet header
- **Packet Type:** L2, ARP, IPv4, IPv6, L4, MPLS, FCoE
- **Options Fields:** SRC/DST MACs/IPs/Ports, Vlans, DSCP, Protocol Number, etc.

ELAM

Scenario #1a: ICMP Failure – Does it reach me?



Leaf-1# debug platform internal tah elam

Leaf-1(TAH-elam)# trig init

Slot 1: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0

Leaf-1(TAH-elam-insel6)# set outer ipv4 src_ip 10.10.10.2 dst_ip 10.10.10.1

Leaf-1(TAH-elam-insel6)# start

Leaf-1(TAH-elam-insel6)# report

ELAM

Asic Trigger Explanations and vPC Notes

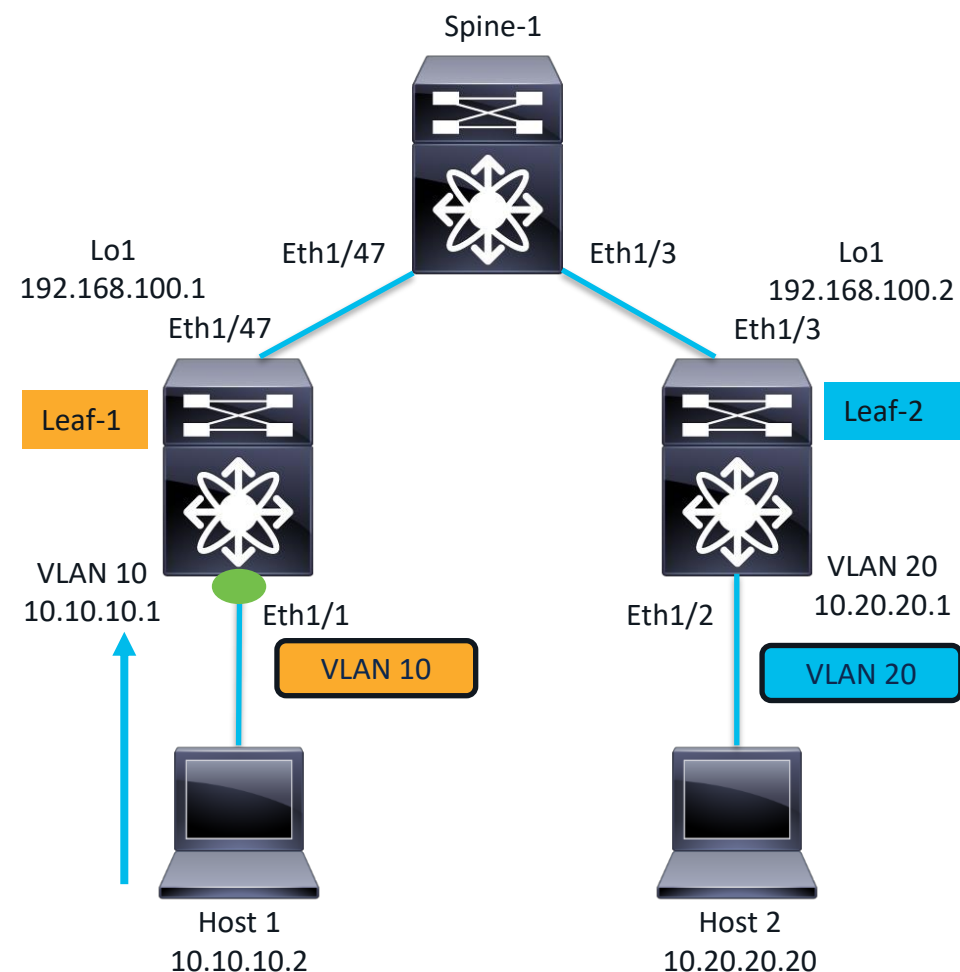
Leaf-1(TAH-elam)# **trig init**

Slot 1: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0

- The **asic value** is only necessary for modular (EoR) Nexus 9ks due to the different linecards which may use different ASIC values per port group
- The **slice number** corresponds to the partition of the ASIC to which the interfaces are associated
- In modern ELAM (post 7.0(3)I5(2)), defining the **lu-a2d value** and **out-select** is not necessary, but it is associated with the different aspects of the forwarding table
- When using vPC, it is important to set up the ELAM capture on both sides, since traffic can technically land on either peer

ELAM

Scenario #1a: ICMP Failure – Does it reach me?



Leaf-1(TAH-elam-insel6)# report

SUGARBOWL ELAM REPORT
SUMMARY

slot - 1, asic - 0, **slice - 0**

Incoming Interface: Eth1/1

Src Idx : 0x1, **Src BD : 10**

**Outgoing Interface Info: dmod 0,
dpid 0**

Dst Idx : 0x5bf, **Dst BD : 10**

Packet Type: IPv4

<prev>

Dst MAC address:

10:B3:D6:A4:75:A7

Src MAC address:

10:B3:D6:A4:BA:17

.1q Tag0 VLAN: 10, cos = 0x0

Sup hit: 1, Sup Idx: 2788

Dst IPv4 address: 10.10.10.1

Src IPv4 address: 10.10.10.2

Ver = 4, DSCP = 0, Don't

Fragment = 0

<cont>

Leaf-1# show system internal access-list sup-redirect-stats | i 2788

2788

copp-system-p-acl-icmp 4

ELAM

ELAM Report Component Notes

Leaf-1(TAH-elam-insel6)# report

ELAM not triggered yet on slot - 1, asic - 0, slice - 0

ELAM hit flop error on slot - 1, asic - 0, slice - 1. Try elam again.

- If you expect to receive the traffic on a specific interface or general and see “ELAM not triggered” there are one of three possible scenarios:
 - You may need to run the ELAM again (it is possible that you started the capture too late)
 - You are not receiving the traffic on the interface that you think you are (particularly relevant if you do not know on what interface you should receive the traffic)
 - The Nexus 9k is not receiving the traffic
- If you see the error “ELAM hit flop error”, this is not a cause for concern. This simply means that you should enter “reset” and then set the trigger with the “set” command again

ELAM

ELAM Report Component Notes

HOMEWOOD ELAM REPORT SUMMARY

slot - 1, asic - 3, slice - 0

=====

Incoming Interface: Eth1/36

Src Idx : 0x8d, Src BD : 4395

Outgoing Interface Info: dmod 2, dpid 48

Dst Idx : 0x79, Dst BD : 4390

<snip>

.1q Tag0 VLAN: 10, cos = 0x0

<snip>

Sup hit: 1, Sup Idx: 2788

- If your ingress interface or egress interface is an L3 port or loopback, the SRC/DST BD field for that interface will show as a number outside of the normal range of vlans allowed by the Nexus, which is normally in the 4096+ range
- When using dot1q tunnels, a transit switch may show a different SRC/DST BD tag than the .1q Tag field ; this is expected behavior
- If this packet is not destined for the Nexus 9k and you see a supervisor hit, there are one of two possible scenarios:
 - You have an SVI on the switch active
 - Your switch is incorrectly punting the packet into the control plane, which can cause latency and/or drops

ELAM

ELAM Report Component Notes

Drop Info:

LUA:

LUB:

LUC:

LUD:

Final Drops:

vntag:

vntag_valid : 0

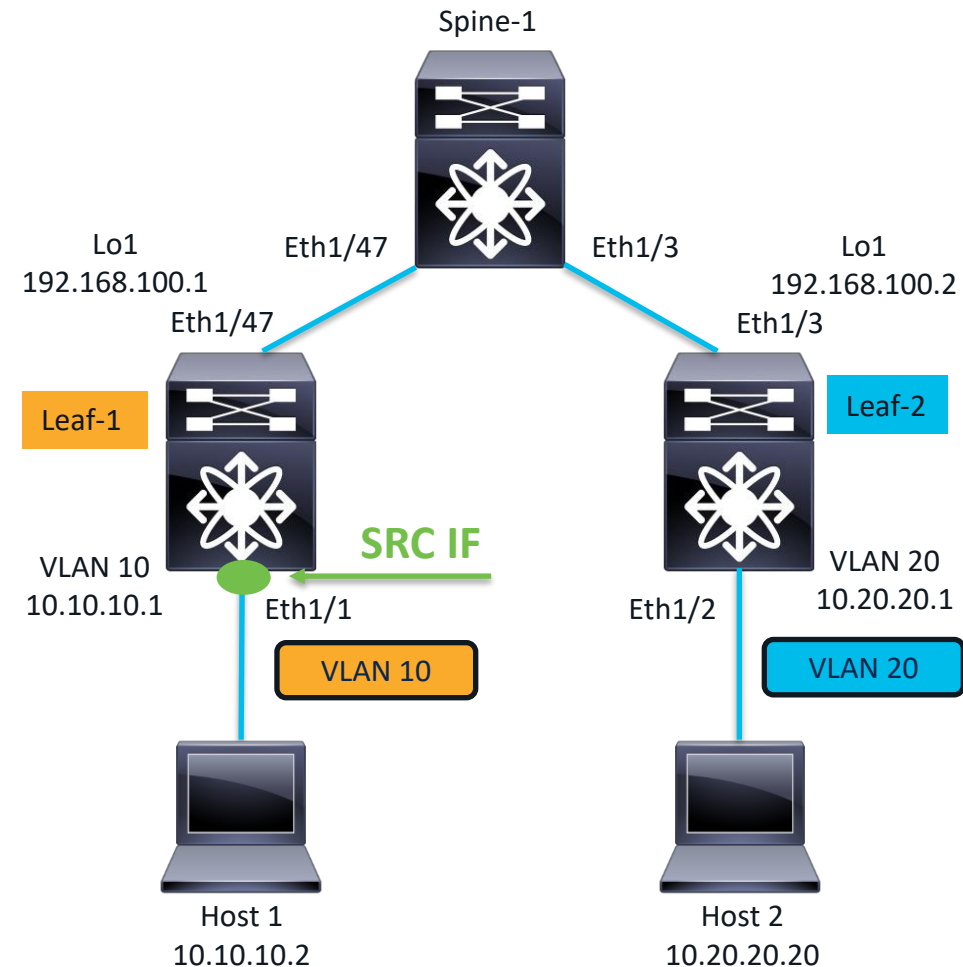
vntag_vir : 0

vntag_svif : 0

- Just because you see something under the “Drop Info” in the second half of the output does not mean that it will drop. If the ELAM correctly registers the packet drop, you should see a reason under BOTH LUA/B/C/D AND the Final Drops sections
- Although ELAM is normally very reliable, sometimes ELAM may show that it is forwarding even though it is not. To verify if this is happening, do the following:
 - Confirm, if possible, that the next hop receives the expected packet
 - Confirm, through consistency checker and troubleshooting commands, that we have correctly programmed routes/L2 adjacencies/protocols

ELAM

Scenario #1b: ICMP Failure – Do I forward it correctly?



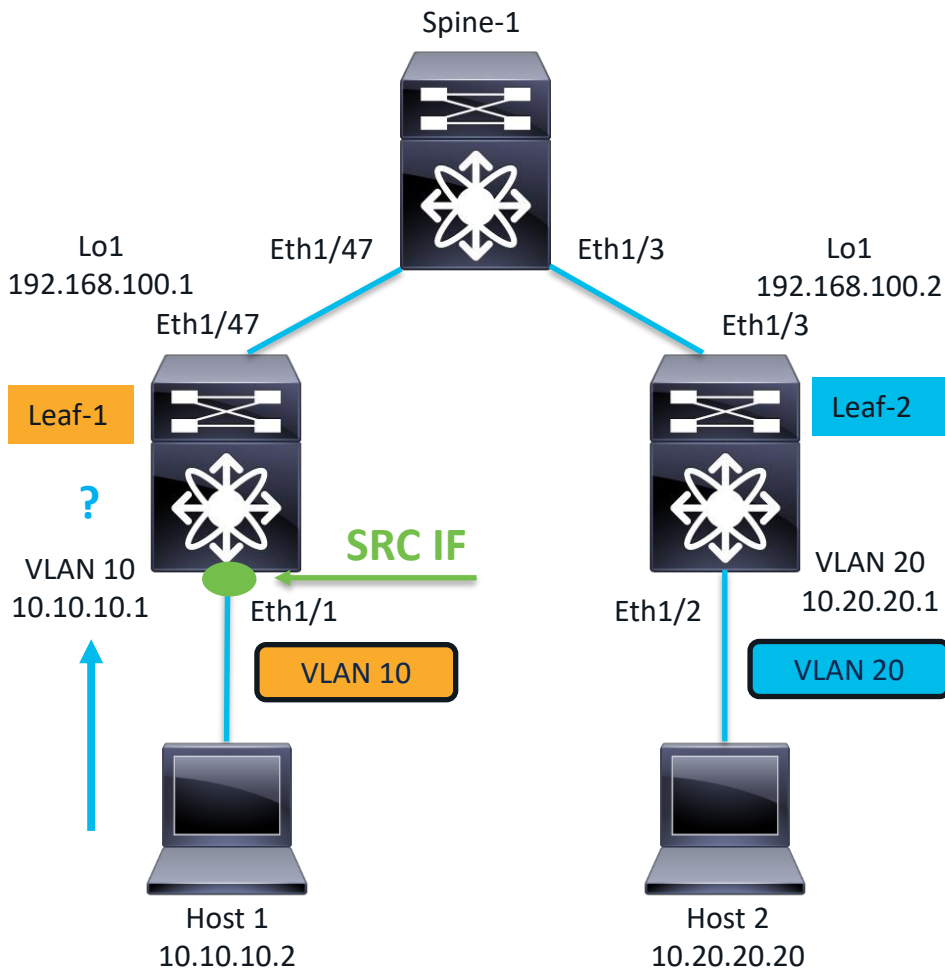
- Determine your SRC Interface and its **slice number** and **source ID**:

Leaf-1# show system internal ethpm info interface eth1/1 | i dpid
IF_STATIC_INFO:
port_name=Ethernet1/1,if_index:0x1a000000,ltl=6144,slot=0,
nxos_port=0,dmod=1,dpid=16,unit=0,queue=65535,xbar_unitbmp=
0x0,ns_pid=255,**slice_num=0**,port_on_slice=16,**src_id=32**

- Confirm that the packet is **non-encapsulated**

ELAM

Scenario #1b: ICMP Failure – Do I forward it correctly?



Leaf-1# debug platform internal tah elam

Leaf-1(TAH-elam)# trig init slice 0 in-select 6 use-src-id 32
Slot 1: param values: start asic 0, slice 0, lu-a2d 1, in-select 6, out-select 0, src_id 32

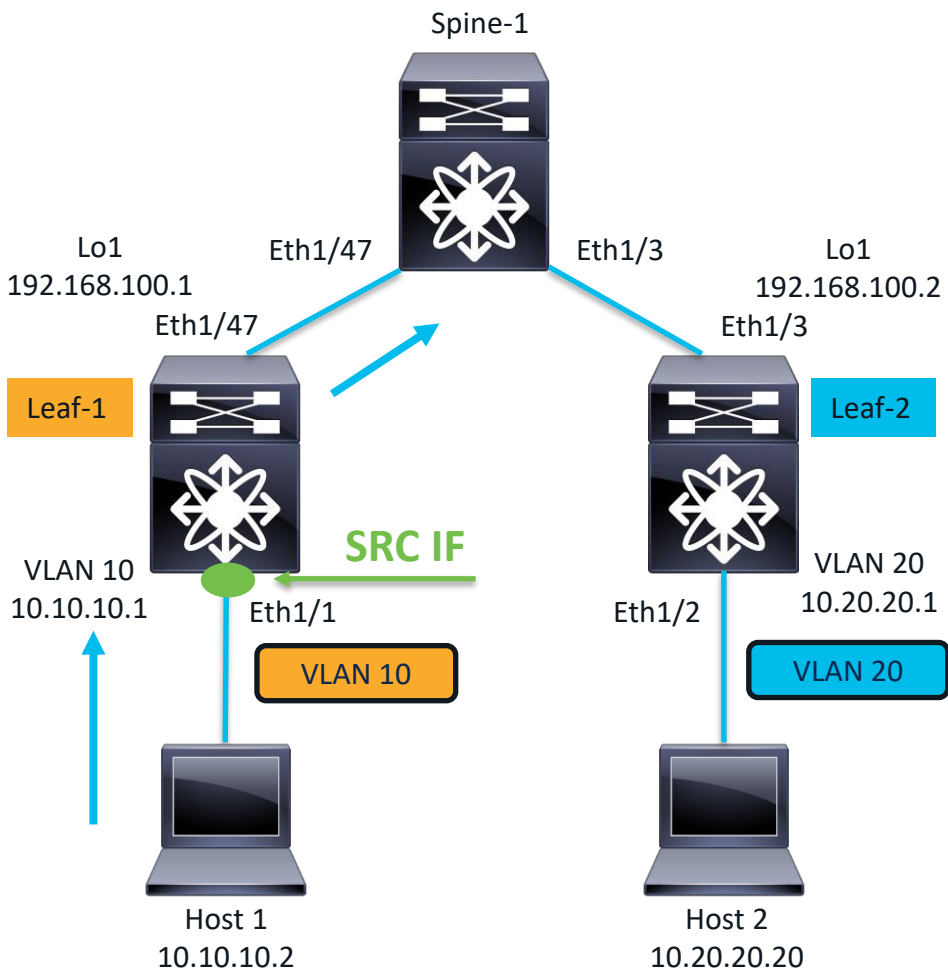
Leaf-1(TAH-elam-insel6)# set outer ipv4 src_ip 10.10.10.2 dst_ip 10.20.20.20

Leaf-1(TAH-elam-insel6)# start

Leaf-1(TAH-elam-insel6)# report

ELAM

Scenario #1b: ICMP Failure – Do I forward it correctly?



Leaf-1# report

SUGARBOWL ELAM REPORT SUMMARY

slot - 1, asic - 0, slice - 0

=====

Incoming Interface: Eth1/1

Src Idx : 0x1, Src BD : 10

Outgoing Interface Info: dmod 1, dpid 38

Dst Idx : 0xb9, Dst BD : 200

<snip>

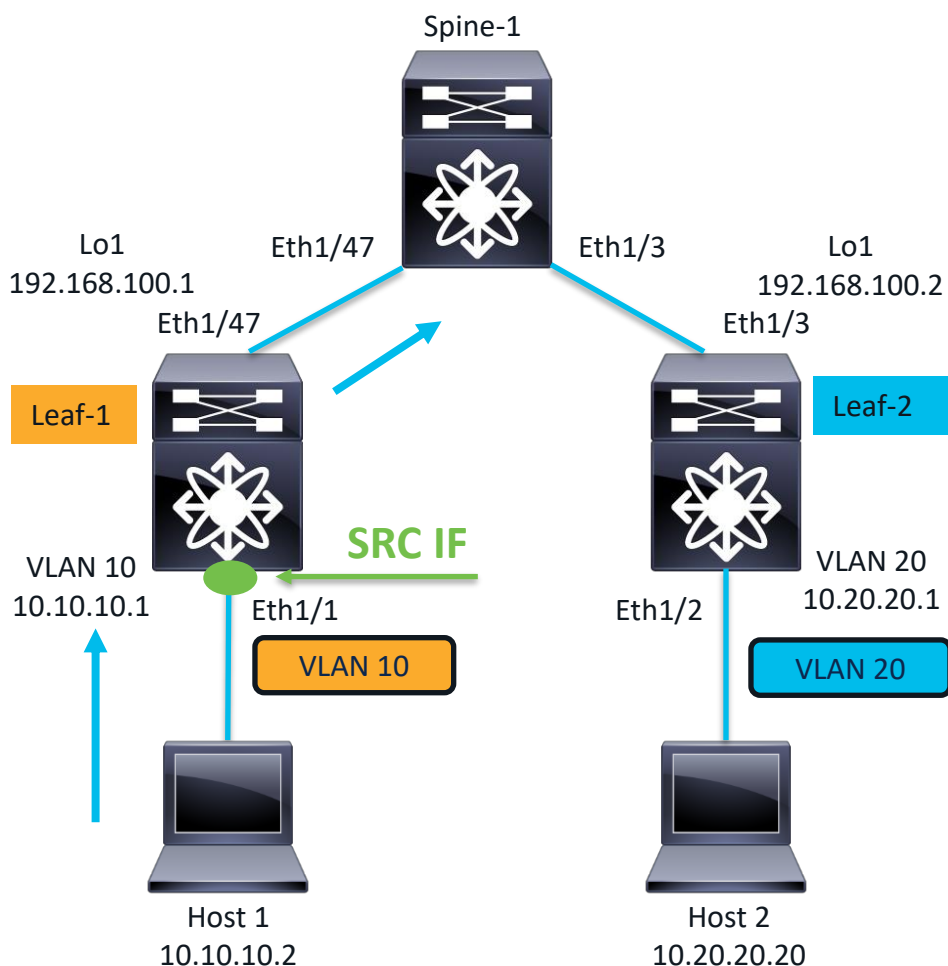
Dst IPv4 address: 10.20.20.20

Src IPv4 address: 10.10.10.2

<snip>

ELAM

Scenario #1b: ICMP Failure – Do I forward it correctly?



Leaf-1# show system internal ethpm info global | i dpid=38

```
IF_STATIC_INFO:
port_name=Ethernet1/47 if_index:0x1a005c00,ltl=5960,slot=0,
nxos_port=184,dmod=1,dpid=38,unit=0,queue=65535,xbar_unitbmp=
0x0,ns_pid=255,sli
ce_num=0,port_on_slice=38,src_id=68
```

Leaf-1# show cdp neighbor interface e1/47

Device-ID	Local Intrfce	Hldtme	Capability	Platform	Port ID
Spine-1(FDO233201F9)	Eth1/47	124	R S HDMI	N9K-C93180YC-EX	Eth1/47

Total entries displayed: 1

ELAM

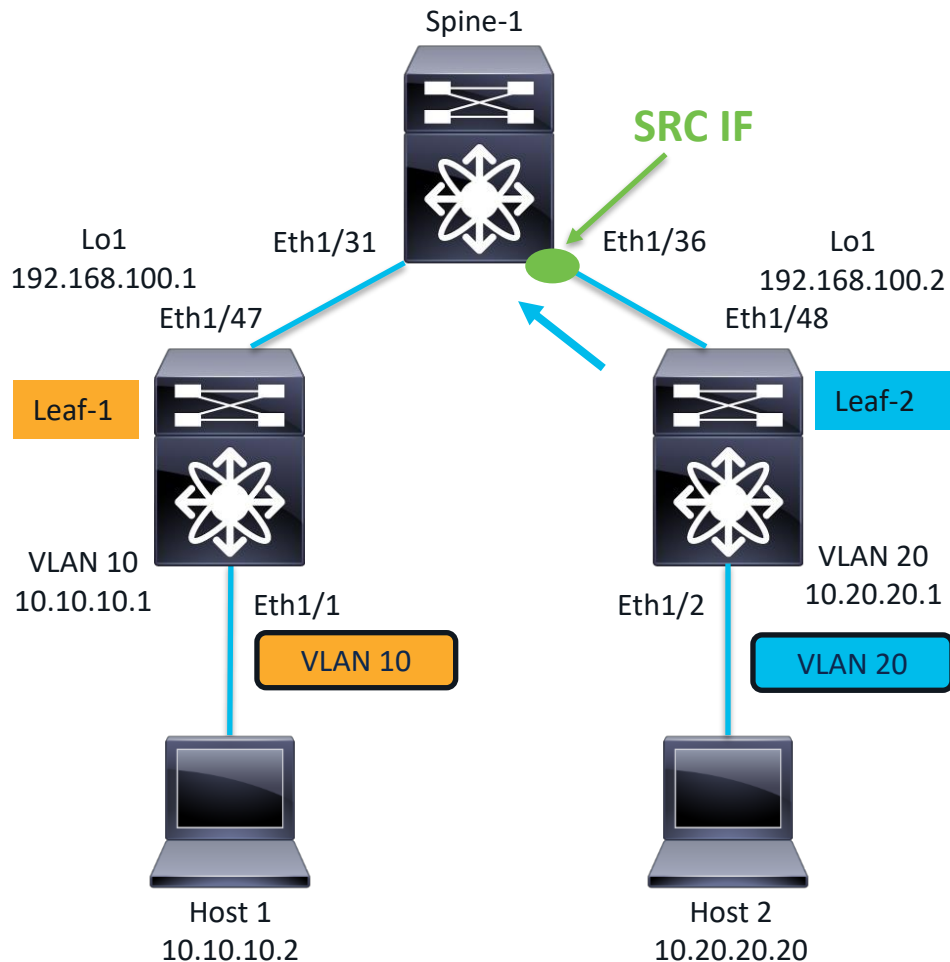
ELAM Report: Optional way to run it

```
Leaf-1(TAH-elam-insel6)# show elam report
Dumping report for module 1 inst 0 slice 0 a_to_d 1 insel 6 outsel 0
Elam Report captured on Interface : Eth1/1
Outgoing Interface : Eth1/47
Final Drop reason: NA
Printing output related to l2_header
<snip>
Printing output related to l3_header
```

- Another way to run it which prevents you from having to decode the outgoing dmod/dpid values

ELAM

Scenario #1c: ICMP Failure – Do I forward it correctly (End of Rack/9500s)



```
Spine-1(config)# debug platform internal tah elam
```

```
Spine-1(TAH-elam)# trig init
```

```
Slot 1: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0
```

```
Slot 22: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0
```

```
Slot 23: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0
```

```
Slot 24: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0
```

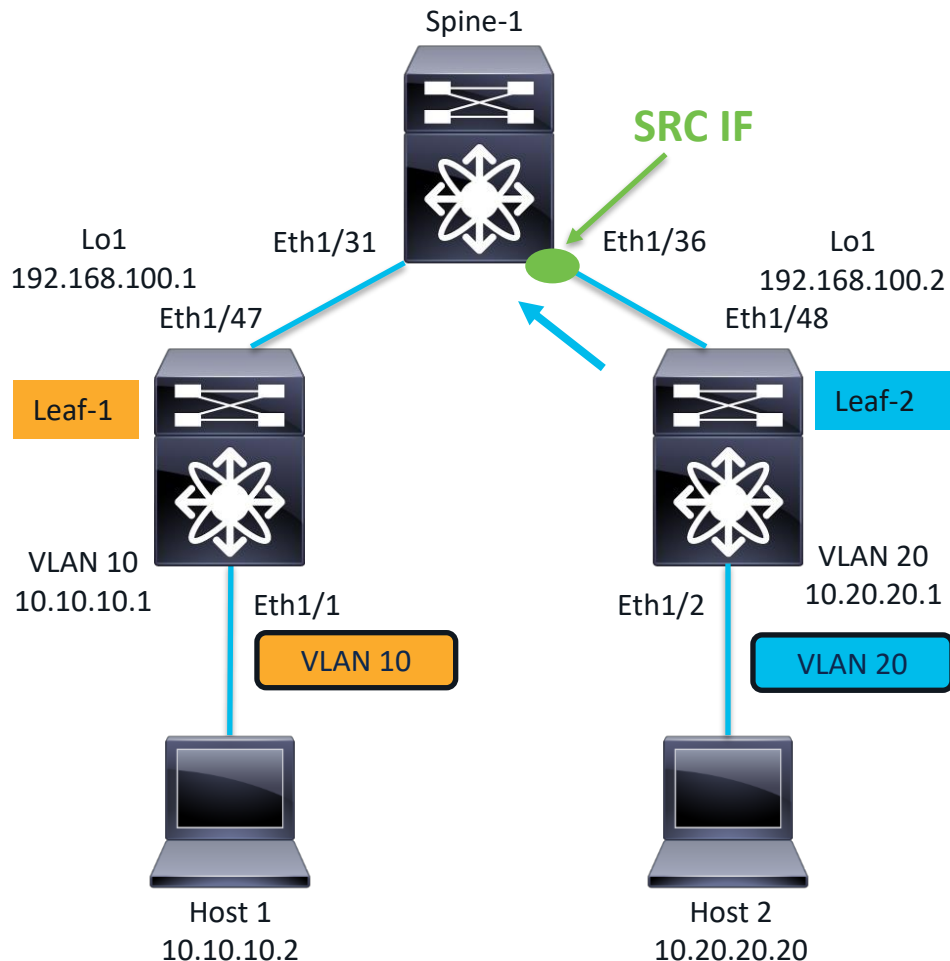
```
Slot 26: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0
```

```
switch(TAH-elam-insel6)#
```

- If you have a Nexus 9500, you likely have multiple linecards and fabric modules
- If you try to run an ELAM wide open on a Nexus 9500, it will attempt to trigger on all of the modules, and only on one slice of a specific ASIC of module 1
- To trigger for a packet correctly on a Nexus 9500, you must capture on the correct linecard/module, the right ASIC and the right slice where the traffic may appear

ELAM

Scenario #1c: ICMP Failure – Do I forward it correctly (End of Rack/9500s)



```
Spine-1# show system internal ethpm info int e1/36 | i dpid
```

```
IF_STATIC_INFO: port_name=Ethernet1/36,if_index:0x1a004600,ltl=6004,slot=0,  
nxos_port=140,dmod=4,dpid=44,unit=3,queue=65535,xbar_unitbmp=0x0,ns_pid=255,  
slice_num=0,port_on_slice=44,src_id=88
```

- Keep in mind that if you have multiple interfaces (like ECMP, port-channels with multiple links, etc.), you will need the highlighted info for all of the interfaces
- If the interfaces are on different modules, you will need to attach to each module and check each one separately

```
Spine-1# attach mod 1
```

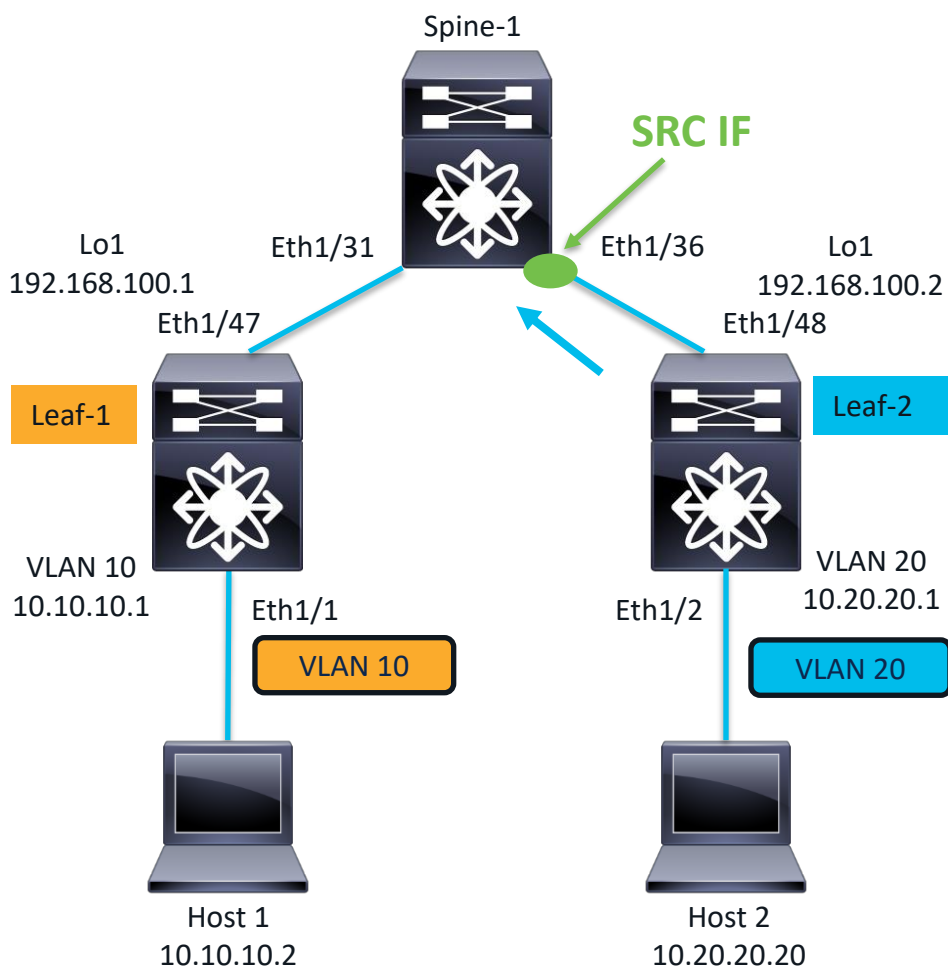
```
Attaching to module 1 ...
```

```
To exit type 'exit', to abort type '$.'
```

```
Last login: Sat May 11 16:44:59 UTC 2024 from sup27 on pts/1
```

ELAM

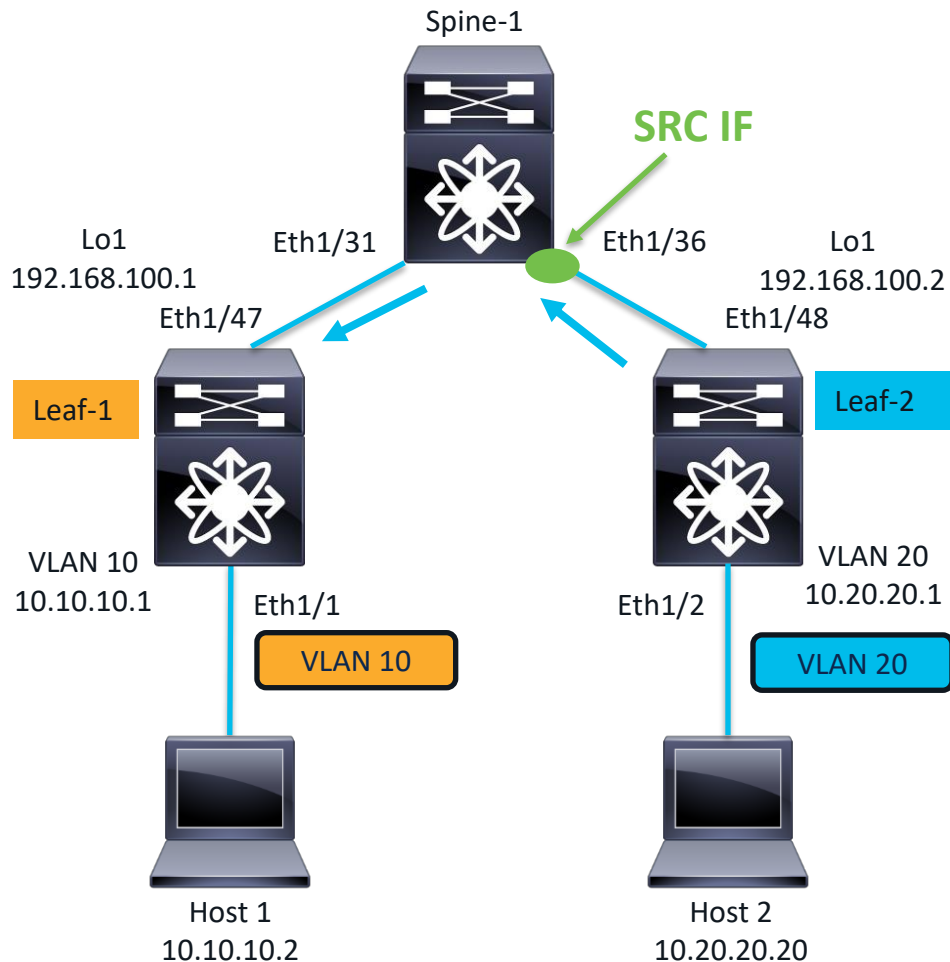
Scenario #1c: ICMP Failure – Do I forward it correctly (End of Rack/9500s)



```
module-1# debug platform internal tah elam asic 3
module-1(TAH-elam)# trig init slice 0 in-select 6 use-src-id 88
Slot 1: param values: start asic 0, slice 0, lu-a2d 1, in-select 6, out-select 0, src_id 88
module-1(TAH-elam-insel6)# set outer ipv4 src 172.16.2.2 dst 9.9.9.9
module-1(TAH-elam-insel6)# start
module-1(TAH-elam-insel6)# report
ELAM not triggered yet on slot - 1, asic - 0, slice - 0
ELAM not triggered yet on slot - 1, asic - 1, slice - 0
ELAM not triggered yet on slot - 1, asic - 2, slice - 0
HOMEWOOD ELAM REPORT SUMMARY
slot - 1, asic - 3, slice - 0
=====
Incoming Interface: Eth1/36
Src Idx : 0x8d, Src BD : 4395
Outgoing Interface Info: dmod 2, dpid 48
Dst Idx : 0x79, Dst BD : 4390
```

ELAM

Scenario #1c: ICMP Failure – Do I forward it correctly (End of Rack/9500s)



```
module-1(TAH-elam-insel6)# end
```

```
module-1# exit
```

```
Spine-1# show system internal ethpm info glob | i dpid=48
```

```
IF_STATIC_INFO: port_name=Ethernet1/29,if_index:0x1a003800,ltl=6032,slot=0,  
nxos_port=112,dmod=1,dpid=48,unit=0,queue=65535,xbar_unitbmp=0x0,ns_pid=  
255,slice_num=0,port_on_slice=48,src_id=96
```

```
IF_STATIC_INFO: port_name=Ethernet1/31,if_index:0x1a003c00,ltl=6024,slot=0,  
nxos_port=120,dmod=2,dpid=48,unit=1,queue=65535,xbar_unitbmp=0x0,ns_pid=  
255,slice_num=0,port_on_slice=48,src_id=96
```

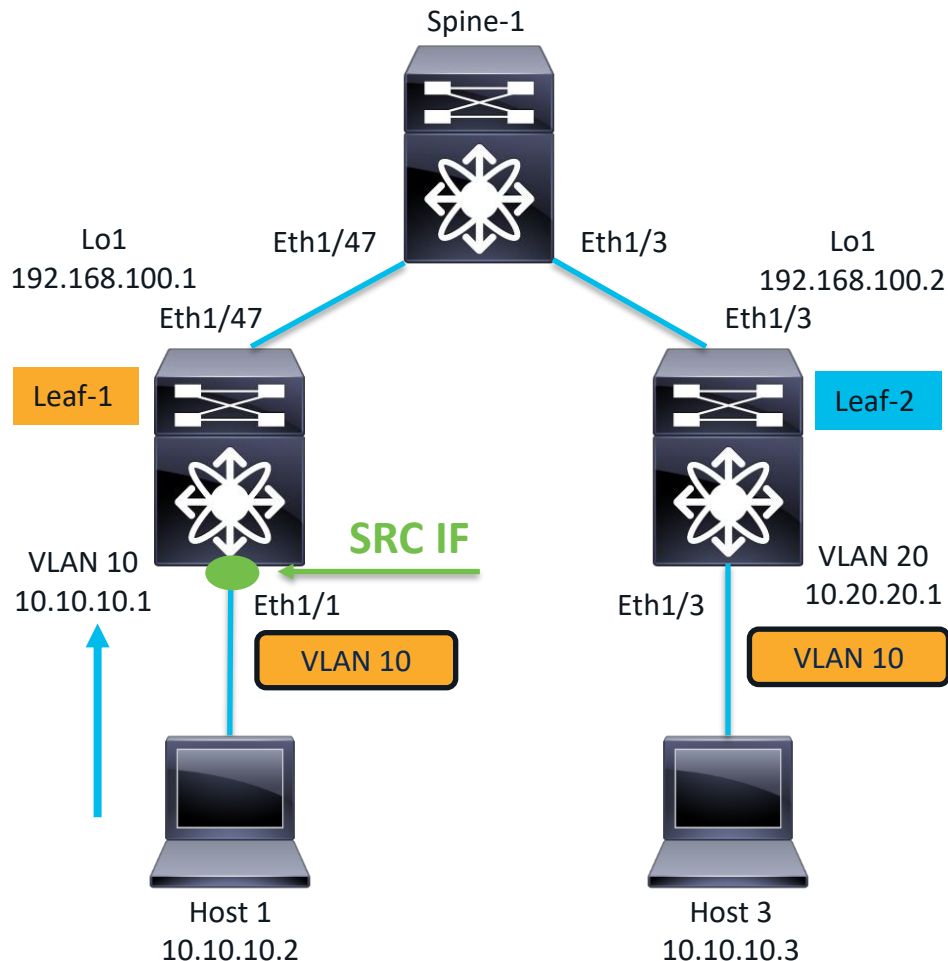
```
IF_STATIC_INFO: port_name=Ethernet1/33,if_index:0x1a004000,ltl=6016,slot=0,  
nxos_port=128,dmod=3,dpid=48,unit=2,queue=65535,xbar_unitbmp=0x0,ns_pid=  
255,slice_num=0,port_on_slice=48,src_id=96
```

```
IF_STATIC_INFO: port_name=Ethernet1/35,if_index:0x1a004400,ltl=6008,slot=0,  
nxos_port=136,dmod=4,dpid=48,unit=3,queue=65535,xbar_unitbmp=0x0,ns_pid=  
255,slice_num=0,port_on_slice=48,src_id=96
```

```
switch#
```

ELAM

Scenario #2: Am I receiving the ARP Request and Flooding it?



Leaf-1# debug platform internal tah elam

Leaf-1(TAH-elam)# trig init slice 0 in-select 6 use-src-id 32
Slot 1: param values: start asic 0, slice 0, lu-a2d 1, in-select 6, out-select 0, src_id 32

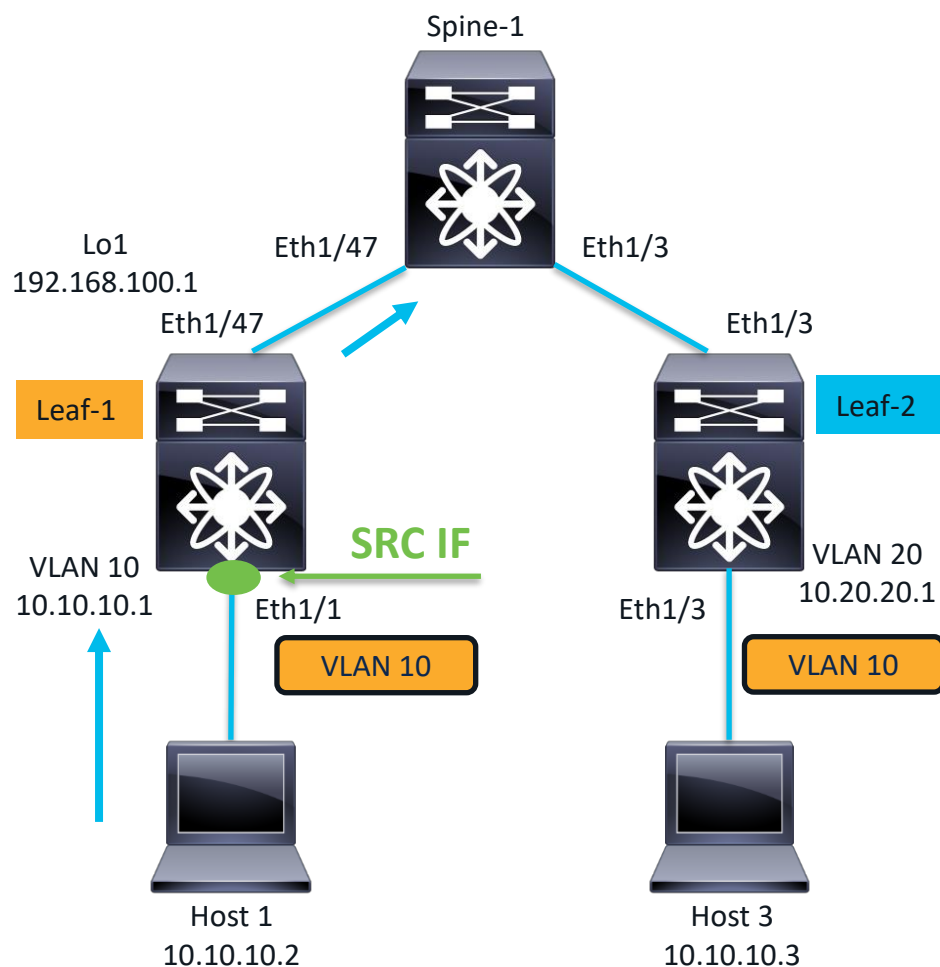
Leaf-1(TAH-elam-insel6)# set outer arp source-ip-addr 10.10.10.2 target-ip-addr 10.10.10.3

Leaf-1(TAH-elam-insel6)# start

Leaf-1(TAH-elam-insel6)# report

ELAM

Scenario #2: Am I receiving the ARP Request and Flooding it?



slot - 1, asic - 0, **slice - 0**

=====

Incoming Interface: Eth1/1

Src Idx : 0x1, **Src BD : 10**

Outgoing Interface Info: **dst_ptr 10**,
dst_ptr_is_flood 1

Packet Type: ARP

Dst MAC address: FF:FF:FF:FF:FF:FF

Src MAC address:

10:B3:D6:A4:BA:17

.1q Tag0 VLAN: 10, cos = 0x6

<cont>

<prev>

Target Hardware address:

FF:FF:FF:FF:FF:FF

Sender Hardware address:

10:B3:D6:A4:BA:17

Target Protocol address: 10.10.10.3

Sender Protocol address: 10.10.10.1

ARP opcode: 1

Sup hit: 1, Sup Idx: 2648

Leaf-1# show system internal access-list sup-redirect-stats | i 2648

2648

ARP REQUEST 3

2648

ARP REQUEST 0

ELAM

Decode Flood Interfaces Option #1: Consistency Checker

- Non-detailed output:

Leaf-1# show consistency-checker membership vlan 10

Checks: Port membership of Vlan in vifvlanmbr, rwegstate and qsmt_ovtbl tables

Additional Checks: Fex port membership of Vlan in vifvlanmbrsearchtable table

Ports configured as "switchport monitor" will be skipped

Ports configured as "switchport mode private-vlan" will be skipped

For additional PVLAN membership vlan checks use:

"show consistency-checker membership vlan [vlan-id] private-vlan"

Checking hardware for Module 1 Unit 0

No FEX interfaces to validate

Consistency Check: PASSED

Vlan:10, Hardware state consistent for:

Ethernet1/1

Ethernet1/47

Ethernet1/48

ELAM

Decode Flood Interfaces Option #1: Consistency Checker

- Detailed output:

Leaf-1# show consistency-checker membership vlan 10 detail

```
"expectedDetails": {},  
  "actualDetails": {  
    "hwTableName": "tah_sug_qsmt_ovtbl",  
    "hwIndexName": "data",  
    "tableData": [  
      {  
        "number": 1,  
        "units": [  
          {  
            "number": 0,  
            "slices": [  
              {  
                "number": 0,  
                "bitmap": "0x00000000:0x000000c0:0x00010000"              }  
            ]  
          }  
        ]  
      }  
    ]  
  }
```

<snip>

Translated Bitmap on
Slide 52

ELAM

Decode Flood Interfaces Option #2: ELAM and ASIC Hardware Tables

```
Leaf-1# attach module 1
```

```
module-1# debug platform internal tah elam
```

```
module-1(TAH-elam)# trig init slice 0 in-select 6 use-src-id 32
```

```
Slot 1: param values: start asic 0, slice 0, lu-a2d 1, in-select 6, out-select 0,  
src_id 32
```

```
module-1(TAH-elam-insel6)# set outer arp source-ip 10.10.10.1 target-ip  
10.10.10.254
```

```
module-1(TAH-elam-insel6)# start
```

```
module-1(TAH-elam-insel6)# report
```

```
SUGARBOWL ELAM REPORT SUMMARY
```

```
slot - 1, asic - 0, slice - 0
```

```
=====
```

```
Incoming Interface: Eth1/1
```

```
Src Idx : 0x1, Src BD : 10
```

```
Outgoing Interface Info: dst_ptr 10, dst_ptr_is_flood 1
```

```
<snip>
```

```
module-1# hex 100xa
```

ELAM

Decode Flood Interfaces Option #2: ELAM and ASIC Hardware Tables

```
module-1(TAH-elam-insel6)# debug hardware internal sug dump asic 0 slice
0 table tah_sug_qsmt_ovtbl 0xa changed field-per-line
asic instance is 0
asic slice is 0
tbl name is tah_sug_qsmt_ovtbl
start entry is 10
change entries only
one field per line
Block base address: 0x01400000
1st table entry address: 0x016800a0
ENTRY[10] = {
data=0x00000000:0x000000c0:0x00010000
}
```

Decode Flood Interfaces Option #2: ELAM and ASIC Hardware Tables

- 000000c0:00010000 = 0000 0000 0000 0000 0000 0000 1100 0000 : 0000 0000 0000 0001 0000 0000 0000 0000

3 0

- show interface hardware-mappings | i 16|38|39|Sport

CISCO *Live!*

ELAM

ELAM for ARP Reply

- For the ARP Reply, you can just get the results from an ARP ELAM for the reverse flow:

```
Leaf-1(TAH-elam-insel6)# set outer arp source-ip-addr 10.10.10.254 target-ip-addr 10.10.10.1
```

```
EX3(TAH-elam-insel6)# start
```

```
EX3(TAH-elam-insel6)# report
```

```
SUGARBOWL ELAM REPORT SUMMARY
```

```
slot - 1, asic - 0, slice - 0
```

```
=====
```

```
Incoming Interface: Eth1/47
```

```
Src Idx : 0x601, Src BD : 10
```

```
Outgoing Interface Info: dmod 1, dpid 16
```

```
Dst Idx : 0x1, Dst BD : 10
```

```
Packet Type: ARP
```

```
<snip>
```

```
Target Hardware address: 10:B3:D6:A4:BA:17
```

```
Sender Hardware address: 00:00:0C:9F:F0:0A
```

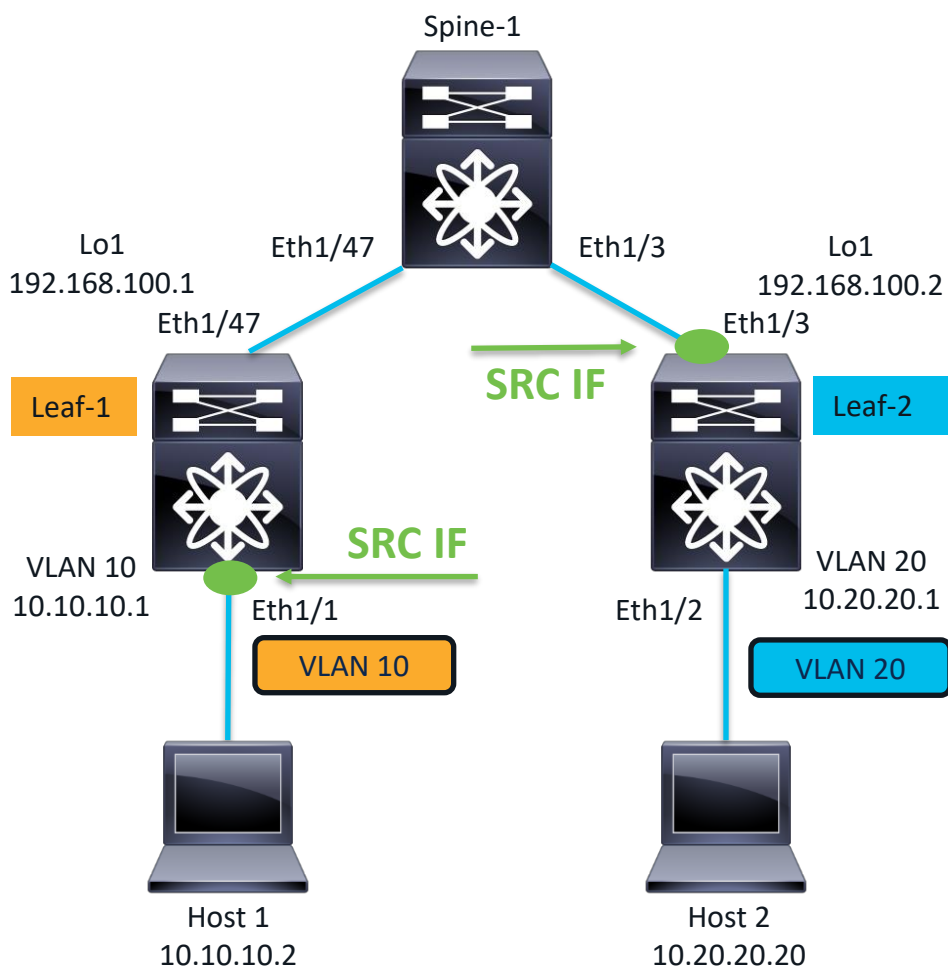
```
Target Protocol address: 10.10.10.1
```

```
Sender Protocol address: 10.10.10.254
```

```
ARP opcode: 2
```

ELAM

Scenario #3: VXLAN Flow – Is the fabric dropping the packet?



- Determine your SRC Interface and its **slice number** and **source ID** on each switch:

Leaf-1# show system internal ethpm info interface eth1/1 | i dpid

IF_STATIC_INFO:

port_name=Ethernet1/1,if_index:0x1a000000,ltl=6144,slot=0,
nxos_port=0,dmod=1,dpid=16,unit=0,queue=65535,xbar_unitbmp=0x0,ns_pid
=255, **slice_num=0**,port_on_slice=16 **src_id=32**

Leaf-2# show system internal ethpm info interface eth1/3 | i dpid

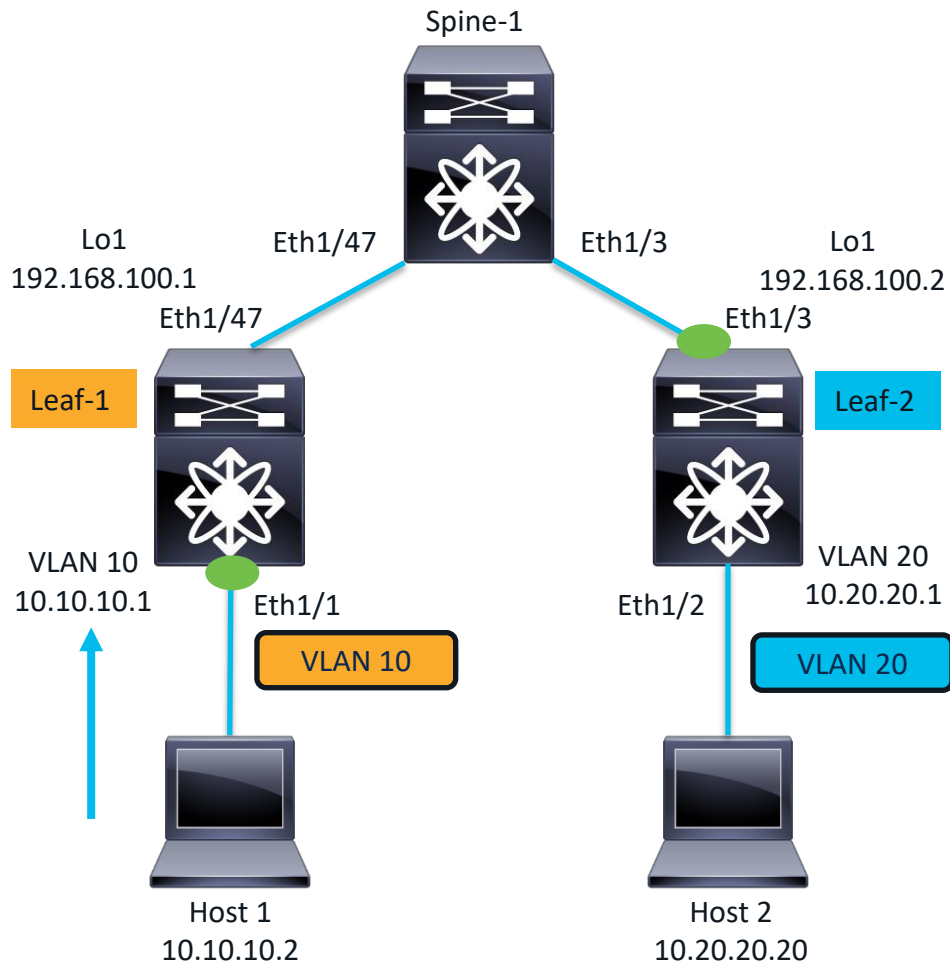
IF_STATIC_INFO:

port_name=Ethernet1/3,if_index:0x1a000400,ltl=6136,slot=0,
nxos_port=8,dmod=1,dpid=18,unit=0,queue=65535,xbar_unitbmp=0x0,ns_pid
=255, **slice_num=0**,port_on_slice=18 **src_id=36**

- Confirm that the packet is **non-encapsulated** on ingress for **Leaf-1**, but it would be **encapsulated** on ingress for **Leaf-2**

ELAM

Scenario #3: VXLAN Flow – Is the fabric dropping the packet?



```
Leaf-1# debug platform internal  
tah elam
```

```
Leaf-1(TAH-elam)# trig init slice 0  
in-select 6 use-src-id 32
```

```
Slot 1: param values: start asic 0,  
slice 0, lu-a2d 1, in-select 6, out-  
select 0, src_id 32
```

```
Leaf-1(TAH-elam-insel6)# set  
outer ipv4 src_ip 10.10.10.2  
dst_ip 10.20.20.20
```

```
Leaf-1(TAH-elam-insel6)# start
```

```
Leaf-1(TAH-elam-insel6)# report
```

```
Leaf-2# debug platform internal  
tah elam
```

```
Leaf-2(TAH-elam)# trig init slice 0  
in-select 9 use-src-id 36
```

```
Slot 1: param values: start asic 0,  
slice 0, lu-a2d 1, in-select 9, out-  
select 0, src_id 36
```

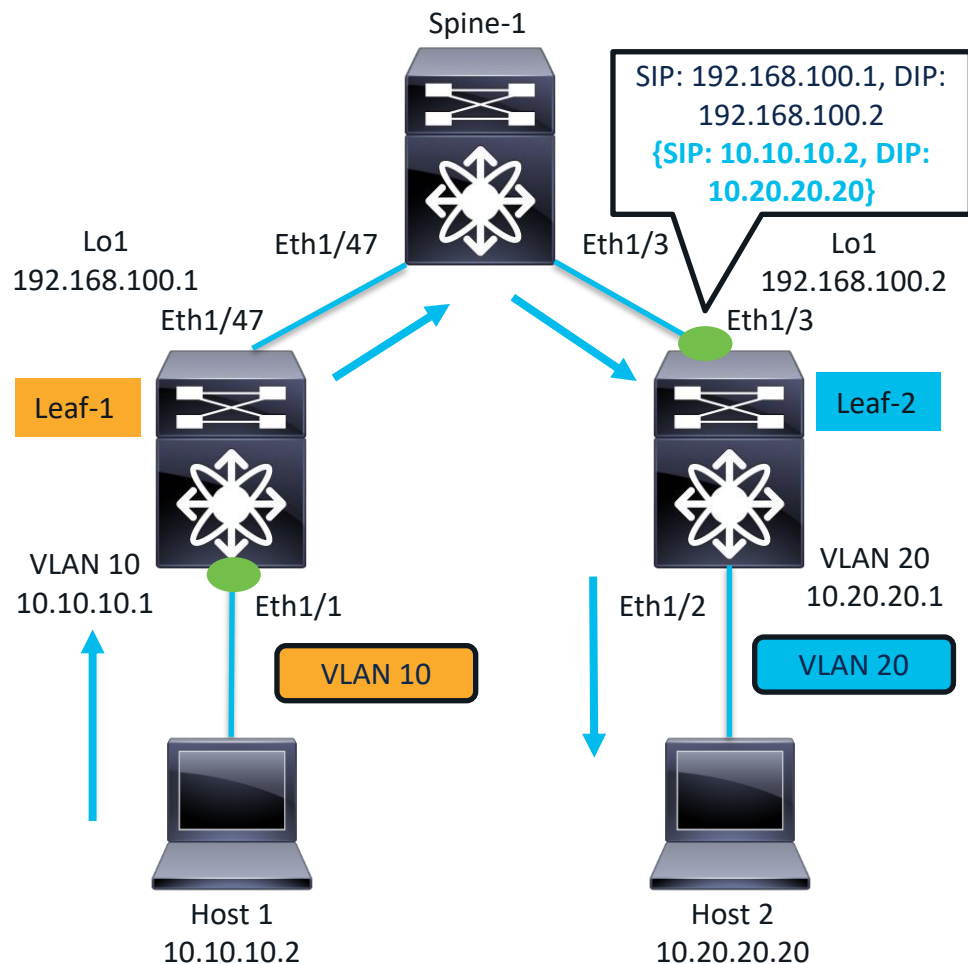
```
Leaf-2(TAH-elam-insel6)# set  
inner ipv4 src_ip 10.10.10.2  
dst_ip 10.20.20.20
```

```
Leaf-2(TAH-elam-insel6)# start
```

```
Leaf-2(TAH-elam-insel6)# report
```

ELAM

Scenario #3: VXLAN Flow – Is the fabric dropping the packet?



Leaf-1# report SUGARBOWL ELAM REPORT SUMMARY

slot - 1,asic - 0, slice - 0

Incoming Interface: Eth1/1

Src Idx : 0x1, Src BD : 10

Outgoing Interface Info: dmod 1,
dpid 38

Dst Idx : 0xb9, Dst BD : 200

<snip>

Dst IPv4 address: 10.20.20.20

Src IPv4 address: 10.10.10.2

<snip>

Leaf-2# report

SUGARBOWL ELAM REPORT SUMMARY

slot - 1,asic - 0, slice - 0

Incoming Interface: Eth1/3

Src Idx : 0x9, Src BD : 200

Outgoing Interface Info: dmod 1, dpid 17

Dst Idx : 0x5, Dst BD : 20

Outer Dst IPv4 address: 192.168.100.2

Outer Src IPv4 address: 192.168.100.1

<snip>

Inner Payload

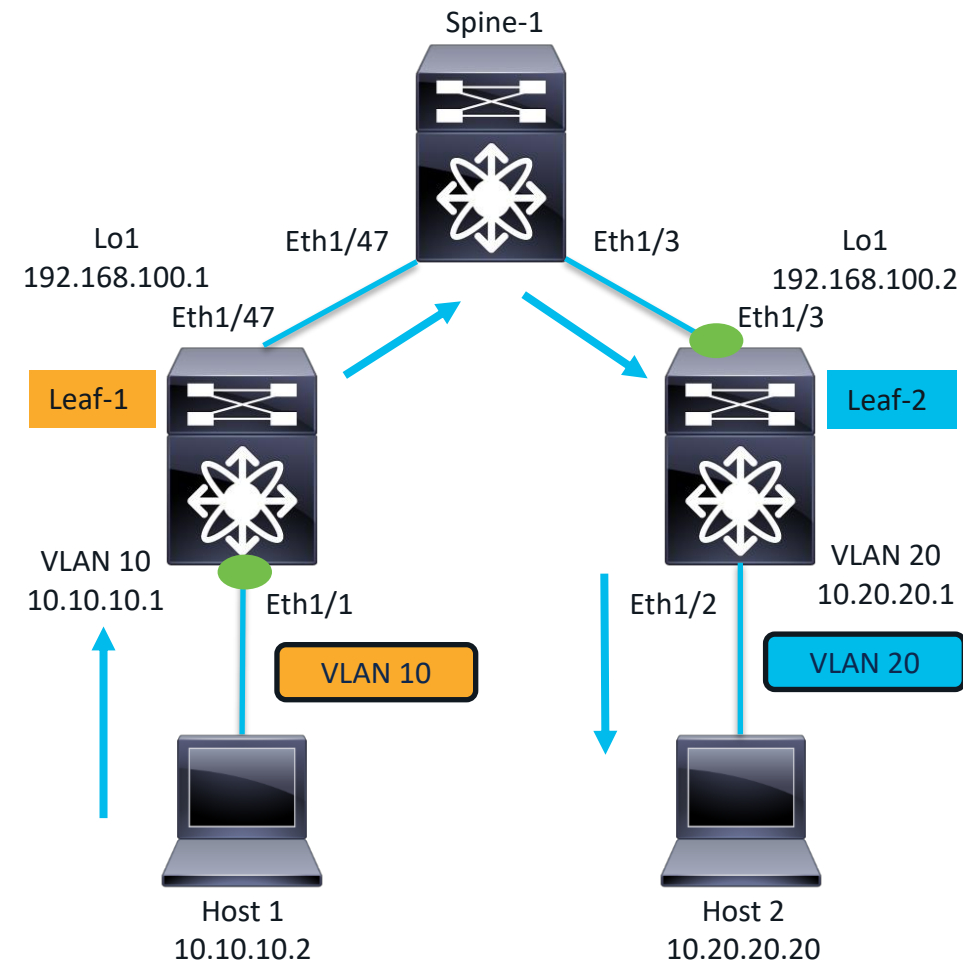
Inner Dst IPv4 address: 10.20.20.20

Inner Src IPv4 address: 10.10.10.2

<snip>

ELAM

Scenario #3: VXLAN Flow – Is the fabric dropping the packet?



Leaf-1# show system internal ethpm
info global | i dpid=38

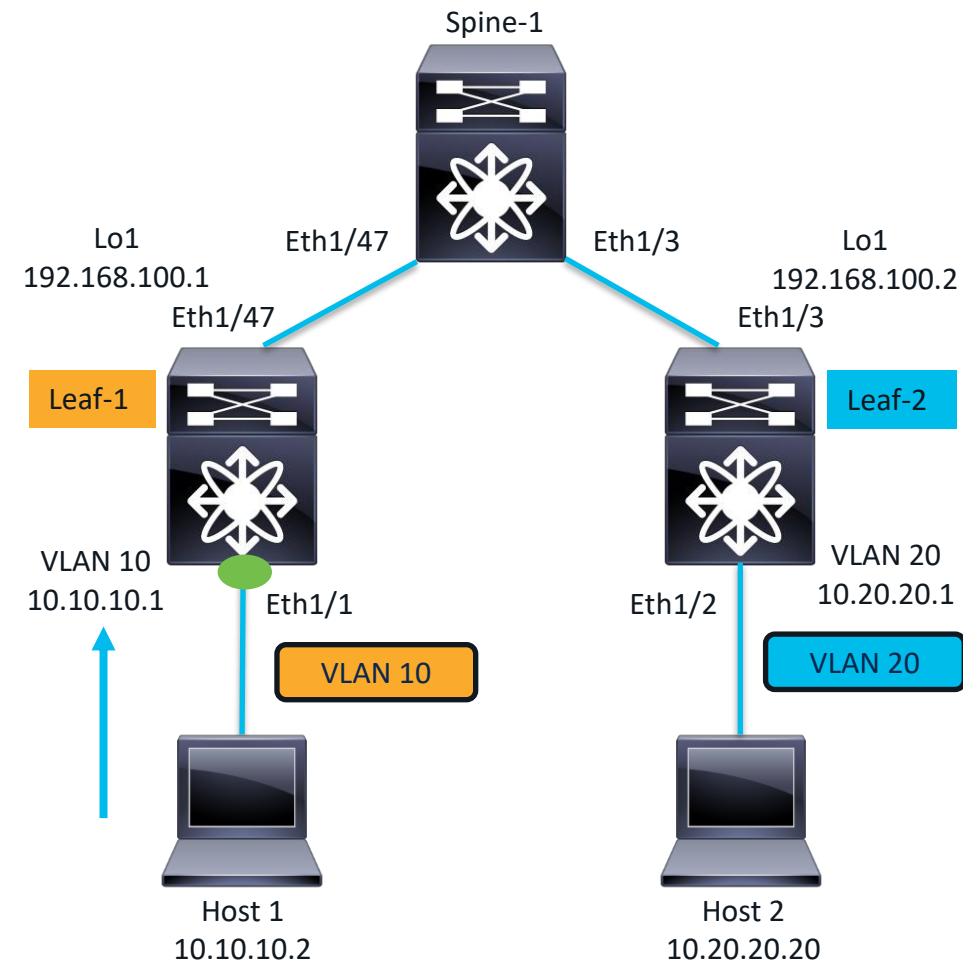
```
IF_STATIC_INFO:  
port_name=Ethernet1/47,if_index:0x1  
1a005c00,ltl=5960,slot=0,  
nxos_port=184,dmod=1,dpid=38,unit  
=0,queue=65535,xbar_unitbmp=0x0,  
ns_pid=255,sl  
ce_num=0,port_on_slice=38,src_id=6  
8
```

Leaf-2# show system internal ethpm
info global | i dpid=17

```
IF_STATIC_INFO:  
port_name=Ethernet1/2,if_index:0x1  
a000200,ltl=6140,slot=0,  
nxos_port=4,dmod=1,dpid=17,unit=0,  
queue=65535,xbar_unitbmp=0x0,ns_  
pid=255,slice_  
num=0,port_on_slice=17,src_id=34
```

ELAM

Scenario #4: Are we dropping the packet?



Leaf-1# debug platform internal tah elam

Leaf-1(TAH-elam)# trig init

Slot 1: param values: start asic 0, start slice 0, lu-a2d 1, in-select 6, out-select 0

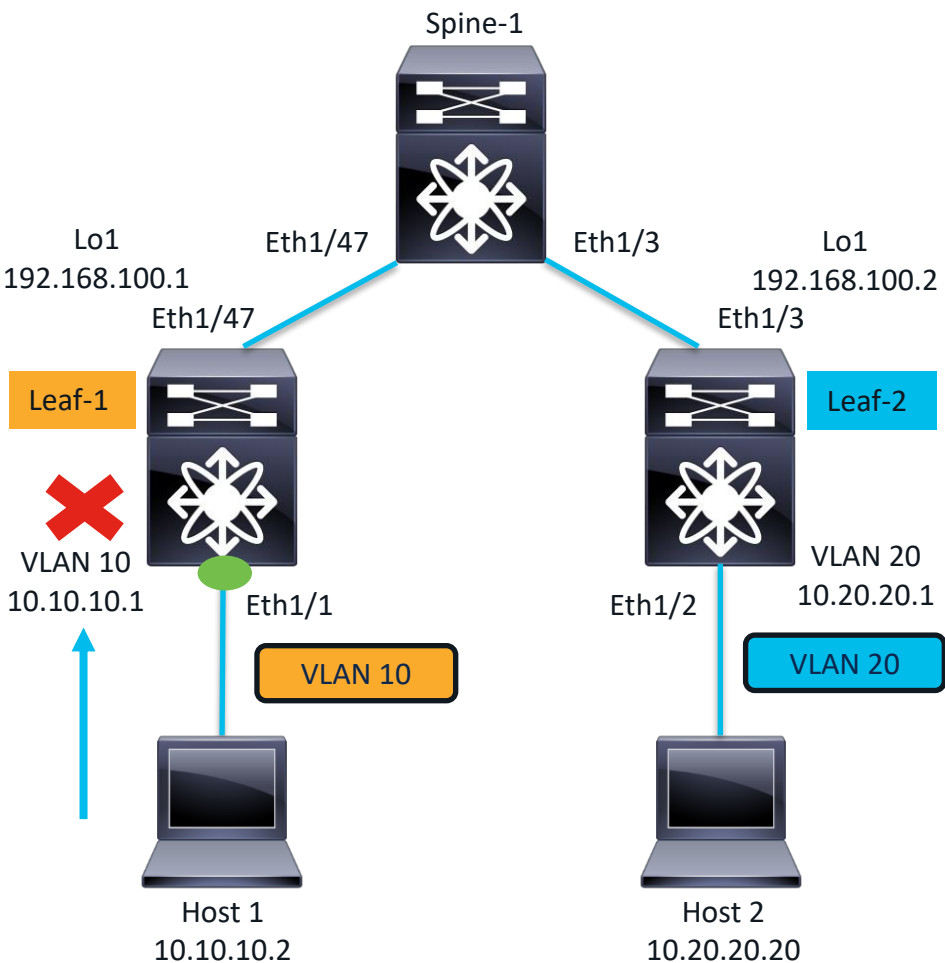
Leaf-1(TAH-elam-insel6)# set outer ipv4 src_ip 10.10.10.2 dst_ip 10.20.20.20

Leaf-1(TAH-elam-insel6)# start

Leaf-1(TAH-elam-insel6)# report

ELAM

Scenario #4: Are we dropping the packet?



Leaf-1# report
SUGARBOWL ELAM REPORT SUMMARY
slot - 1, asic - 0, slice - 0
=====

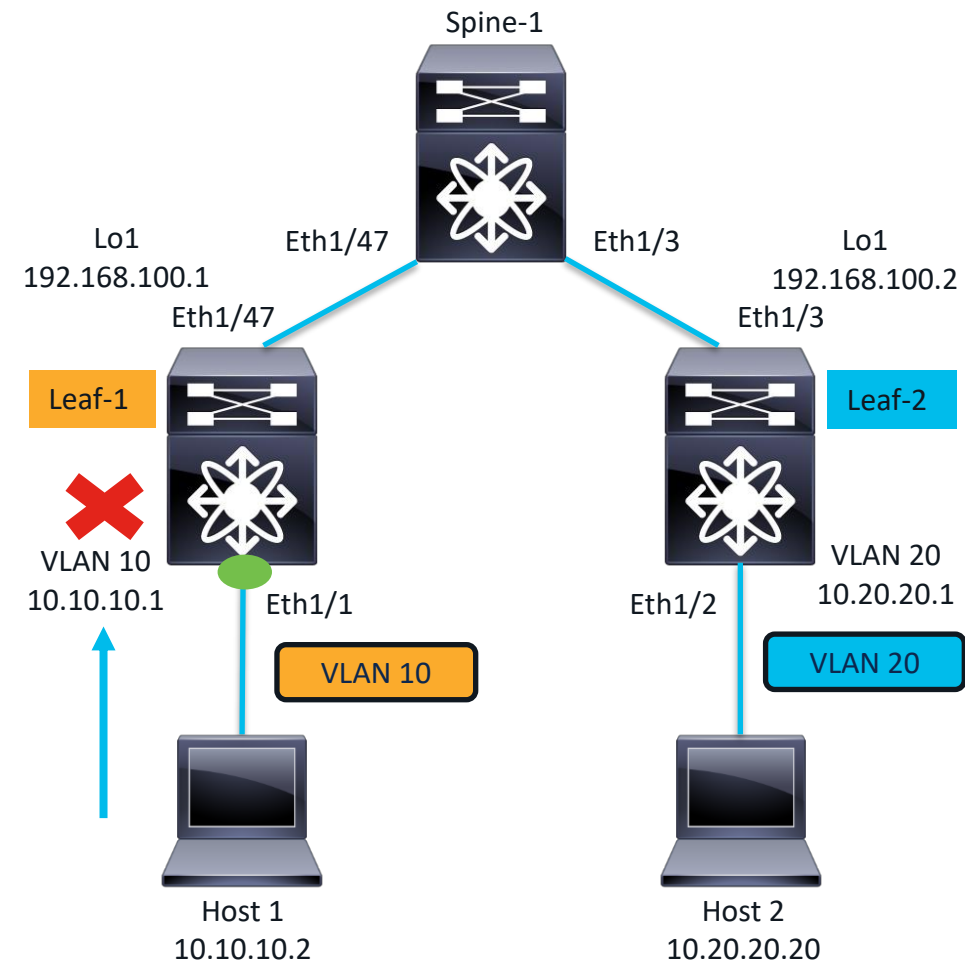
Incoming Interface: Eth1/1
Src Idx : 0x1, Src BD : 10
Outgoing Interface Info: dmod 1, dpid 38
Dst Idx : 0xb9, Dst BD : 200
<snip>
Dst IPv4 address: 10.20.20.20
Src IPv4 address: 10.10.10.2
<snip>
Drop Info:

LUA:
LUB:
LUC:
LUD:
ACL_DROP
Final Drops:
ACL_DROP

Even though we show a forwarding decision to another interface, we are dropping the packet due to this reason

ELAM

Scenario #4: Are we dropping the packet?



Leaf-1# show run interface vlan 10

```
!Command: show running-config interface Vlan10
!Running configuration last done at: Sun May 12 21:38:29 2024
!Time: Sun May 12 21:38:32 2024
```

version 10.3(4a) Bios:version 05.47

```
interface Vlan10
no shutdown
ip access-group ciscolive in
no ip redirects
ip address 10.10.10.1/24
```

Leaf-1# sh ip access-list ciscolive

```
IP access list ciscolive
10 deny ip 10.10.10.2/32 10.20.20.20/32
20 permit ip any Cisco live
```

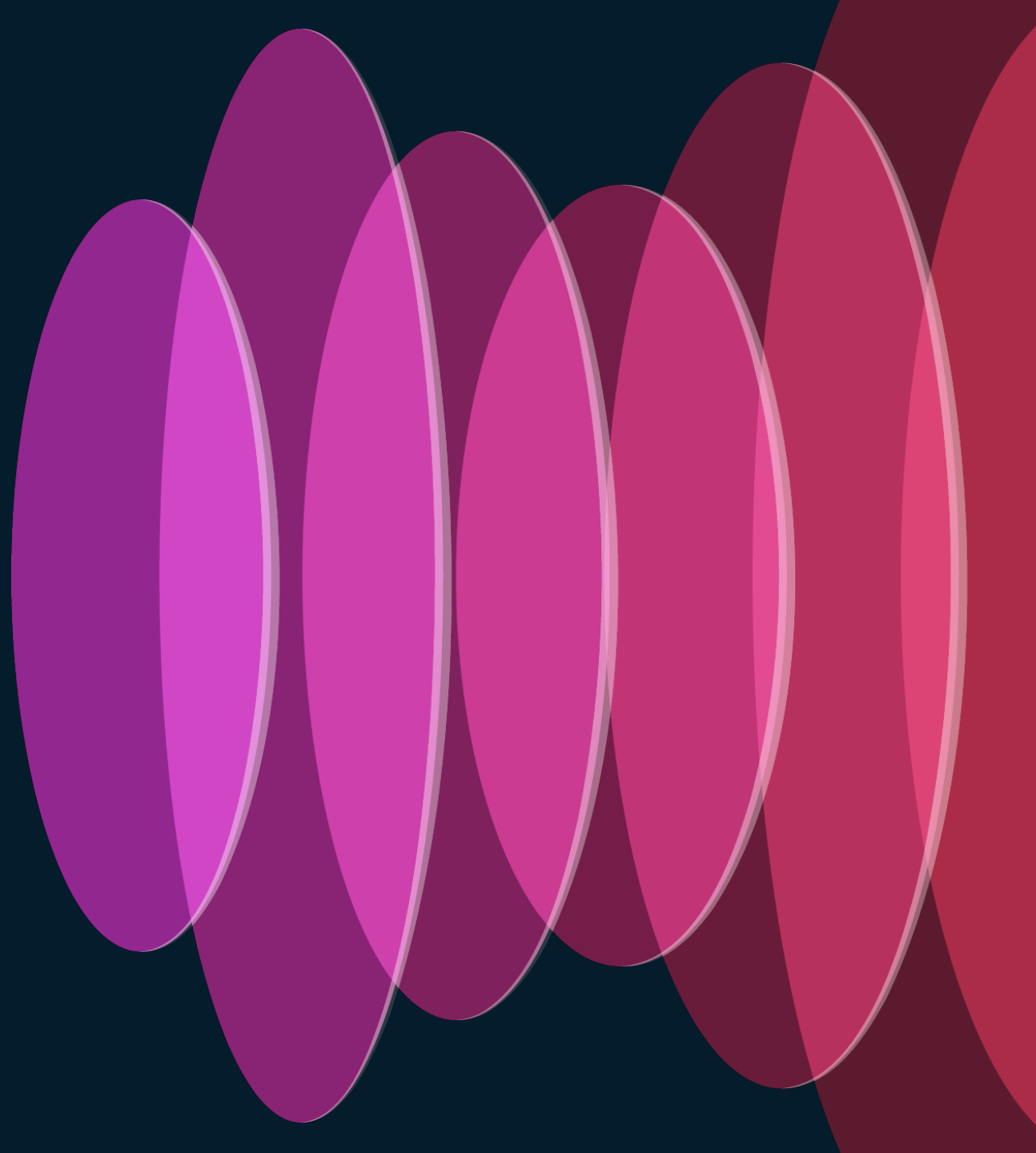
ELAM

Scenario #4: Are we dropping the packet?

- Most common drop codes for ELAM/codes that indicate bad forwarding:
 - ACL_DROP: Frame/Packet matched on a deny entry for an ACL
 - IP_MTU_CHECK_FAILURE: Frame failed the MTU check for the interface
 - IP_SELF_FWD_FAILURE: IP Redirects enabled on the SVI
 - ROUTING_DISABLED: Routing for particular vlan disabled
 - SRC_VLAN_MBR: Packet/Frame received on an interface where the vlan is not configured/programmed
 - TTL_EXPIRED: Packet received on an interface that causes the TTL to be decremented to zero, resulting in a drop
 - UC_DF_CHECK_FAILURE: vPC loop avoidance failure
 - UC_PC_CFG_TABLE_DROP: No route in the VRF for the destination
 - UC_RPF_FAILURE:
 - UC_TENANT_MYTEP_BRIDGE_MISS: VXLAN leaf receiving traffic from a leaf for which it has not learned any hosts/routes ; it does not have a peering with that VTEP
 - UC_TENANT_MYTEP_ROUTE_MISS: VXLAN leaf in the particular tenant VRF does not have a route for the given destination

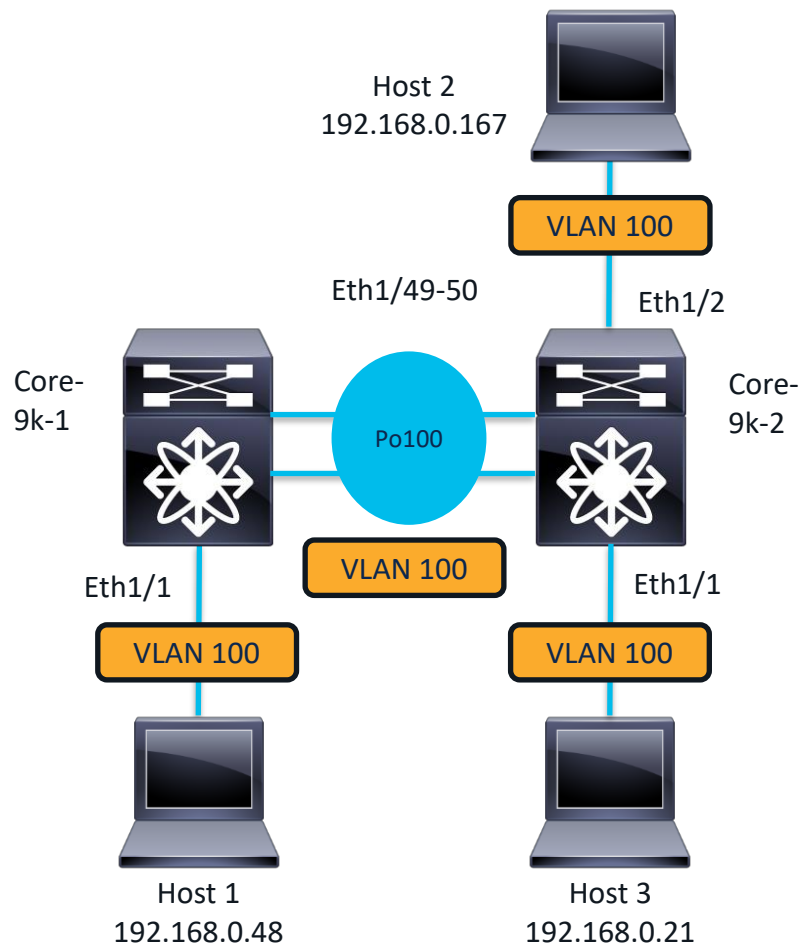
Tool #4:

Consistency-Checker



Consistency-Checker

Example Customer Scenario



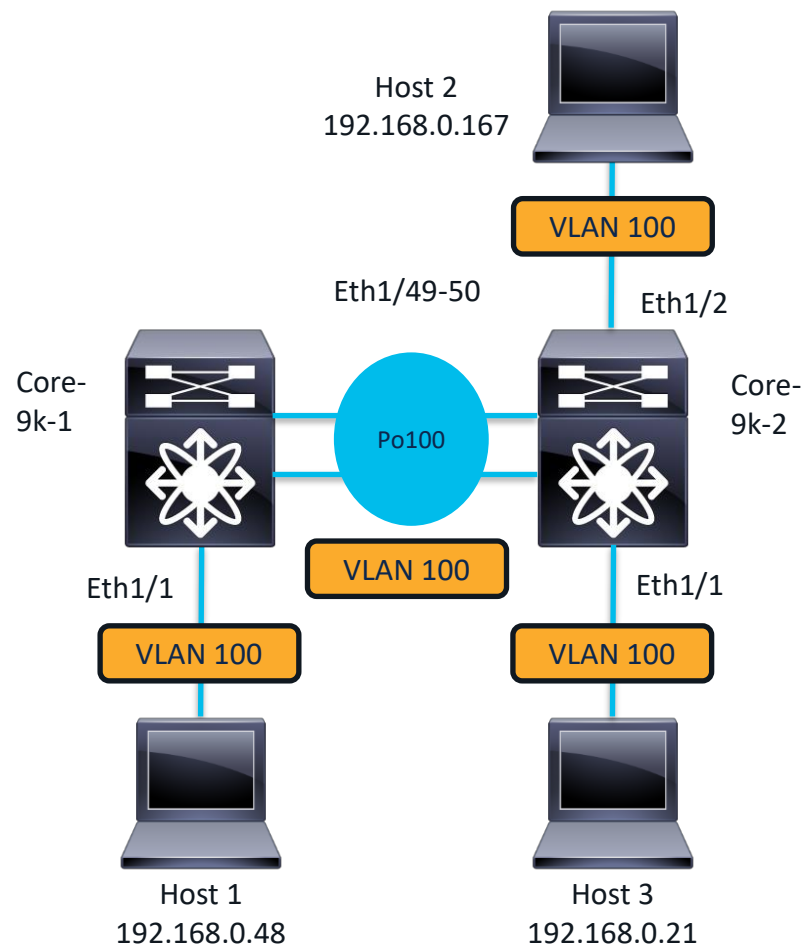
Problem Description:

You have devices in vlan 100 in a similar (simplified) topology to that on the left. Some can resolve ARP and ping, while others cannot ping or even resolve ARP.

How would you troubleshoot this?

Consistency-Checker

Example Customer Scenario

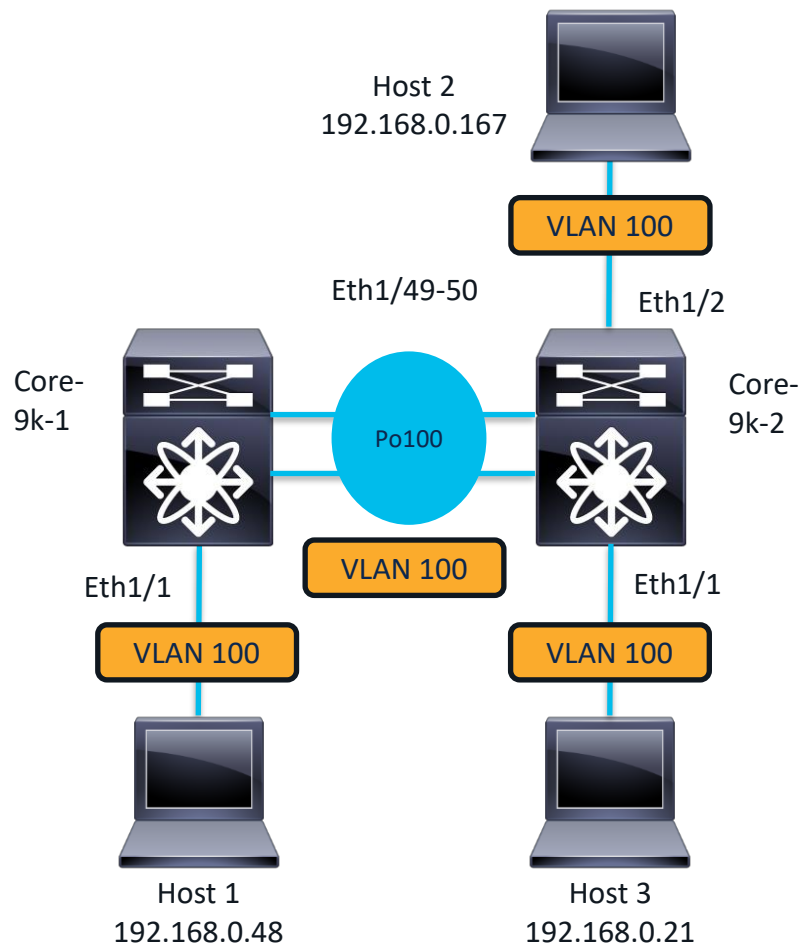


Normal Troubleshooting Reveals:

- Links from the switches to the affected devices (and between the switches themselves) were tested and found to be clean
- MACs of affected devices are learned on relevant interfaces
- STP found to be forwarding on all relevant interfaces
- No ACLs on the core switches
- Host 2 can always resolve ARP and Host 3, and can resolve ARP for Host 1, but not ping it
- Host 1 cannot resolve ARP for Host 2, but if Host 2 tries, it successfully pings it

Consistency-Checker

Example Customer Scenario



Troubleshooting Using Our Session's Tools (So Far) Reveals:

- No software switching of the traffic on either of the switches for any flows, as per Ethalyzer
- Multiple ELAM captures reveal the following:
 - For the ARP traffic between Hosts 1 and 3, the ARP Request is flooded and the Reply is seen to ingress and egress Eth1/49 on Core-9k-1
 - ICMP traffic between Hosts 1 and 3 shows the Request Entering Core-9k-1 on Eth1/49, and the Reply is seen leaving Eth1/50
 - ARP traffic between Hosts 1 and 2 shows the Request makes it to Host 2, and the Reply is sent by Core-9k-2 on Eth1/50
 - When Host 3 attempts to Host 1, all traffic is seen on Eth1/49 between Eth1/49 on both switches?

Eth1/50 appears to have some issue, but what is it and how can we figure it out?

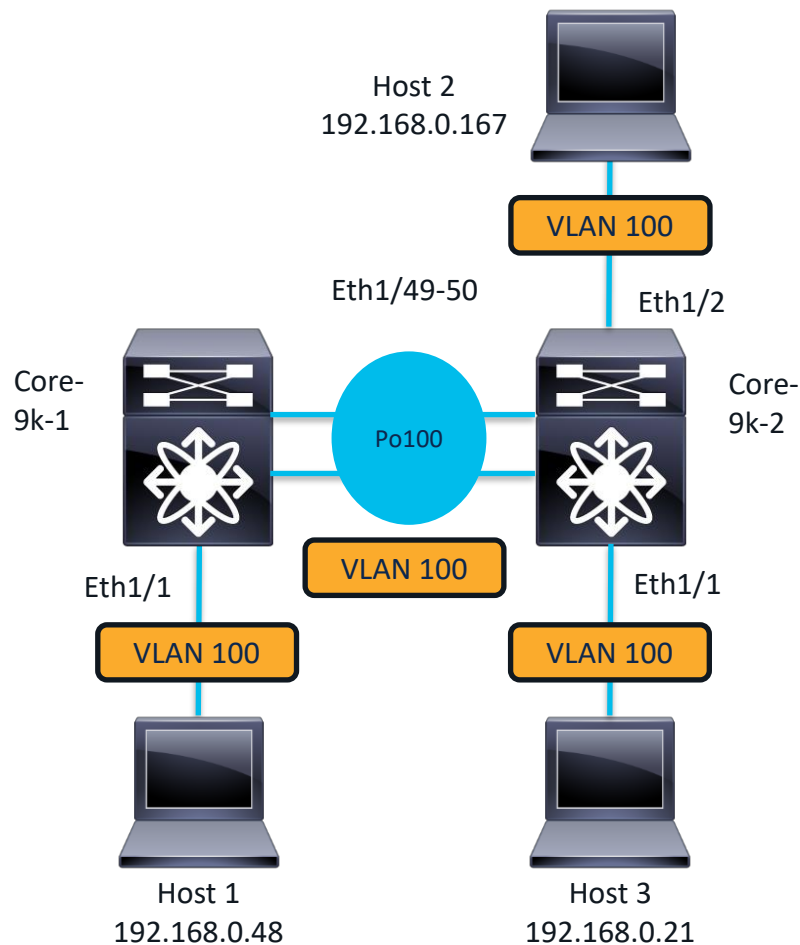
Consistency Checker

Forwarding State/Feature Consistency Verification Tool

- Validates consistency between software and hardware programming of many features
 - Grabs output directly from ASIC hardware tables and compares it to the existing configuration
 - Includes both L2 and L3 features and technologies such as Switching, Unicast/Multicast Routing, VXLAN config checks, Interface Programming Checks
- Can complement troubleshooting done with Ethalyzer and ELAM
- Syntax:
 - `Show consistency-checker [feature/technology] [feature options] [detail]`

Consistency-Checker

Example Customer Scenario



- Using the consistency checker for our problem:

```
Core-9k-1# show consistency-checker member vlan 100  
<snip>
```

```
Checking hardware for Module 1 Unit 0  
<snip>
```

Consistency Check: **FAILED**

Vlan:10, Hardware state consistent for:

Ethernet1/1

Ethernet1/49

Vlan:10, **Hardware state inconsistent for:**
Ethernet1/50

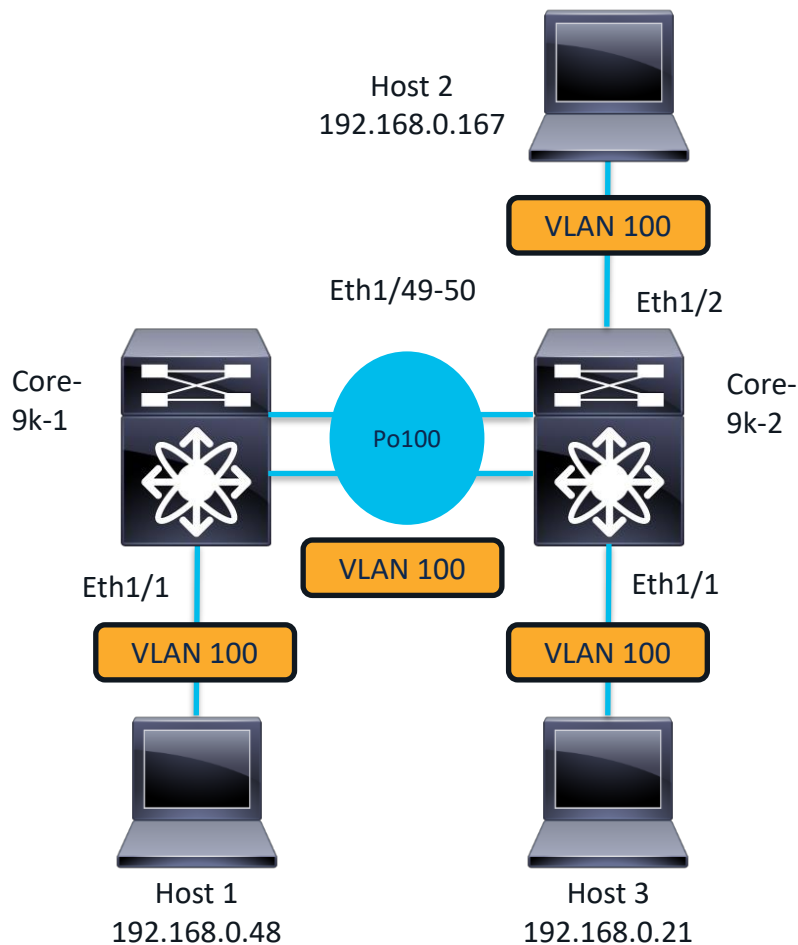
- Other commands that would work in this instance:

show consistency-checker stp-state vlan 100

show consistency-checker l2 switchport int port-channel 100

Consistency-Checker

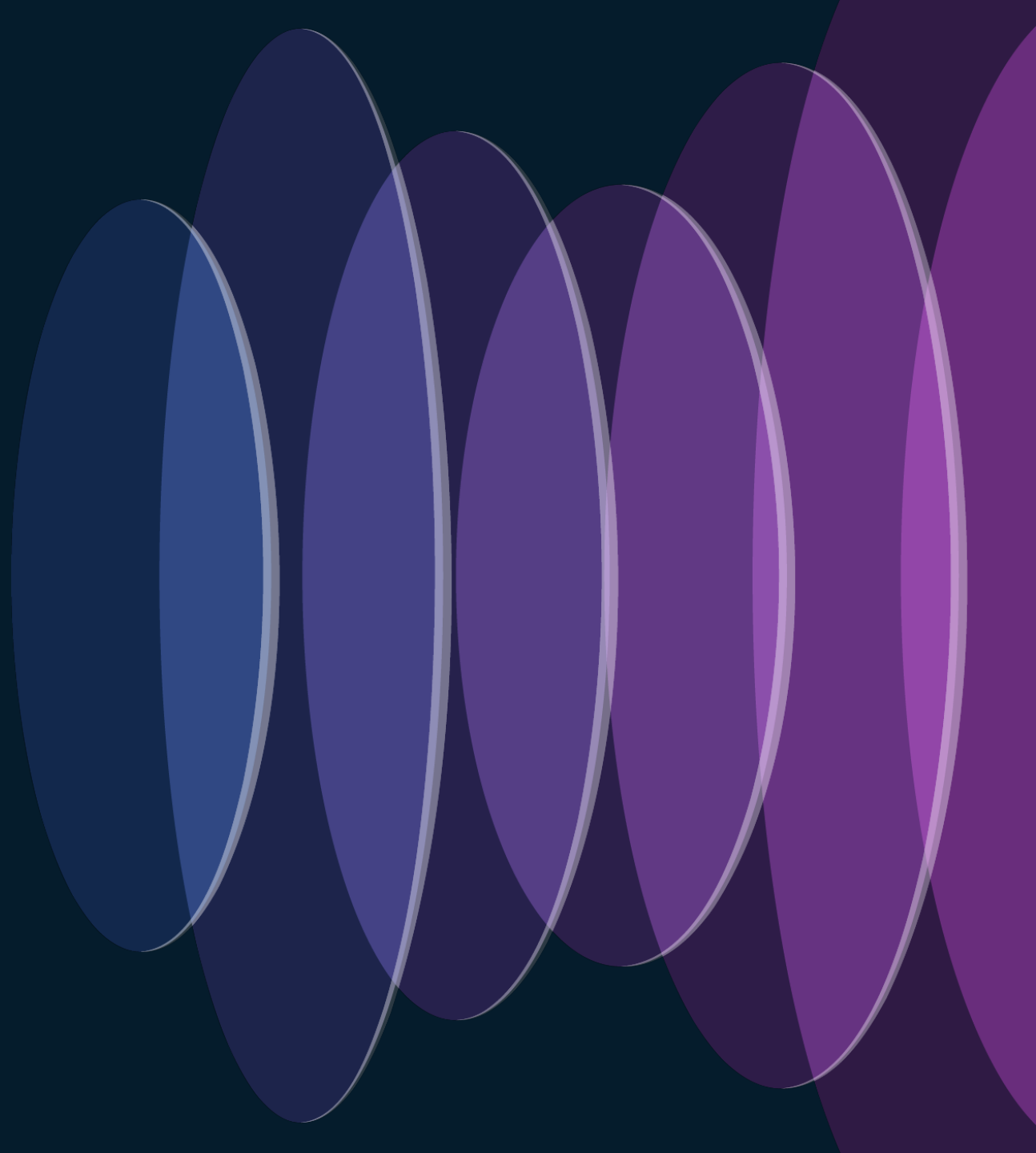
Example Customer Scenario: Resolution Steps



- **You've identified the underlying issue. Now what?**
- **Steps :**
 - Grab a [show tech detail] and/or relevant feature show techs
 - Flap the relevant SVI/interface/route
 - If flapping doesn't work, perform [reload ascii]
 - Regardless of flapping/reloads working, take a show tech detail/feature show tech after
 - For further analysis, you can send your troubleshooting results and the show techs to TAC

Tool #5:

Show Troubleshoot



Troubleshoot Command

- Helps us check MAC and IP route programming in hardware
 - Gathers hardware and software table commands
 - Nests and organizes commands and their output for more coherent viewing

Syntax

- L2:

```
Leaf-1#show troubleshoot l2 [mac | port-channel] [interface | vlan]
```

- L3

```
Leaf-1#show troubleshoot l3 [ipv4 | ipv6] [src-ip | vrf] [IP | vrf_name]
```

Troubleshoot Command

Example of L3 Troubleshoot Output

```
Leaf-1# show troubleshoot l3 ipv4 10.20.20.1 src-ip 10.10.10.1 vrf default
```

```
*****
```

```
CHECK ROUTE IN PI RIB
```

```
*****
```

```
show ip route 10.20.20.20 vrf default
```

```
10.20.20.20/32, ubest/mbest: 1/0
```

```
*via 10.1.1.2, Eth1/47, [110/5], 00:17:13, ospf-1, intra
```

```
*****
```

```
CHECK ROUTE IN PD FIB
```

```
*****
```

```
show forwarding route 10.20.20.20/32 vrf default
```

```
slot 1
```

```
=====
```

```
IPv4 routes for table default/base
```

Prefix	Next-hop	Interface	Labels	Partial Install
10.20.20.20/32	10.1.1.2	Ethernet1/47		

Check Route in RIB

Check Route in FIB

Notice this entry in FIB matches with RIB

Troubleshoot Command

Example of L3 Troubleshoot Output

CHECK ROUTE IN UFIB

show forwarding internal trace v4-pfx-history module 1

PREFIX 10.20.20.20/32 TABLE_ID 0x1

Time	usecs	ha_handle	next_obj	next_obj_HH	NH_cnt	epoch	operation
2024/04/24 13:59:57.239	58555	0xca9071fc	V4 adj	0x7a127	1	1	Create

CHECK HOST ROUTE IN HARDWARE

show hardware internal tah l3 v4host | grep 10.20.20.20

HW Loc	Ip Entry	VRF	MPath	NumP	Base/L2ptr	CC	SR	DR	TD	DC	DE	LI	HR
3/5	10.20.20.20	1	No	0	0xd0004								

Check prefix
learning history

Check Host
route entry in
v4 host table

Adjacency
Index Checks

Troubleshoot Command

Example of L3 Troubleshoot Output

CHECK FOR THE ADJACENCY

show hardware internal tah l3 adjacency 0xd0004

AdjId	FP	BD	DMac	DstIdx	DstIsPtr
-----	-----	-----	-----	-----	-----
0xd0004	13/0/0x4	4100	e4:1f:7b:2f:a6:87	1	No

Checks if adjacency
is correct

Leaf-1# sh ip arp | in 10.1.1.2
10.1.1.2 00:06:24 e41f.7b2f.a687 Ethernet1/47
Leaf-1#

Entry matches with
RIB and FIB

Troubleshoot Command

Example of L3 Troubleshoot Output

RUNNING CONSISTENCY CHECKER

CHECKING HARDWARE ASIC TYPE

Please wait, consistency checker may take a while...

Consistency checker passed for 10.20.20.20/32

Leaf-1#

Starting to check
consistency

Consistency Check
Passed

Troubleshoot Command

Example of L2 Troubleshoot Output

```
Leaf-1# show troubleshoot l2 mac 689e.0b8b.0327 vlan 10 detail
```

```
MAC: 689e.0b8b.0327 Vlan: 10
```

```
Show spanning-tree VLAN 10
```

VLAN Name	Status	Ports
-----------	--------	-------

10 VLAN0010	active	Eth1/1
-------------	--------	--------

VLAN Type	Vlan-mode
-----------	-----------

10 enet	CE
---------	----

Troubleshoot Command

Example of L2 Troubleshoot Output

```
Leaf-1# show troubleshoot l2 mac 689e.0b8b.0327 vlan 10 detail
```

```
MAC: 689e.0b8b.0327 Vlan: 10
```

```
Show spanning-tree VLAN 10
```

VLAN Name	Status	Ports
-----------	--------	-------

10 VLAN0010	active	Eth1/1
-------------	--------	--------

VLAN Type	Vlan-mode
-----------	-----------

10 enet	CE
---------	----

```
show mac address-table address 689e.0b8b.0327 vlan 10
```

```
Legend:
```

* - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
age - seconds since last seen, + - primary entry using vPC Peer-Link,
(T) - True, (F) - False, C - ControlPlane MAC, ~ - vsan

VLAN	MAC Address	Type	age	Secure	NTFY	Ports
* 10	689e.0b8b.0327	dynamic	0	F	F	Eth1/1

Troubleshoot Command

Example of L2 Troubleshoot Output

```
show system internal l2fm l2dbg macdb address 689e.0b8b.0327 vlan 10
```

Legend

Db: 0-MACDB, 1-GWMACDB, 2-SMACDB, 3-RMDB, 4-SECMACDB 5-STAGEDB

Src: 0-UNKNOWN, 1-L2FM, 2-PEER, 3-LC, 4-HSRP

5-GLBP, 6-VRRP, 7-STP, 8-DOTX, 9-PSEC 10-CLI 11-PVLAN

12-ETHPM, 13-ALW_LRN, 14-Non_PI_MOD, 15-MCT_DOWN, 16 - SDB

17-OTV, 18-Deounce Timer, 19-AM, 20-PCM_DOWN, 21 - MCT_UP

22-VxLAN, 23-L2RIB 24-CTRL, 25-UFDm

Slot:0 based for LCS 31-MCEC 20-OTV/ORIB

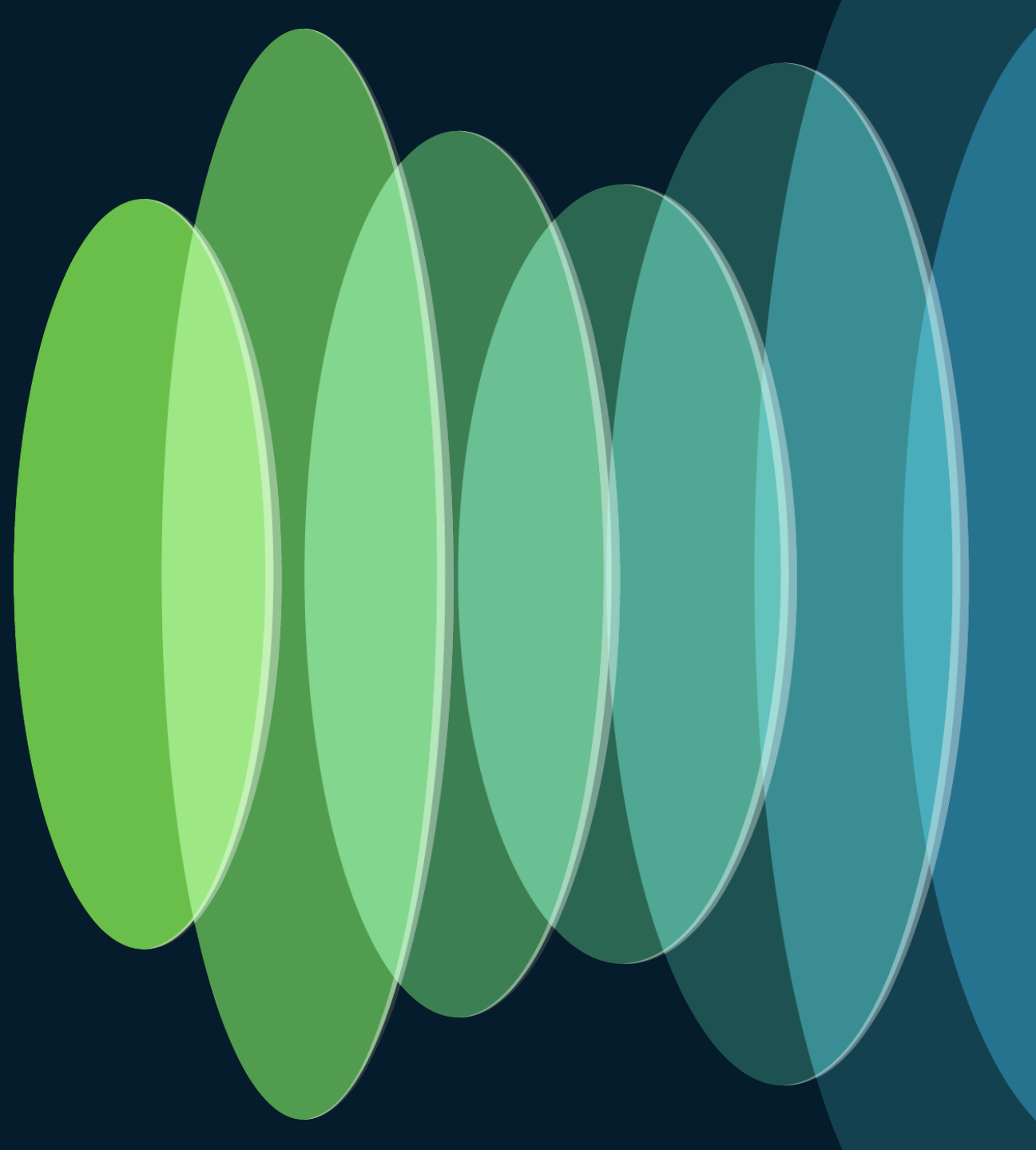
VLAN: 10 MAC: 689e.0b8b.0327 FE ID: 0

Time	If/swid	Db Op	Src Slot	FE-BMP	Count	Detail
Apr 24 13:56:37	2024:176320	0x0901000a 0		REGDB_ADD	0 0	0xffff --
Apr 24 13:56:37	2024:176334	0x1a000200 0		MAC_NOTIF_AM_MOVE	1 0	0xffff --

VLAN: 10 MAC: 689e.0b8b.0327

Time	If/swid	Db Op	Src Slot	FE-BMP	Count	Detail
Apr 24 13:56:32	2024:729	0x1a000200 0	INSERT	3	0 0x1	--

Tool #6: iCAM



Intelligent CAM Analytics and Machine-learning (iCAM)

- iCAM provides resource monitoring and analytics.
- You can obtain traffic, scale and resource (usage level) monitoring for the following resources and functions:

Enable Feature icam and monitoring

Leaf-1(config)# feature icam

Leaf-1(config)# icam monitor scale

Beginning with 9.3(5)

This feature is enabled by default

iCAM monitoring

ACL TCAM entries	ACL TCAM resource utilization
Forward information base (FIB) TCAM resource utilization	Layer 2 Switching
Unicast routing	Multicast Routing
VXLAN	Process memory
Shared memory	

Intelligent CAM Analytics and Machine-learning (iCAM)

Using iCAM to check L2-Switching Scale

Leaf-1# show icam scale l2-switching

Scale Limits for L2 Switching

Feature	Verified Scale	Config Scale	Cur Scale	Cur Util	Threshold Exceeded	Polled Timestamp
MAC Addresses	-	-	-	-	-	-
Mod:1,FE:0)	92000	92000	16	0.01	None	2024-05-09 13:54:50
VLANs	3967	3000	3839	127.96	Critical	2024-05-09 13:54:50
(VDC:1)	-	-	3839	127.96	Critical	2024-05-09 13:54:50
Isolated Port*Vlan	190000	190000	0	0	None	2024-05-09 13:54:50
(VDC:1)	-	-	0	0	None	2024-05-09 13:54:50

VLAN
Utilization Level
Critical

Leaf-1#

Intelligent CAM Analytics and Machine-learning (iCAM)

Using iCAM to check Unicast Routing Scale

Leaf-1# show icam scale unicast-routing

Scale Limits for Unicast Routing

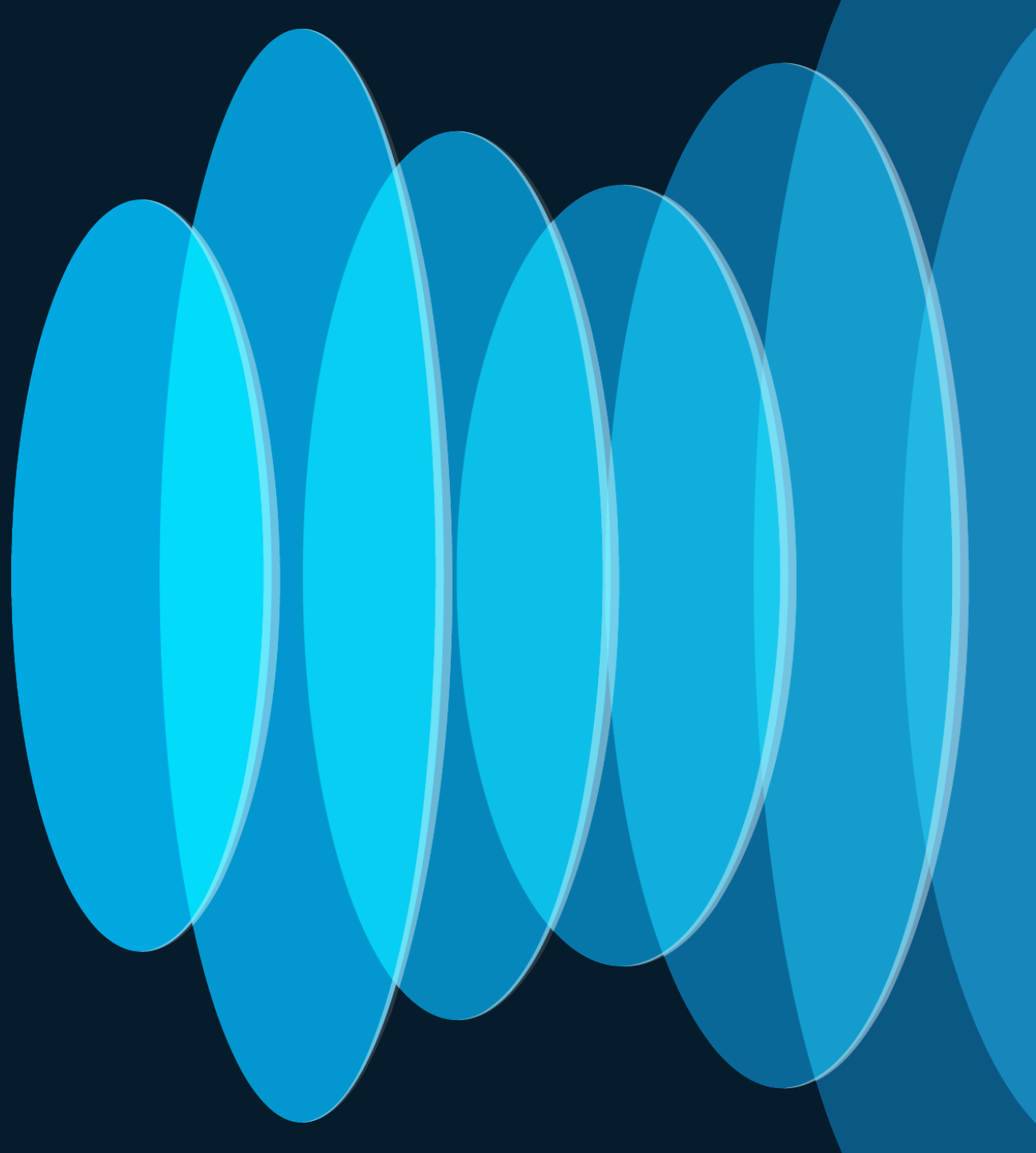
Feature	Verified Scale	Config Scale	Cur Scale	Cur Util	Threshold Exceeded	Polled Timestamp
IPVv4 LPM Routes	-	-	-	-	-	-
Mod:1)	6000	6000	5468	91.13	Warning	2024-05-09 13:54:50
IPVv6 LPM Routes	-	-	-	-	-	-
Mod:1)	1900	1900	03	0.15	None	2024-05-09 13:54:50

Leaf-1#.

LPM Routes
Scale High

High Utilization

Tool #7: PIE



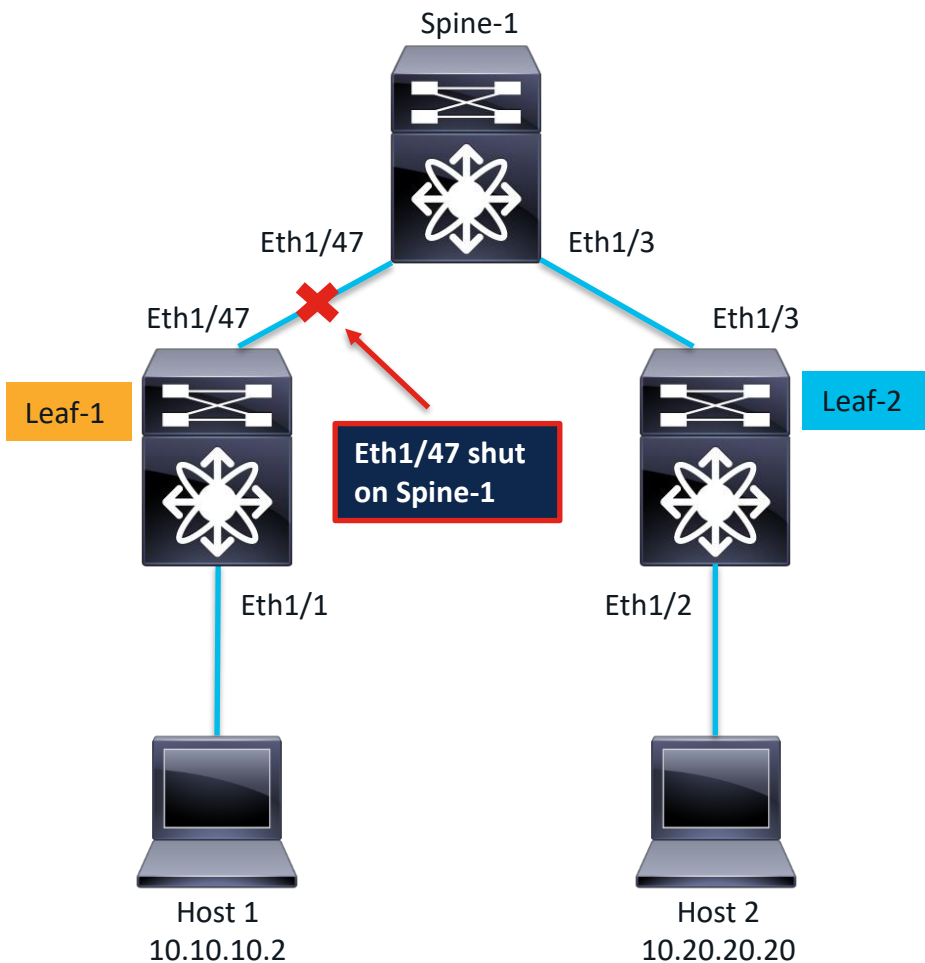
PIE

Platform Telemetry Tool

- Platform Insights Engine
- Can help to identify or RCA issues with different Layer 1 issues
- Supported on Cloudscale ToR switches starting on 10.2(1)
 - EoR Cloudscale (not Fretta) linecards supported as of 10.2(2)

PIE

Scenario #1: Link Failure



Leaf-1# **show pie interface ethernet 1/47 link-down-rca**

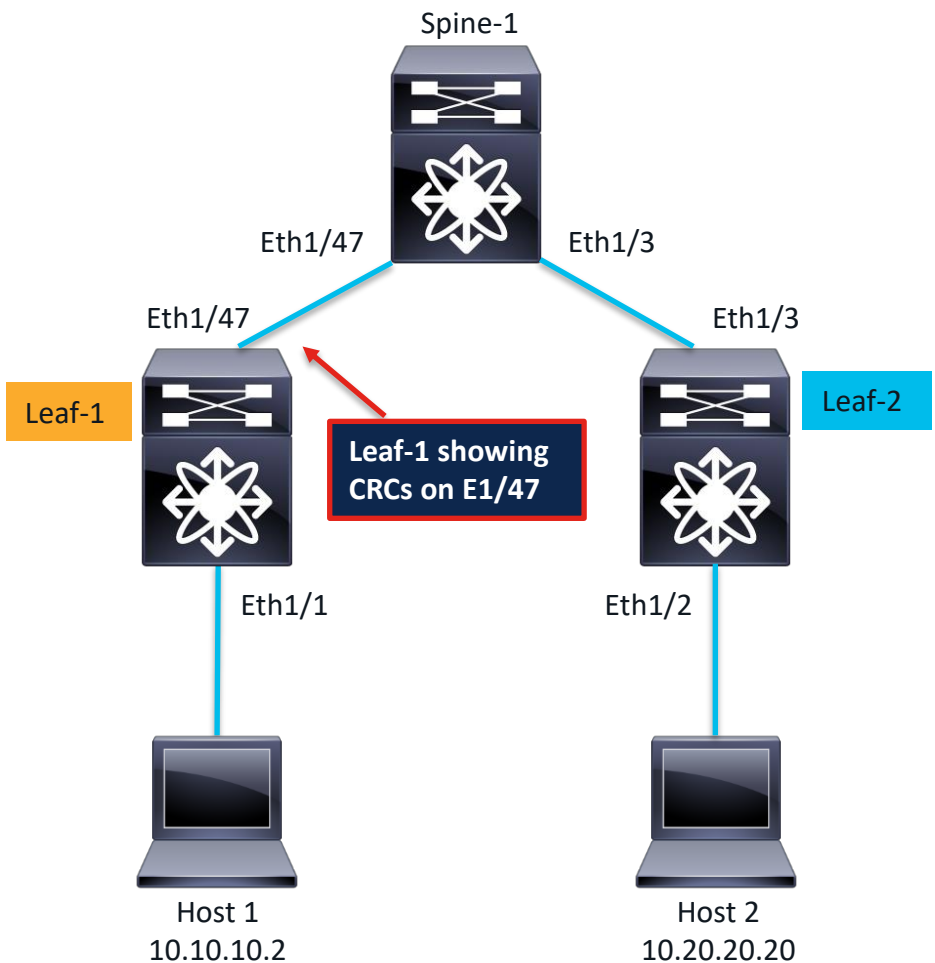
2024-05-01 04:56:42 Event Id: 00003377 Ethernet1/50
Source Id: 436232704 RCA Code: 1

Reason: No Signal from peer is detected .Please check peer configuration.

- Apart of Link Debug Telemetry to assist with more granular L1 link issues related to signaling
- **Show pie interface ethernet X [link-down-rca | link-flap-rca] [detail]**

PIE

Scenario #2: Optic Health



```
Leaf-1# show pie interface e1/47 transceiver-insights
```

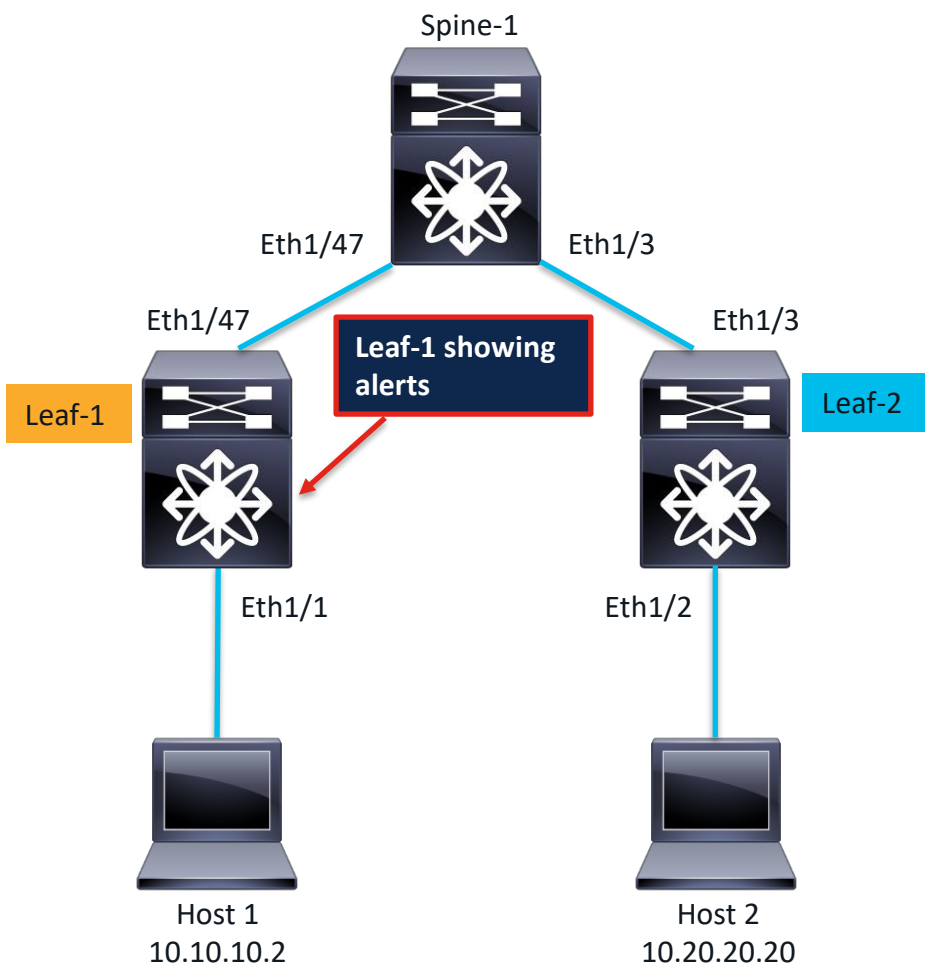
```
2024-05-01 01:03:26  Event Id: 00008608 Event Class: xcvr DOM DB
Event      Interface: Ethernet1/1
```

```
Health Metric: -----BAD----- Mod: 01
```

- Provides metrics for optics to indicate source of link flaps or optic health with respect to current/voltage/power
- Only supported when DOM is supported on the transceiver
- **Show pie interface ethernet X [transceiver-insights] [detail]**

PIE

Scenario #3: Environment Monitoring (PSUs and FANs)



```
Leaf-1# show pie envmon fan
```

```
2024-05-01 05:36:32 Event Id: 00003419 Event Class: Fan insights
Source Id: 0x0102 Mod: 01
```

```
fan_health : PIE_ENTITY_HEALTH_BAD
```

```
Leaf-1# show pie envmon psu all
```

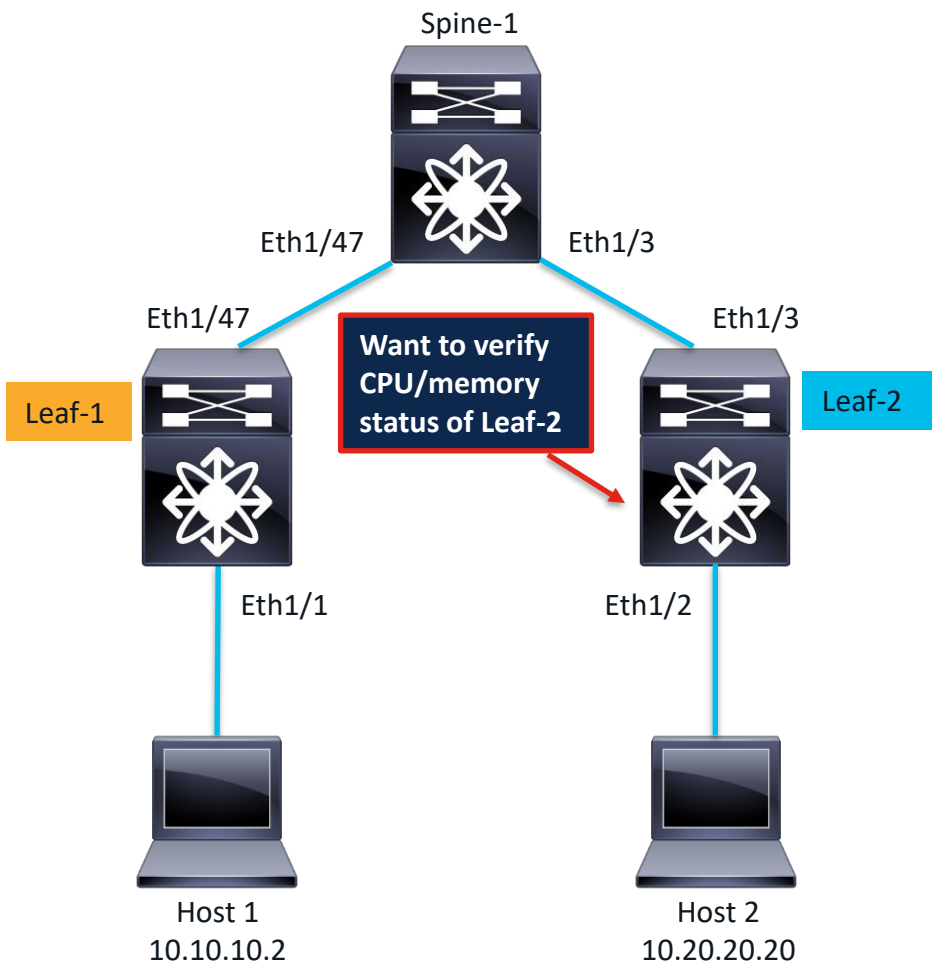
```
2024-05-01 05:36:32 Event Id: 00003418 Event Class: PSU insights
Source Id: 0x0101 Mod: 01
```

```
psu_health : PIE_ENTITY_HEALTH_GOOD
```

- Provides metrics for all fan and PSU statuses
- **Show pie envmon fan [detail]**
- **Show pie envmon psu [#|all] [detail]**

PIE

Scenario #4: CPU and Memory Top Talkers



```
Leaf-2# show pie envmon cpu-usage
```

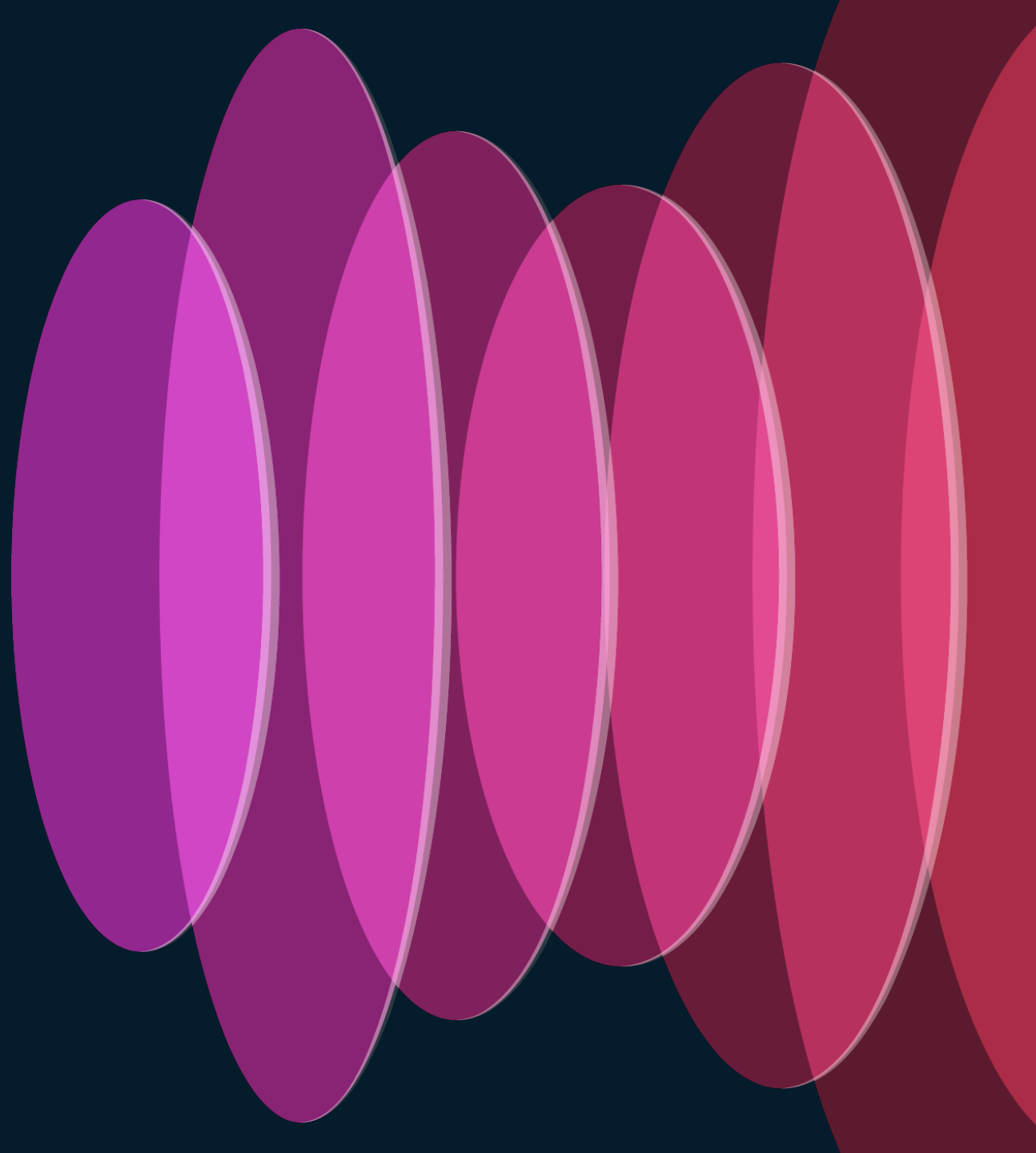
```
2024-05-01 06:06:35 Event Id: 00003453 Event Class: CPU usage
insights Source Id: 0x0102 Mod: 01
Cpu_Health : Normal
```

```
Leaf-2# show pie envmon mem-usage
```

```
2024-05-01 06:06:35 Event Id: 00003454 Event Class: MEM usage
insights Source Id: 0x0102 Mod: 01
Memory_Health : OK
```

- Shows overall CPU/memory status and top 10 talkers
- **Show pie env cpu-usage [detail]**
- **Show pie env mem-usage [detail]**

Summary



Summary

Tool #1: Ethalyzer – Captures packet going to and from CPU

Tool #2: SPAN-to-CPU – Captures Passthrough Traffic

Tool #3: ELAM – Captures 1 packet at a time

Tool #4: Consistency Checker – Checks consistency of various component

Tool #5: Show troubleshoot - Check hardware programming for I2 and I3 entries

Tool #6: iCAM - iCAM provides resource monitoring and analytic



The bridge to possible

Conclusion

In conclusion, NXOS is a feature rich OS with lots of inbuilt tools.

If you know how to use them, it will expand your tool and empower you in your troubleshooting.

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Question & Answer

Additional Reference Resources

ELAM

<https://www.cisco.com/c/en/us/support/docs/switches/nexus-9000-series-switches/213848-nexus-9000-cloud-scale-asic-tahoe-nx-o.html>

<https://www.youtube.com/watch?v=s0PSHN2Qxhc>

Ethalyzer

<https://www.cisco.com/c/en/us/support/docs/switches/nexus-7000-series-switches/116136-trouble-ethalyzer-nexus7000-00.html>

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Thank you

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