

Troubleshooting Cisco Catalyst 9000 Series Switches

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Agenda

- 01 Introduction**
- 02 Platform Troubleshooting**
- 03 Packet Drops**
- 04 Forwarding Verification**



PINK FLANNEL FLOWER

Introduction

Catalyst 9k family



	9200/9200L	9300/9300X	9400	9500/9500X	9600/9600X
Format	Stackable	Stackable	Chassis	Standalone	Chassis

All Catalyst 9000 series switches are based upon UADP and Silicon One ASICs and run IOS-XE.

Different feature sets and performance but same architecture



Catalyst IOS-XE Software release schedule

	17.12	17.14	17.15	17.16	17.17
Next planned release	17.12.6	None	17.15.4	None	None
End of Software Maintenance	March 2026	May 2025	-	Jan 2026	-
End of Vulnerability Security Support	Sept 2027	May 2025	-	Jan 2026	-
Extended Maintenance Release	Yes	No	Yes	No	No

Recommended releases:

<https://www.cisco.com/c/en/us/support/docs/switches/catalyst-9300-series-switches/214814-recommended-releases-for-catalyst-9200-9.html>

Software Maintenance Upgrade(SMU)

- SMU's provide patches on top of IOS-XE
- Hitless , No reload needed to apply on top of IOS-XE
- Reboot, Reload is performed to apply SMU

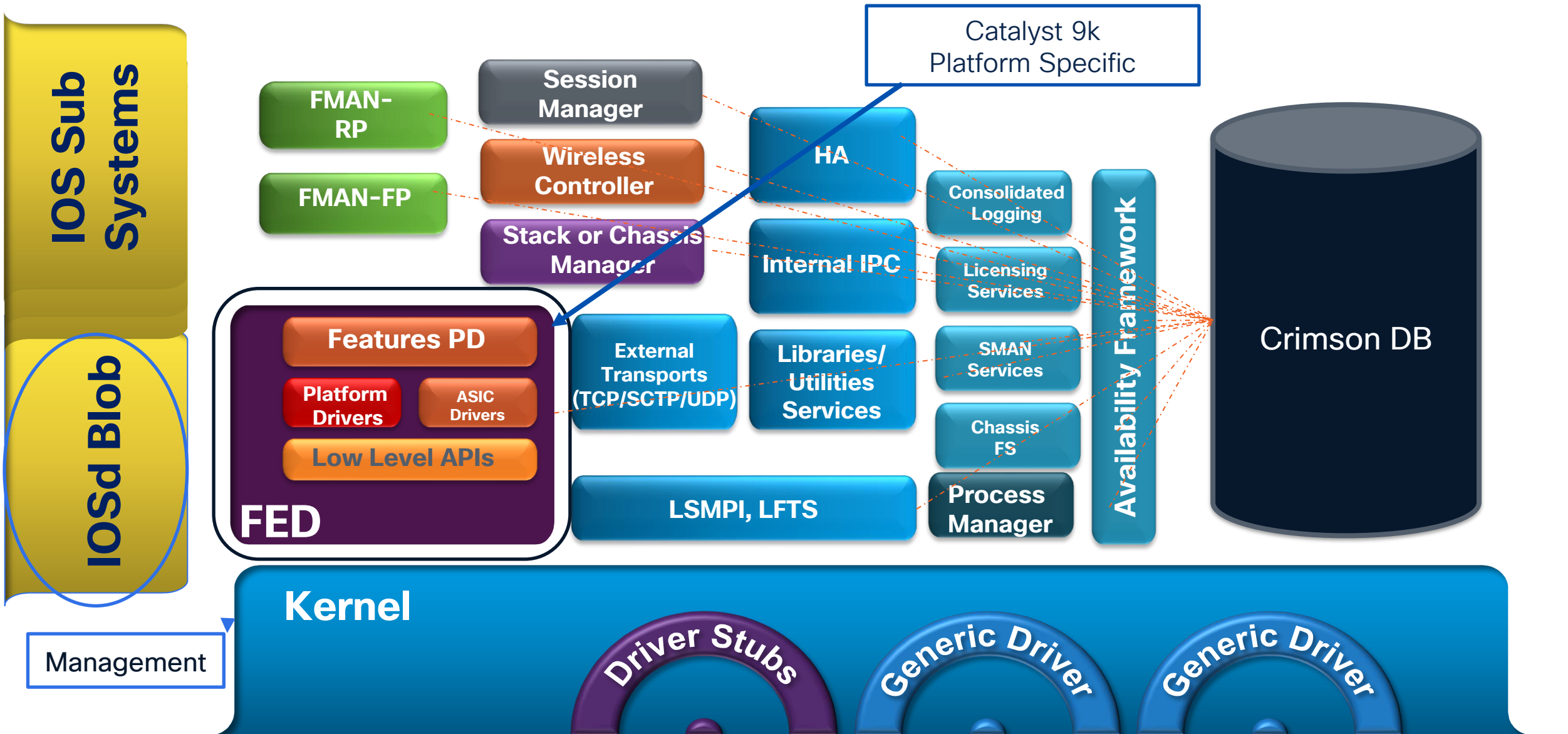
Select a Software Type

[IOS XE In-Service Software Upgrade \(ISSU\) Matrix](#)
[IOS XE Software](#)
[IOS XE Software AP Device Pack](#)
[IOS XE Software Maintenance Upgrade AP Service Pack \(SMU APSP\)](#)
[IOS XE Software Maintenance Upgrades \(SMU\)](#) ←
[IOS XE Wireless Controller Software Package](#)

- **Show install package flash:<file name> (reboot? Yes/No)**
- Catalyst 9200, All SMUs require a cold reload of the system during activation.
- Apply with the command:
Install add file <smu> activate commit
- Confirm with command:
show install summary
- Remove with:
install deactivate file <file>
- Do not remove .bin from smu from flash

File Information	Release Date	Size
Hitless/Recommended SMU, Cisco IOS Software and IOS XE Software PSIRT bundle cat9k_iosxe.17.09.06b.CSCwp21536.SPA.smu.bin Advisories 	27-Jun-2025	4.19 MB
Hitless/Recommended SMU, 9410 :Standby switch keeps rebooting continuously after reload cat9k_iosxe.17.09.06b.CSCwo65998.SPA.smu.bin Advisories 	22-Jun-2025	0.22 MB

IOS-XE graphical overview



Show and Debug Commands

- Many of the features run primarily on IOSd
- Those features provide the regular debugs and show commands

```
Switch#show ip route  
Switch#show cdp neig  
Switch#debug ip packet 101
```

- Note: **Debugs /show** commands shows IOSd's view of the system
Ex: **debug ip packet**, **shows ip pim**, **shows ip route**.
- Processes outside of IOSd do communicate with IOSd
Ex: **show access-session** retrieve access-session information from the Session Manager

IOS-XE Specific Show Commands

- Many processes outside IOSd are non-platform specific
Ex: Forwarding manager (fman) , WebUI (nginx), Wireless (wncd)
- Debug/show commands similar on all IOS-XE Devices

```
Switch#show platform software ip switch active R0 cef  
ASR_1k#show platform software ip rp active cef  
CSRv#show platform resources
```

- Specify location for command execution:
 - Active, Standby or switch number
 - RP/R0, Route Processor,
 - FP/F0 , Forwarding Processor

Catalyst 9k Platform Specific Show Commands

- FED (Forwarding Engine Driver) is the Catalyst 9000 platform specific layer
- Catalyst 9k platform specific commands :
show / set / debug platform hardware | software fed

```
9300#show platform software fed switch active ifm mappings
9300#show platform software fed switch 5 ifm mappings
9400#show platform software fed active ifm mappings
```

- A FED instance runs on every switch in a stack and every supervisor module
- FMAN-FP processes run on every switch in the stack.
- FMAN-RP process only on Active and Standby Supervisor/Switches

Debugging outside IOSd process

- To facilitate debugging/logging trace logs are available for all processes using always on tracing
- Tracing levels set with granularity (default notice). Always on tracing
- Common processes:
 - **fed**, forwarding engine driver
 - **fman**, forwarding manager process
 - **smd**, session manager
 - **wncd**, wireless process
- Processes do not run on just active switch/supervisor

```
Switch#set platform software trace smd switch active R0 dot1x-all verbose
Switch#show platform software trace level smd switch active R0 | inc dot1x
dot1x                                Notice
dot1x-all                          Verbose
dot1x-redun                         Notice
Switch#set platform software trace all notice ← set all back to default
```

Displaying trace logs

- Trace log files are stored in crashinfo:/logs in binary format.
- Analyzing traces: show logging process <process> [internal]
- Bundle creation of binary traces:
“request platform software trace archive”

```
Edge_1#show logging process smd | inc RADIUS
2022/06/06 23:24:03.268912 {smd_R0-0}{1}: [radius] [24732]: (info): RADIUS: Send Accounting-Request to
10.48.91.222:1813 id 1813/184, len 850
2022/06/06 23:24:03.268937 {smd_R0-0}{1}: [radius] [24732]: (info): RADIUS: authenticator e5 d1 b7 4d 8b e9 d5
06 - 14 b9 8d b6 8c 29 93 94
2022/06/06 23:24:03.268945 {smd_R0-0}{1}: [radius] [24732]: (info): RADIUS: Vendor, Cisco [26] 211
2022/06/06 23:24:03.268954 {smd_R0-0}{1}: [radius] [24732]: (info): RADIUS: Cisco
AVpair [1] 205 "cts-pac-opaque="
2022/06/06 23:24:03.268960 {smd_R0-0}{1}: [radius] [24732]: (info): RADIUS: Vendor, Cisco [26] 36
2022/06/06 23:24:03.268966 {smd_R0-0}{1}: [radius] [24732]: (info): RADIUS: Cisco
AVpair [1] 30 "dc-profile-name=Cisco-Device"
```

Radius Debugs for dot1x/mab are in
Session Manager trace

Platform Troubleshooting

Looking at the Kernel CPU information

- Kernel CPU utilization can be seen per switch/supervisor module

```
9300_54#show process cpu platform sorted location switch active R0
CPU utilization for five seconds: 12%, one minute: 9%, five minutes: 5%
Core 0: CPU utilization for five seconds: 14%, one minute: 10%, five minutes: 5%
Core 7: CPU utilization for five seconds: 14%, one minute: 10%, five minutes: 6%
  Pid      PPid      5Sec      1Min      5Min  Status      Size  Name
-----
 14854    13498      51%      38%      22%   S           951436  linux_iosd-imag
 15322    15160      42%      30%      15%   S           313236  fed main event
   2960         2       8%       5%       2%   R              0  lsmpi-xmit
   2961         2       5%       4%       2%   S              0  lsmpi-rx
```

- linux_iosd-image process as seen on kernel is IOSd process
- Lsmpi processes are part of Linux Shared Memory Punt Interface
- Every switch might run different processes.
- Changing the location will display cpu to check standby or members

IOSd CPU utilization

```
9300_54#show process cpu sort
```

```
CPU utilization for five seconds: 25%/1%; one minute: 22%; five minutes: 11%
```

PID	Runtime(ms)	Invoked	uSecs	5Sec	1Min	5Min	TTY	Process
40	9474304	54714487	173	22.95%	16.12%	8.15%	0	ARP Input
24	95502	12431773	7	0.07%	0.00%	0.00%	0	IPC Mcast Pendin
41	152951	13280277	11	0.07%	0.00%	0.00%	0	ARP Background
53	102409	12729984	8	0.07%	0.00%	0.00%	0	Dynamic ARP Insp
83	4759850	48620416	97	0.07%	0.03%	0.02%	0	IOSD ipc task
121	5602021	50896336	110	0.07%	0.04%	0.05%	0	Crimson config p
136	5112131	792052381	6	0.07%	0.03%	0.02%	0	L2 LISP Punt Pro

- Inside IOSd process many functions and processes run
Examples: BGP, RIP, CEF, ARP, UDLD, CDP, SSH, SNMP, Telnet
- CPU not involved in data plane forwarding
- Control Plane Policing(CoPP) enabled by default on cat9k to protect CPU
- CoPP parameters can be modified, use caution when doing

CPU utilization in IOSd

- CPU history gives an overview of CPU history for last minute, hour and day

```
9300_54#show processor cpu history
100
90
50  **      **      **      **      **      **      ***      ***
40  *#*     *#*     *#*     *#*     *#*     *#*     *#*     *#*
30  ##*     ##*     ##*     ##*     ##*     ##*     ##*     ##*
20  ##*     ##*     ##*     ##*     ##*     ##*     ##*     ##*
10  ###     ###     ###     ###     ###     ###     ###     ###
    0.....5.....1.....1.....2.....2.....3.....3.....4.....4.....5.....5.....6
      0      5      0      5      0      5      0      5      0      5      0
      CPU% per minute (last 60 minutes)
      * = maximum CPU%   # = average
```

- Pattern of Interval and length of CPU spikes can point to trigger.
- Average high CPU utilization cause more concern than short spikes

Catching CPU spikes in IOSd

- CPU spikes often occur when not actively watching the switch.
- IOS allows CPU monitoring:
process cpu threshold type total rising <%> interval <s> falling <%> interval <s>
- When threshold are exceeded syslog is generated
- Syslog can be used by Embedded Event Manager to automate collection of data during time of failure

```
%SYS-1-CPURISINGTHRESHOLD: Threshold: Total CPU Utilization(Total/Intr): 48%/15%, Top 3 processes (Pid/Util): 40/32%, 94/0%, 105/0%
```

```
9300_54#show proc cpu | inc 40 | 94 | 105 | PID
```

Top 3 processes,
ARP input is highest

PID	Runtime(ms)	Invoked	uSecs	5Sec	1Min	5Min	TTY	Process
40	19640520	69264320	283	22.48%	20.61%	10.14%	0	ARP Input
94	652410	6428606	101	0.07%	0.00%	0.00%	0	PuntInject Keepa
105	3477489	6127722	567	0.00%	0.02%	0.02%	0	Crimson flush tr

Determining Cause of Inband traffic

9300_54#show platform software fed switch active punt rates interfaces

Packets per second averaged over 10 seconds, 1 min and 5 mins

Active interfaces
sending to cpu

Interface Name	IF_ID	Recv 10s	Recv 1min	Recv 5min	Drop 10s	Drop 1min	Drop 5min
GigabitEthernet1/0/11	0x00000013	5999	1707	2074	0	0	0
Vlan192	0x00000036	5999	1707	2074	0	0	0

9300_54#show platform software fed switch active punt cpuq rates

Packets per second averaged over 10 seconds, 1 min and 5 mins

Per Queue Statistics

Q no	Queue Name	Rx 10s	Rx 1min	Rx 5min	Drop 10s	Drop 1min	Drop 5min
0	CPU_Q_DOT1X_AUTH	0	0	0	0	0	0
1	CPU_Q_L2_CONTROL	0	0	0	0	0	0
5	CPU_Q_FORUS_ADDR_RESOLUTION	6000	1874	2414	0	0	0

Queue
information

Drops typically seen on Port
Asic not in FED punt path

Using Embedded Packet Capture

- EPC provides packet capture on interface or control plane level
- Data capture in hardware, traffic copied to EPC process for capturing
- Packet capture rate limited to protect CPU , good for visibility, not for performance captures

```
9300_54#monitor capture CL interface GigabitEthernet 1/0/11 in
9300_54#monitor capture CL match any
9300_54#monitor capture CL start
9300_54#monitor capture CL stop
9300_54#monitor capture CL export location flash:cl.pcap
9300_54#show monitor capture file flash:cl.pcap display-filter arp
Starting the packet display ..... Press Ctrl + Shift + 6 to exit
 352  57.9  00:00:ca:fe:ca:fe  ff:ff:ff:ff:ff:ff  ARP 60 Who has 192.168.5.1? Tell 192.168.2.8
 353  57.9  00:00:ca:fe:ca:fe  ff:ff:ff:ff:ff:ff  ARP 60 Who has 192.168.5.2? Tell 192.168.2.8
 354  57.9  00:00:ca:fe:ca:fe  ff:ff:ff:ff:ff:ff  ARP 60 Who has 192.168.5.3? Tell 192.168.2.8
 355  57.9  00:00:ca:fe:ca:fe  ff:ff:ff:ff:ff:ff  ARP 60 Who has 192.168.5.4? Tell 192.168.2.8
 356  57.9  00:00:ca:fe:ca:fe  ff:ff:ff:ff:ff:ff  ARP 60 Who has 192.168.5.5? Tell 192.168.2.8
```

Where and what to capture

Export capture to file

Displays capture from flash or buffer

Determine packets hitting a specific CPU queue

- FED allows limited packet captures done in punt and inject path
- Allows filter to be setup to collect specific data.
- Use filter “fed.queue==<queue>” for collecting specific cpu queue
- Detail and brief packet display.

Detail contains internal forwarding meta data

```
9300_54#debug plat soft fed switch active punt packet-capture set-filter "fed.queue == 5"
9300_54#debug platform software fed switch active punt packet-capture [start|stop]
9300_54#show platform software fed switch active punt packet-capture brief
Punt packet capturing: disabled. Buffer wrapping: disabled
Total captured so far: 4096 packets. Capture capacity : 4096 packets
Capture filter : "fed.queue == 5"
----- Punt Packet Number: 3, Timestamp: 2023/05/31 13:14:45.888 -----
interface : physical: GigabitEthernet1/0/11[if-id: 0x00000013], pal: Vlan192 [if-id: 0x00000036]
metadata   : cause: 7 [ARP request or response], sub-cause: 1, q-no: 5, linktype: MCP_LINK_TYPE_IP
ether hdr  : dest mac: ffff.ffff.ffff, src mac: 0000.cafe.cafe
ether hdr  : ethertype: 0x0806 (ARP)
```

Metadata indicates
why it was punted

Configure FED CPU Packet Capture

<https://www.cisco.com/c/en/us/support/docs/ios-nx-os-software/ios-xe-gibraltar-16121/216746-configure-punt-inject-fed-packet-capture.html>

Control Plane Policing HW stats

- Control plane policing drops frames on port ASIC's to protect CPU
- Do not modify defaults without a clear understanding of the impact

9300_1#show platform hardware fed switch active qos queue stats internal cpu policer

CPU Queue Statistics

QId	PlcIdx	Queue Name	Enabled	(default) Rate	(set) Rate	Queue Drop (Bytes)	Queue Drop (Frame)
4	2	Routing Control	Yes	5400	5400	0	0
5	14	Forus Address resolution	Yes	4000	65000	2212622868	345698644

Control Plane policing drops

CPU Queue Policer Statistics

Policer Index	Policer Accept Bytes	Policer Accept Frames	Policer Drop Bytes	Policer Drop Frames
12	0	0	0	0
13	9562218	122704	453808601	7079824

Rate changed from Default rate

CPP Classes to queue map

PlcIdx	CPP Class	: Queues
0	system-cpp-police-data	: ICMP GEN/ BROADCAST/ ICMP Redirect/
14	system-cpp-police-forus	: Forus Address resolution/ Forus traffic/

Platform Memory

```
9600_SVL#show processes memory platform sorted location switch 1 R0
System memory: 15993924K total, 6935004K used, 9058920K free,
Lowest: 9025140K
```

Pid	Text	Data	Stack	Dynamic	RSS	Name
5373	256860	1488024	136	488	1488024	linux_iosd-imag
31175	203	885528	136	132984	885528	fed main event
26748	7236	295848	136	3808	295848	fman_rp
15847	8158	263112	136	4692	263112	fman_fp_image
27259	450	235088	136	4720	235088	dbm
28641	2583	228456	164	101856	228456	confd
30179	87	208392	136	7832	208392	pubd
25903	336	193308	136	388	193308	ndbmand
4272	790	177200	136	33732	177200	smand
18087	178	176024	136	13104	176024	sessmgrd

IOSd

FED

Forwarding
manager

SMD

- Kernel memory utilization is available per switch
- linux_iosd-image process is IOSd
- Resident Set Size(RSS), memory occupied by each Process

IOSd Memory

```
9600_SVL#show processes memory sorted holding
```

```
Processor Pool Total: 2959189564 Used: 687714160 Free: 2271475404
reserve P Pool Total: 102404 Used: 88 Free: 102316
lsmapi_io Pool Total: 6295128 Used: 6294296 Free: 832
```

PID	TTY	Allocated	Freed	Holding	Getbufs	Retbufs	Process
0	0	488208064	77059624	381785696	0	0	*Init*
238	0	137113496	1017784	136266568	0	0	IP ARP Adjacency
82	0	50195904	2966104	27577736	0	0	IOSD ipc task
565	0	720962728	696333696	24623088	0	0	DHCPD Receive
4	0	42371936	17822928	22358600	0	0	RF Slave Main Th

- IOSd runs as a process , but does still provides some kernel features like memory management for all processes running inside IOSd
- Processor Pool: Pool for Processes on IOSd
- lsmapi_io : Linux Shared Memory Punt Interface memory, IO buffers

IOSd Memory Allocator

```
9600_SVL#show processes memory 565
Tracekey : 1#01327ced3d92c0f78c7959f154fa0114
Process ID: 565
Process Name: DHCPD Receive
Total Memory Held: 24623088 bytes

Processor memory Holding = 24623088 bytes
size = 10549344, count = 321, pc = :5644D0D8C000+934D623
size = 10450752, count = 318, pc = :5644D0D8C000+548EF85
size = 1478880, count = 45, pc = :5644D0D8C000+861423D
size = 1032040, count = 120, pc = :5644D0D8C000+8615EB3
size = 985920, count = 30, pc = :5644D0D8C000+8608243
```

- Allocator PC indicator of what allocated memory
- Not all increased in memory are leaks, memory might get released again or functions might just need more memory
- Monitor over time and multiple boxes to determine possible pattern

Packet Drops

Checking interface status

Err-disabled => check
show interface status errdisable
or show log for cause

Vlan column shows routed(L3) ,
trunk or base vlan

Half Duplex 1Gb/s, possible
duplex mismatch?

```
9500_1#show interfaces status | ex notc
```

Port	Name	Status	Vlan	Duplex	Speed	Type
Twe1/0/7		connected	routed	a-full	a-1000	10/100/1000BaseTX SFP
Twe1/0/12		err-disabled	1	full	10G	SFP-10GBase-CU1M
Twe1/0/15		connected	routed	full	10G	SFP-10GBase-CU3M
Twe1/0/20		connected	4094	full	10G	SFP-10GBase-CU1M
Twe1/0/21		connected	routed	a-half	a-1000	10/100/1000BaseTX SFP
Twe1/0/22		disabled	1	auto	auto	10/100/1000BaseTX SFP
Hu1/0/26		connected	trunk	full	40G	QSFP 40G CU3M
Hu1/0/27		connected	4094	full	100G	QSFP 100G CU2M

Show interface status command gives a quick overview of interface status

Ethernet Statistics

```
Switch#show controllers ethernet-controller gi 5/0/48
```

```
Transmit                               GigabitEthernet5/0/48 Receive
1562496684 Total bytes                 2968958225 Total bytes
  5032561 Unicast frames                6004241 Unicast frames
700808558 Unicast bytes                1807110661 Unicast bytes
  1269484 Multicast frames              2789759 Multicast frames
861688062 Multicast bytes              1161847500 Multicast bytes
    1 Broadcast frames                  1 Broadcast frames
    0 Cos 0 Pause frames                0 Cos 0 Pause frames
1236978 Minimum size frames            871517 Minimum size frames
1892419 65 to 127 byte frames           2181611 65 to 127 byte frames
1941967 128 to 255 byte frames           2712229 128 to 255 byte frames
  685594 256 to 511 byte frames          1260418 256 to 511 byte frames
    20261 512 to 1023 byte frames        900135 512 to 1023 byte frames
    524827 1024 to 1518 byte frames      868091 1024 to 1518 byte frames
      0 8192 to 16383 byte frames         0 8192 to 16383 byte frames
      0 16384 to 32767 byte frame         0 16384 to 32767 byte frame
      0 > 32768 byte frames              0 > 32768 byte frames
      0 Late collision frames             0 SymbolErr frames
      0 Excess Defer frames              0 Collision fragments
      0 Good (1 coll) frames              0 ValidUnderSize frames
      0 Good (>1 coll) frames             0 InvalidOverSize frames
      0 Deferred frames                  0 ValidOverSize frames
```

```
LAST UPDATE 361 msec AGO
```

Ethernet controller statistics give more detailed port statistics

Frame size distribution

Error statistics

Verifying link utilization

Input/output rates show average over 5 minutes (default). Traffic might be bursty in nature

```
Switch#show interfaces | inc line|rate
```

```
Vlan1 is up, line protocol is up , Autostate Enabled
```

```
5 minute input rate 0 bits/sec, 0 packets/sec
```

```
5 minute output rate 0 bits/sec, 0 packets/sec
```

```
GigabitEthernet0/0 is administratively down, line protocol is down
```

```
5 minute input rate 0 bits/sec, 0 packets/sec
```

```
5 minute output rate 0 bits/sec, 0 packets/sec
```

```
GigabitEthernet1/0/11 is up, line protocol is up (connected)
```

```
30 seconds input rate 575000 bits/sec, 958 packets/sec
```

```
30 seconds output rate 126975000 bits/sec, 10473 packets/sec
```

```
GigabitEthernet1/0/12 is down, line protocol is down (notconnect)
```

```
5 minute input rate 0 bits/sec, 0 packets/sec
```

```
5 minute output rate 0 bits/sec, 0 packets/sec
```

```
GigabitEthernet1/0/13 is down, line protocol is down
```

```
5 minute input rate 0 bits/sec, 0 packets/sec
```

```
5 minute output rate 0 bits/sec, 0 packets/sec
```

```
Switch#show controllers utilization
```

Port	Receive Utilization	Transmit Utilization
Gi1/0/1	0	0
Gi1/0/11	0	92
.		
Gi1/0/24	0	0
Te1/1/1	0	0
Te1/1/4	9	0
Total Ports : 33		

```
Total Ports Receive Bandwidth Percentage Utilization : 0
Total Ports Transmit Bandwidth Percentage Utilization : 0
Average Switch Percentage Utilization : 0
```

load-interval has a range of 30-600 seconds

Bandwidth in %
Current load

Verifying QoS

Ingress class, marking
on protocol

Per class statistics

Egress, set dscp ,
priority queue and
police

```
Switch#show policy-map interface te 1/0/11 | sec VOICE
Class-map: DNA-MARKING_IN#VOICE (match-all)
  182156 packets
  Match: protocol attribute traffic-class voip-telephony
  Match: protocol attribute business-relevance business-relevant
  QoS Set
    dscp ef
Class-map: DNA-EZQOS_2P6Q3T_9K#VOICE-PQ1 (match-any)
  337900 packets
  Match: dscp ef (46)
  Priority: Strict,
  Priority Level: 1
  police:
    rate 10 %
    rate 10000000000 bps, burst 31250000 bytes
    conformed 437456190 bytes; actions:
      transmit
    exceeded 0 bytes; actions:
      drop
```

```
Switch#show platform hardware fed switch active qos dscp-cos counters interface te 1/0/11
```

	Frames	Bytes
Ingress DSCP0	13098	0
Ingress DSCP46	534087	0
Ingress COS0	679340	0
Ingress COS7	0	0
Egress DSCP0	1446	0
Egress DSCP46	337900	0
Egress COS0	6411995	0
Egress COS7	18400	0

Ingress counters

Egress counters

QoS Hardware configuration

9300_45#show platform hardware fed switch active qos queue config interface gi 1/0/11

Asic:0 Core:1 DATA Port:11 GPN:1 LinkSpeed:0x1

DTS			Hardmax			Softmax			PortSMin		GlblSMin		PortStEnd						
0	1	5	200	12	3200	5	500	0	0	6	9600								
1	1	4	0	13	4800	5	750	2	300	6	9600								
Priority			Shaped/shared			weight		shaping_step		sharpedWeight									
0		0	Shared			50		0		0									
1		0	Shared			75		0		0									
Port			Port			Port		Port		Port									
Priority			Shaped/shared			weight		shaping_step											
2			Shaped			254		255											
Weight0			Max_Th0			Min_Th0		Weigth1		Max_Th1		Min_Th1		Weight2		Max_Th2		Min_Th2	
0		0	2709			0		0		3028		0		0		3400		0	
1		0	3825			0		0		4275		0		0		4800		0	

Hardm
Softma

Queue
shape
Queue
Step

Drop t
queue

Hardmax : Reserved
Softmax : Global pool

Queue mode:
shaped or shared
Queue limit for shaping
Step/weight * speed

Drop thresholds for
queue/threshold
In Buffers (256 byte)

- **qos queue-softmax-multiplier <percentage>** allow all queue sizes to be increased. Use with caution

QoS hardware statistics

9300_45#show platform hardware fed switch active qos queue stats interface gigabitEthernet 1/0/11

AQM Global counters

GlobalHardLimit: 7976 | GlobalHardBufCount: 0

GlobalSoftLimit: 11872 | GlobalSoftBufCount: 0

High Watermark Soft Buffers:

429 <--- clear on read

Asic:0 Core:1 DATA Port:10 Hardware Enqueue Counters

Q	Buffers (Count)	Enqueue-TH0 (Bytes)	Enqueue-TH1 (Bytes)	Enqueue-TH2 (Bytes)	Qpolicer (Bytes)
0	200	0	385820	46085690	0
1	0	0	0	0	0

Asic:0 Core:1 DATA Port:0 Hardware Drop Counters

Q	Drop-TH0 (Bytes)	Drop-TH1 (Bytes)	Drop-TH2 (Bytes)	SBufDrop (Bytes)	QebDrop (Bytes)	QpolicerDrop (Bytes)
0	0	0	412312	0	0	0
1	0	0	0	0	0	0

Highest number of buffers in use by interface since last issuing command

Current buffer count per queue

- At Asic level there are 8 Queues/3 Thresholds
- Enqueue/Drop Counters available per queue/per threshold
- Buffers (count) show currently assigned buffers to Queue (256 bytes)
- To enable high water mark counter monitoring.
set platform hardware fed switch active qos port-monitor interface <if>

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BRKTRS-3090

Doppler ASIC packet forwarding drop counters

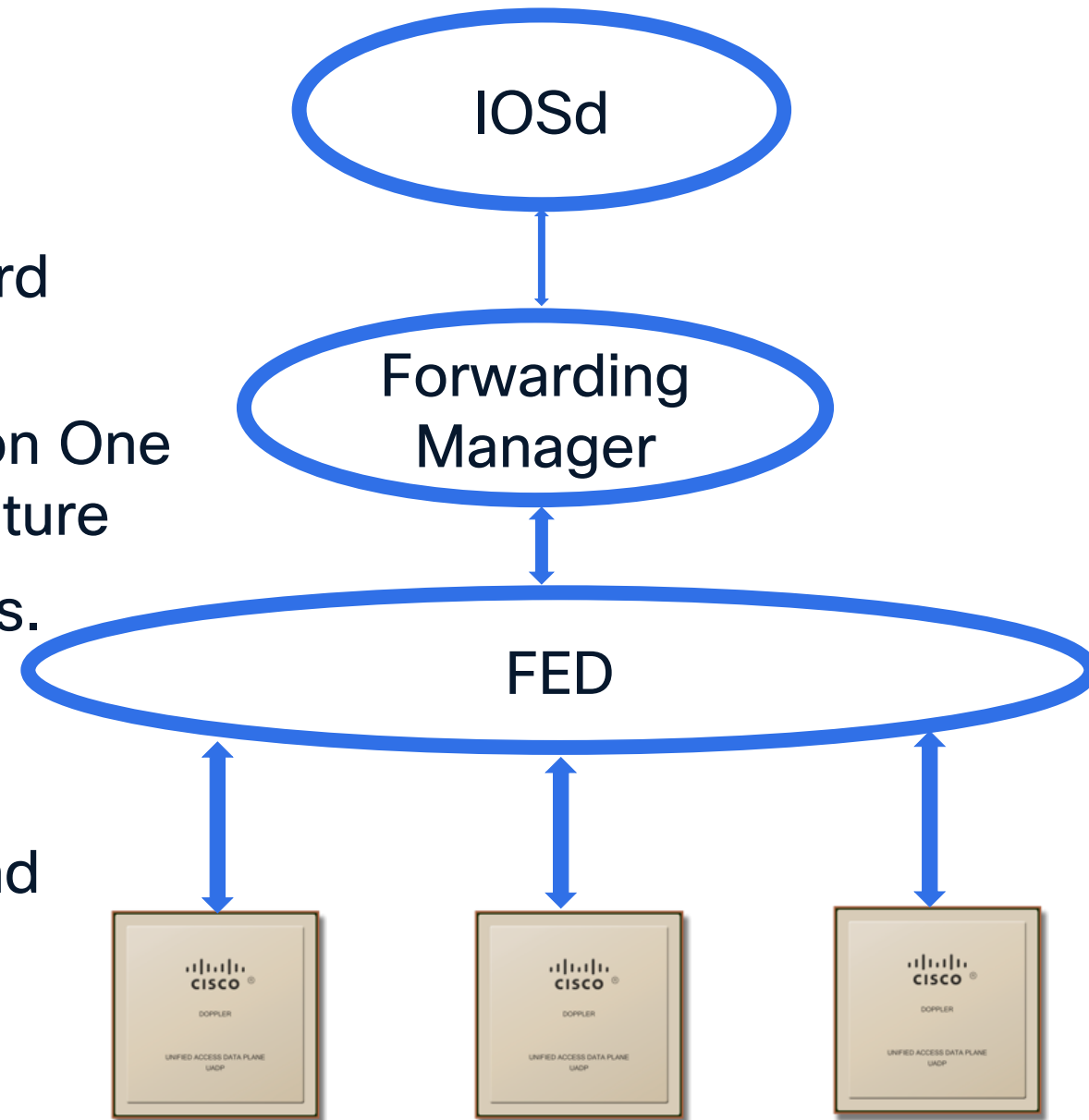
```
9300_45#show platform hardware fed switch active fwd-asic drops exceptions
****EXCEPTION STATS ASIC INSTANCE 0 (asic/core 0/0)****
=====
Asic/core |                NAME                |   prev   |   current   |   delta
=====
0  0  NO_EXCEPTION                        35364016   35364108     92
0  0  IPV4_CHECKSUM_ERROR                 0         0            0
0  0  ROUTED_AND_IP_OPTIONS_EXCEPTION      2         2            0
0  0  CTS_FILTERED_EXCEPTION              0         0            0
0  0  AUTH_DRIVEN_DROP                    0         0            0
0  0  PKT_DROP_COUNT                      0        3732        3732
0  0  ALLOW_DOT1Q_EXCEPTION_COUNT          0         0            0
0  0  ALLOW_PRIORITY_TAGGED_EXCEPTION_COUNT 0         0            0
0  0  IGR_EXCEPTION_L5_ERROR              0        363        363
0  0  IP_UNICAST_TTL_REACHED_ZERO         0         0            0
0  0  MISC_FATAL_ERROR                    0         0            0
```

- Every packet passing through Port Asic gets parsed by the port-asic's on both receive and transmit side
- Exception drops are counted per Asic, not per port.

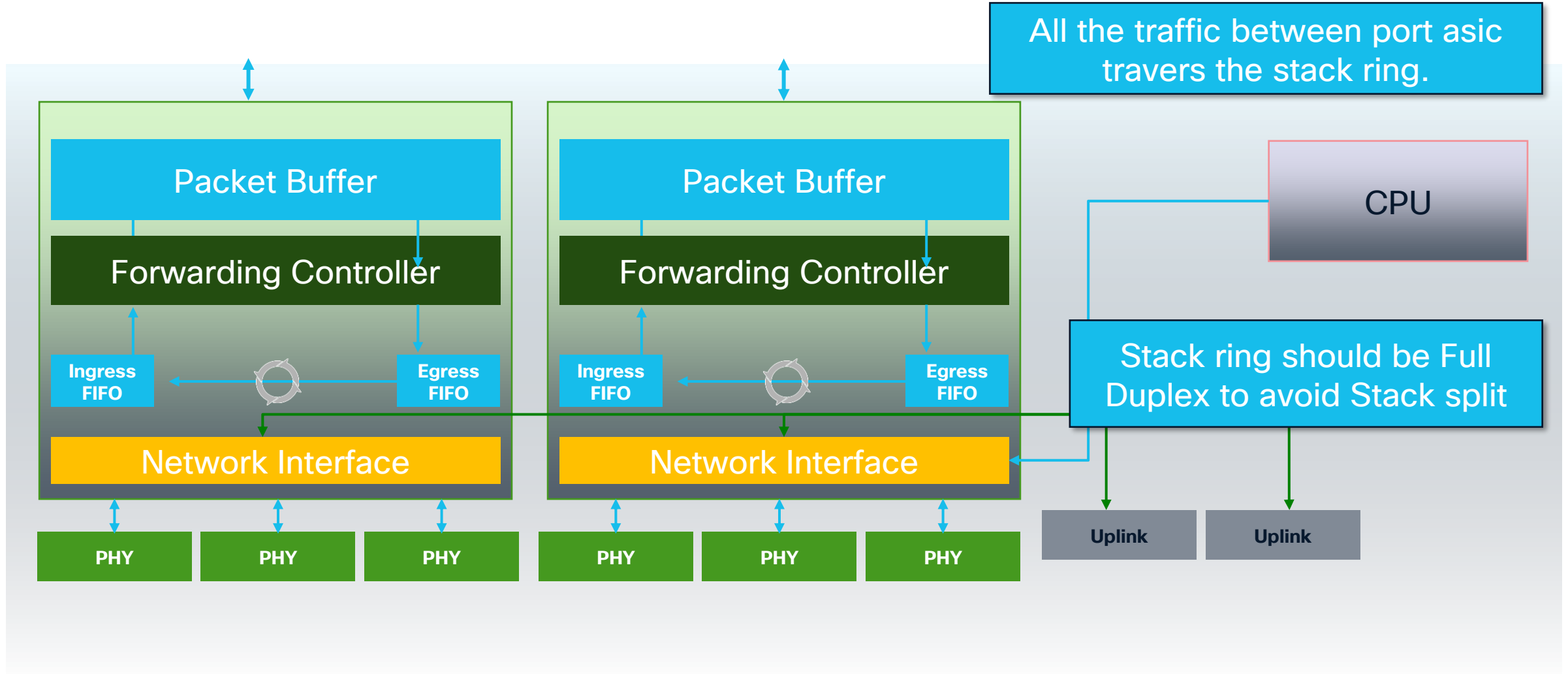
Forwarding Verification

Troubleshooting Forwarding

- Many layers are involved in forwarding
- Troubleshoot from top (IOSd) down toward the hardware layer
- 9500X and 9600 (Supervisor 2) use Silicon One
All other models based on UADP architecture
- Packet processing happens on port ASICs.
- CPU path only supports a limited packet forwarding.
- Understand HW architecture to understand Flow of the packet through the system



Catalyst 9200/9300 Stackable Switches



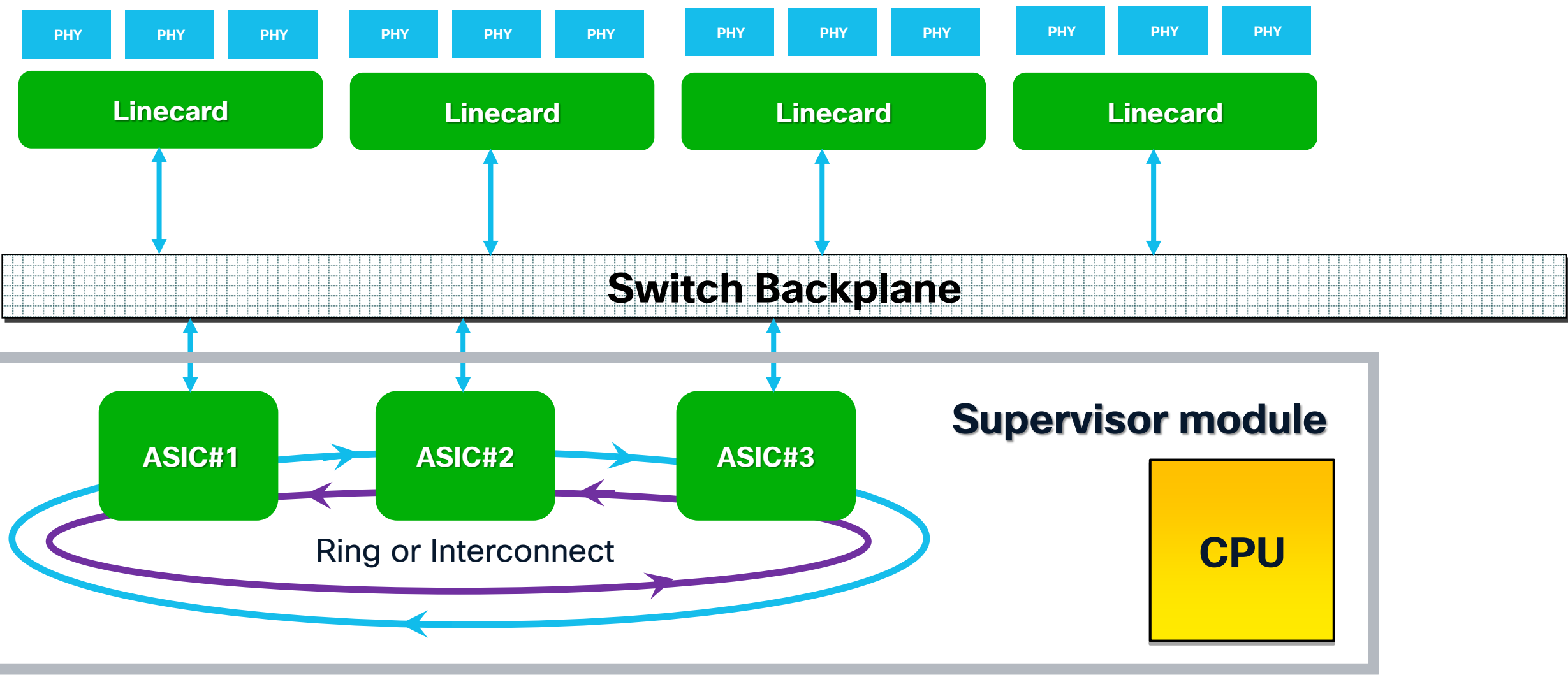
Switch Stacks

```
9300_10#show switch stack-ports summary
```

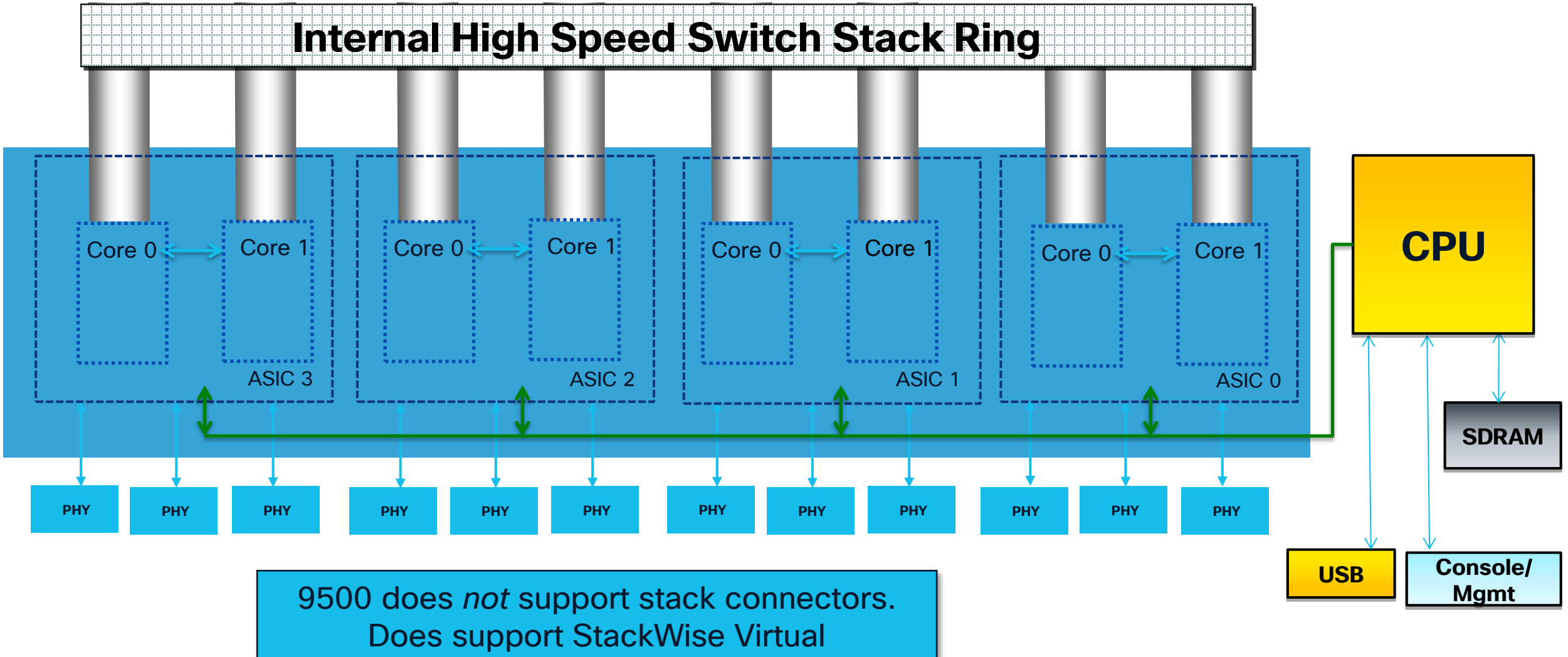
Sw#/Port#	Port Status	Neighbor/Port	Cable Length	Link OK	Link Active	Sync OK	#LinkOK	In Loopback
1/1	OK	4/2	100cm	Yes	Yes	Yes	1	No
1/2	OK	2/1	50cm	Yes	Yes	Yes	1	No
2/1	OK	1/2	50cm	Yes	Yes	Yes	2	No
2/2	OK	3/1	50cm	Yes	Yes	Yes	1	No
3/1	OK	2/2	50cm	Yes	Yes	Yes	1	No
3/2	OK	4/1	50cm	Yes	Yes	Yes	2	No
4/1	OK	3/2	50cm	Yes	Yes	Yes	1	No
4/2	OK	1/1	100cm	Yes	Yes	Yes	2	No

- Ensure all stack ports are connected and Link Ok to ensure stack is running with redundancy and full bandwidth
- High Number of #LinkOK or inability to read cable length might indicate bad cable/stack ports
- **Show tech-support stack** to gather detailed information

Catalyst 9400/9600 Chassis based



Catalyst 9500 Fixed Switches



Interface Internal Mappings

Interface to ASIC mapping important to understand data flows

```
9300_1#show platform software fed switch active ifm mappings
```

Interface	IF_ID	Inst	Asic	Core	Port	SubPort	Mac	Cntx	LPN	GPN	Type	Active
GigabitEthernet1/0/1	0x8	1	0	1	0	0	26	6	1	1	NIF	Y
GigabitEthernet1/0/2	0x4c	1	0	1	1	0	6	7	2	2	NIF	Y
GigabitEthernet1/0/3	0x4d	1	0	1	2	0	28	8	3	3	NIF	Y

Internally used interface addressing:

- LPN : Local Port Number
- GPN : Global Port Number
- IF_ID : Interface Identification, used for many fed CLI
- Type : Type of interface, NIF = Network Interface
- Inst : Instance : ASIC + Core
- Port : Asic Ports
- Active : Is Interface Active

Troubleshoot between ports on same ASIC when possible

IFM Mappings logical interface

```
9600_SVL#show platform software fed switch active ifm interfaces vlan
Interface                IF_ID                State
-----
Vlan1                    0x0005ffff          READY
Vlan123                  0x00420012          READY
Vlan900                  0x00420010          READY
9600_SVL#show platform software fed switch active ifm interfaces svi
Interface                IF_ID                State
-----
Vlan123                  0x0000013b          READY
9600_SVL#show platform software fed switch active ifm interfaces tunnel
Interface                IF_ID                State
-----
Tunnel1                  0x00000143          READY
```

- An unique IF_ID is assigned to every logical and physical.
- Every type of interface has its unique IF_ID.
Ex: Layer 2 Vlan has a different IF_ID as the Layer 3 SVI

IF_ID more detail

```
• 9600_SVL#show platform software fed switch active ifm if-id 0x138
Interface IF_ID      : 0x00000000000000138
Interface Name       : FortyGigabitEthernet2/1/0/1
Interface Block Pointer : 0x7f33b89fd918
Interface Block State  : READY
Interface State       : Enabled
Interface Status      : ADD, UPD
Interface Type        : ETHER
Port Type             : ROUTE PORT
Port Location         : LOCAL
Slot                  : 15
Unit                  : 0
Slot Unit             : 1
SNMP IF Index         : 148
GPN                   : 577
Port Handle           : 0xb7000104
IPv4 MTU              : 9100
IPv6 MTU              : 0
IPv4 VRF ID           : 0x0
IPv6 VRF ID           : 0x0
Protocol flags        : 0x0007 [ ipv4 ipv6 pim_ipv4 ]
```

Specifying the IF-ID gives
verbose information

Information available varies
depending on Interface Type

One VRF ID per VRF, VRF ID
0 is Global Routing Table

Layer 2 Forwarding. Verifying HW STP state

```
9300_54#show platform hardware fed switch active vlan 192 egress
VLAN STP State in hardware
vlan id is:: 192
Interfaces in forwarding state: : Gi1/0/11 (Untagged) , Te1/1/1 (Untagged) , Te1/1/4 (Tagged)
9300_54#show platform hardware fed switch active vlan 192 ingress
VLAN STP State in hardware
vlan id is:: 192
Interfaces in forwarding state: : Gi1/0/11 (Untagged) , Te1/1/1 (Untagged) , Te1/1/4 (Tagged)
flood list: : Gi1/0/11, Te1/1/1, Te1/1/4
```

- Show spanning tree gives IOSd view of Spanning Tree
- Hardware forwarding states can be checked *per switch* on FED layer
- Outputs will show what interface are in forwarding state and if traffic is tagged or untagged
- Flood list indicates what Ports will receive flooded traffic on this switch

Layer 2 Forwarding, IOSd mac address tables

```
9300_54#show mac address vlan 192
      Mac Address Table
Vlan  Mac Address      Type      Ports
----  -
192    0000.cafe.cafe      DYNAMIC   Gi1/0/11
192    0013.c3c1.0d89      DYNAMIC   Gi1/0/11
192    0050.5693.5e70      DYNAMIC   Te1/1/4
192    a0f8.4910.2dd3      STATIC    Vl192
192    d0ec.35c9.d353      DYNAMIC   Te2/1/1
Total Mac Addresses for this criterion: 5
```

- **Show mac address-table** command shows overview of All mac addresses That includes Mac Addresses owned by the switch
- IOSd shows global view in the system.
FED on each stack member maintains its own Mac Address Table

FED MATM Mac Address Table

9300_1#show platform software fed switch 1 matm macTable vlan 100

VLAN	MAC	Type	Seq#	EC_Bi	Flags	machandle	siHandle	diHandle	*a_time	*e_time	ports
192	0000.cafe.cafe	0x1	71718	0	0	0x7f2348	0x7f2198	0x7f2478	300	112	GigabitEthernet1/0/11
192	d0ec.35c9.d353	0x101	71719	0	0	0x7f2328	0x7f2148	0x7f2588	300	14	TenGigabitEthernet2/1/1
192	0013.c3c1.0d89	0x1	71720	0	0	0x7f23d8	0x7f2378	0x7f4278	300	11	GigabitEthernet1/0/11
192	a0f8.4910.2dd3	0x8002	0	0	64	0x7f2308	0x7f21c8	0x5234	0	0	Vlan192
192	0050.5693.5e70	0x1	12772	0	0	0x7f23d8	0x7f2358	0x7f23e8	300	13	TenGigabitEthernet1/1/4

*a_time=aging_time(secs) *e_time=total_elapsed_time(secs)

Type:

MAT_DYNAMIC_ADDR 0x1 MAT_STATIC_ADDR 0x2 MAT_CPU_ADDR 0x4 MAT_DISCARD_ADDR 0x8

MAT_ALL_VLANS 0x10 MAT_NO_FORWARD 0x20 MAT_IPMULT_ADDR 0x40 MAT_RESYNC 0x80

MAT_DO_NOT_AGE 0x100 MAT_SECURE_ADDR 0x200 MAT_NO_PORT 0x400 MAT_DROP_ADDR 0x800

MAT_DUP_ADDR 0x1000 MAT_NULL_DESTINATION 0x2000 MAT_DOT1X_ADDR 0x4000 MAT_ROUTER_ADDR 0x8000

MAT_WIRELESS_ADDR 0x10000 MAT_SECURE_CFG_ADDR 0x20000 MAT_OPQ_DATA_PRESENT 0x40000 MAT_WIRED_TUNNEL_ADDR 0x80000

MAT_DLR_ADDR 0x100000 MAT_MRP_ADDR 0x200000 MAT_MSRRP_ADDR 0x400000 MAT_LISP_LOCAL_ADDR 0x800000

MAT_LISP_REMOTE_ADDR 0x1000000 MAT_VPLS_ADDR 0x2000000

- Type Field indicates the type of MAC address using a bitmap.
- Sequence number of an entry changing would indicate relearning
- FED maintains its own MAC address table.
- MAT_DO_NOT_AGE bit set in type for non owning FED instances

Layer 3 Forwarding. Routing protocols

```
9300_20#show ip route 10.48.13.0
Routing entry for 10.48.13.0/24
  Known via "isis", distance 115, metric 30, type level-2
  Redistributing via isis
  Last update from 172.18.255.9 on TenGigabitEthernet1/0/47, 00:40:35 ago
  Routing Descriptor Blocks:
  * 172.18.255.9, from 172.31.254.18, 00:40:35 ago, via TenGigabitEthernet1/0/47
    Route metric is 30, traffic share count is 1

9300_20#show ip arp 172.18.255.9
Protocol    Address            Age (min)  Hardware Addr   Type   Interface
Internet    172.18.255.9       41         0072.78f8.aed6   ARPA   TenGigabitEthernet1/0/47
```

- Verify routing table and next hop information with known correct path
- Confirm the route shown is covered by the correct subnet and learned by the expected routing protocol.

Cisco Express Forwarding

```
9300_20#show ip cef 10.48.13.0 internal
10.48.13.0/24, epoch 4, RIB[I], refcnt 6, per-destination sharing
sources: RIB
feature space:
  IPRM: 0x00028000
  Broker: linked, distributed at 4th priority
ifnums:
  TenGigabitEthernet1/0/47(144): 172.18.255.9
path list 70C9760F41F0, 327 locks, per-destination, flags 0x4D [shble, hvsh, rif, hwc]
  path 70C978450268, share 1/1, type attached nexthop, for IPv4
    nexthop 172.18.255.9 TenGigabitEthernet1/0/47, IP adj out of TenGigabitEthernet1/0/47, addr
172.18.255.9 70C9761536E8
output chain:
  IP adj out of TenGigabitEthernet1/0/47, addr 172.18.255.9 70C9761536E8
```

- CEF shows the Forwarding Information Base showing how traffic will be forwarded through the system.
- Sources show where the route is learned from. RIB(Routing Information Base)
- Use Detail or Internal keywords to get even more detail

Cisco Express Forwarding

```
9300_20#show adjacency 172.18.255.9 detail
Protocol Interface Address
IP TenGigabitEthernet1/0/47 172.18.255.9 (174)
0 packets, 0 bytes
sourced in sev-epoch 9
Encap length 14
007278F8AED6007278F813550800
L2 destination address byte offset 0
L2 destination address byte length 6
Link-type after encap: ip
ARP

9300_20#show ip arp TenGigabitEthernet 1/0/47
Protocol Address Age (min) Hardware Addr Type Interface
Internet 172.18.255.10 - 0072.78f8.1355 ARPA TenGigabitEthernet1/0/47
Internet 172.18.255.9 221 0072.78f8.aed6 ARPA TenGigabitEthernet1/0/47
```

- CEF adjacency displays next hop information.
- Layer 2 rewrite information displayed to verify Destination and Source Mac Address of rewritten packet

Forwarding Manager (FP/RP)

```
9300_20#show platform software ip switch active f0 cef prefix 10.48.13.0/24 detail
Forwarding Table
10.48.13.0/24 -> OBJ_ADJACENCY (0x4a), urpf: 81
Prefix Flags: unknown
aom id: 11562925, HW handle: (nil) (created)

9300_20#show platform software object-manager switch active f0 object 11562925
Object identifier: 11562925
Description: PREFIX 10.48.13.0/24 (Table id 0)
Obj type id: 71
Obj type: route-pfx
Status: Done, Epoch: 0, Client data: 0x452c6ae8
```

- Forwarding Manager should show the prefix on both Standby/Active RP and on all FP (stack members or supervisor modules)
- aom id shown with FP can be used to display prefix in object manager

Forwarding Manager (FP/RP)

```
9300_20#show platform software adjacency switch active f0 index 0x4a
Adjacency id: 0x4a (74)
  Interface: TenGigabitEthernet1/0/47, IF index: 144, Link Type: MCP_LINK_IP
  Encap: 0:72:78:f8:ae:d6:0:72:78:f8:13:55:8:0
  Encap Length: 14, Encap Type: MCP_ET_ARPA, MTU: 9100
  Flags: no-l3-inject
  Nexthop addr: 172.18.255.9
  IP FRR MCP_ADJ_IPFRR_NONE 0
  aom id: 8386846, HW handle: (nil) (created)
```

- Forwarding Manager should show the prefix on both Standby/Active RP and on all FP (stack members or supervisor modules)
- AOM id shown with FP can be used to display prefix in object manager

Forwarding Manager (FP/RP)

```
9300_20#show platform software object-manager switch active f0 object 8386846
Object identifier: 8386846
  Description: adj 0x4a, Flags None
  Obj type id: 40
  Obj type: adj
  Status: Done, Epoch: 0, Client data: 0x4546afd8
9300_20#show plat soft object-manager switch active f0 object 8386846 downlinks
Object identifier: 987
  Description: PREFIX 0.0.0.0/0 (Table id 0)
  Status: Done
Object identifier: 11562925
  Description: PREFIX 10.48.13.0/24 (Table id 0)
  Status: Done
..
```

- By using downlinks, parents and children keyword the hierarchy in object manager can be explored for related objects

Error Objects

```
9600X_50#show platform software object-manager switch active f0 statistics
Forwarding Manager Asynchronous Object Manager Statistics
Object update: Pending-issue: 2, Pending-acknowledgement: 0
Batch begin:   Pending-issue: 0, Pending-acknowledgement: 0
Batch end:     Pending-issue: 0, Pending-acknowledgement: 0
Command:       Pending-acknowledgement: 0
Total-objects: 1897
Stale-objects: 0
Resolve-objects: 0
Childless-delete-objects: 0
Backplane-objects: 0
Error-objects: 9
Number of bundles: 0
Paused-types: 0
```

- Error object that do not get cleared could suggest forwarding issues
- Lookup objects to verify relationship to potential issues

Error Objects

```
9600X_50#show platform software object-manager switch active f0 error-object
Object identifier: 650830
  Description: LB 0x10000417
  Status: Modify/delete-failed
9600X_50#show platform software object-manager switch active f0 object 650830
Object identifier: 650830
  Description: LB 0x10000417
  Obj type id: 60
  Obj type: loadbalance
  Status: Modify/delete-failed, Epoch: 0, Client data: 0xad0635e8
```

- Use keyword error-object, pending-* to see object id's
- Check objects in error to confirm their detail and possible impact

FED Routing tables

```
9300_20#show platform software fed switch active ip route 10.48.13.0/24 detail
vrf      dest                htm                flags      SGT      DGID Last-modified                SecsSinceHit
---      ----                ---                -----      ---      ----  -
0        10.48.13.0/24            0x78bcb94983a8 0x0         0        0      2025/02/04 20:36:50.190          3
FIB: prefix_hdl:0x2600007a, mpls_ecr_prefix_hdl:0, sgtOverWrite: 0
===== OCE chain =====
ADJ:objid:74 {link_type:IP ifnum:0x90, adj:0x62000050, si: 0x78bcb9199178 IPv4: 172.18.255.9 }
[Output omitted]
Station Index (SI) [0xc3]
RI = 0x1f
DI = 0x53a8
Replication Bitmap: LD
Destination index   = 0x53a8
pmap                = 0x00000000 0x400000000000
pmap_intf : [TenGigabitEthernet1/0/47]
..
```

- FED layer output dependant on platform used (S1 vs Doppler)
- Replication Bitmap (per Asic/Core) shows if traffic is Local, Remote or to other Core on forwarding asic.
- Bits in pmap are set for interfaces that will receive traffic

FED Adjacency table

```
9300_20#show platform software fed switch 1 ip adj 172.18.255.9 detail
IPV4 Adj entries
dest          if_name          dst_mac          si_hdl   ri_hdl   adj_id Last-modified
172.18.255.9  TenGiga1/0/47  0072.78f8.aed6   0x78178 0x78158 0x4a   2024/12/31 16:31:09
Asic          SI-Index          DI-Index
----          -
0             195              0x53a8
Destination index = 0x53a8
pmap           = 0x00000000 0x4000000000000000
pmap_intf : [TenGigabitEthernet1/0/47]
Rewrite info:
  ASIC#:0 RI:31 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1)
Mapped_rii:L3_UNICAST_IPV4(9)
  MAC Addr: MAC Addr: 00:72:78:f8:ae:d6, L3IF LE Index 38
```

- FED Adjacency tables show detail regarding how to possibly packet will be rewritten
- Rewrite happens on Egress

FED Tables, Silicon One

```
9600X_50#show platform software fed switch active ip route 10.48.13.0/24
IPV4ROUTE_ID:id:0x5dd182def298 nobj:(IPNEXTHOP_ID,0x1000001d) 10.48.13.0/24 tblid:0 DA:0
  NPD: device:0 lsparec:0 api_type:route(3)
  SDK: is_host:0 l3_dest:0x7b8bedf76590 l3_dest:la_l3_fec_impl_base(oid=2851) vrf(gid/oid):0/0x267
  ADJ:objid:0x1000001d (IPv4: 172.31.250.218) nh_type:NHADJ_NORMAL iif_id:0x4bc ether_type:0x8
#child:105
  srcmac:a453.0e46.22c5 dstmac:4ce1.75eb.0e82
  NPD: fec_oid:2851 was_nor_nh:1 cr_def:0 stale:0 l3port_valid:1
  NPD: device:0 nh_gid/oid:10/0xb1a old_gid/oid:0/0x0 parent_oid:2711
  SDK: cla_nhtype:0
9600X_50#show platform software fed switch active ip adj 172.31.250.218
Number of IPv4 Adjacency entries: 13
Adjacency ID      Adjacency IPAddress      Dest MacAddr      Nexthop Type      Interface
0x1000001d        172.31.250.218          4ce1.75eb.0e82    NORMAL            HundredGigE1/0/16
```

- Silicon One outputs differ from Doppler based platform on FED layer but can provide similar outputs
- Note : Not all FED commands work on both Doppler and S1.

TCAM route utilization

```
9300_20#show platform software fed switch active ip route summary
```

```
Total number of v4 fib entries = 11348
```

```
Total number succeeded in hardware = 8186
```

```
Mask-Len 0 :- Total-count 1 hw-installed count 1
```

```
Mask-Len 4 :- Total-count 1 hw-installed count 1
```

```
Mask-Len 8 :- Total-count 2 hw-installed count 2
```

```
Mask-Len 24 :- Total-count 10002 hw-installed count 8171
```

```
Mask-Len 30 :- Total-count 1331 hw-installed count 0
```

```
Mask-Len 32 :- Total-count 11 hw-installed count 11
```

- Hardware installed count should match Total-Count
- Routes not installed into Hardware are mostly due to resource issues
- TCAM's use regions to program hardware.

Verifying TCAM Utilization

```
9300_20#show platform hardware fed switch active fwd-asic resource tcam utilization
```

```
Codes: EM - Exact_Match, I - Input, O - Output, IO - Input & Output, NA - Not Applicable
```

```
CAM Utilization for ASIC [0]
```

Table	Subtype	Dir	Max	Used	%Used	V4	V6	MPLS	Other
Mac Address Table	EM	I	32768	97	0.30%	0	0	0	97
Mac Address Table	TCAM	I	1024	21	2.05%	0	0	0	21
L3 Multicast	EM	I	8192	0	0.00%	0	0	0	0
L3 Multicast	TCAM	I	512	9	1.76%	3	6	0	0
L2 Multicast	EM	I	8192	0	0.00%	0	0	0	0
L2 Multicast	TCAM	I	512	11	2.15%	3	8	0	0
IP Route Table	EM	I	24576	12	0.05%	11	0	1	0
IP Route Table	TCAM	I	8192	8190	99.98%	8177	10	2	1
QOS ACL	TCAM	IO	5120	181	3.54%	52	86	0	43
Security ACL	TCAM	IO	5120	129	2.52%	26	58	0	45
Netflow ACL	TCAM	I	256	42	16.41%	20	20	0	2

- TCAM Full situation can lead to performance issues
- Choose suitable SDM template to optimize TCAM allocation
- TCAM utilization can vary per ASIC
- Check syslog for error messages

Verifying Hardware Forwarding

- Catalyst 9000 based switches allow packets to be sent through the system to verify hardware forwarding.
- **Show Platform Hardware fed switch <id> forward** command.
allows building a packet from the CLI through pcap to verify hardware forwarding
- Using “exact-route” provides a faster response with less detail
- Use packet information as it arrives on the interface to determine where and if it will be forwarded through the system.
- Using the “show platform” command see the last packet's forwarding result:
Show Platform Hardware fed switch <id> forward last summary|detail

Verifying Hardware Forwarding

```
9300_20#show platform hardware fed switch 1 forward exact-route interface te 1/0/1 0072.78f8.aed1 0072.78f8.1354 ipv4 10.48.91.151 10.48.13.151 tcp 10001 23 0
```

Ingress Packet Details:

```
ether hdr : dest mac: 0072.78f8.1354, src mac: 0072.78f8.aed1
ether hdr : ethertype: 0x0800 (IPv4)
ipv4  hdr : dest ip: 10.48.13.151, src ip: 10.48.91.151
ipv4  hdr : packet len: 40, ttl: 64, protocol: 6 (TCP)
tcp   hdr : dest port: 23, src port: 10001
```

Ingress packet

Ingress Packet Hexdump (first 128 bytes):

```
007278F813550072 78F8AED608004500 0028000100004006 FD410A305B970A30
..
```

Egress Interface: **TenGigabitEthernet1/0/47**

Egress Packet Details:

```
ether hdr : dest mac: 0072.78f8.aed6, src mac: 0072.78f8.1355
ether hdr : ethertype: 0x0800 (IPv4)
ipv4  hdr : dest ip: 10.48.13.151, src ip: 10.48.91.151
ipv4  hdr : packet len: 40, ttl: 63, protocol: 6 (TCP)
tcp   hdr : dest port: 23, src port: 10001
```

Egress packet

Egress Packet Hexdump (first 128 bytes):

```
007278F8AED60072 78F8135508004500 0028000100003F06 FE410A305B970A30
...
```

Meraki Dashboard – Show Commands

Global Overview

Organization
DE - CX Calo Lab

Network
800801 - New School
Pattern-2

Network-wide

Assurance

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800801-MBL-ESW03

C9300L-48P-4X 50:00:e0:3f:04:00

Set a location for this switch

Add an address below and check Move marker to update its location

ADDRESS

LAN IP
10.200.33.4 (statically assigned)

VLAN
111

PUBLIC IP
64.104.249.2

GATEWAY
10.200.33.1

DNS
64.104.200.248
8.8.8.8

LAN IPV6
VIA AUTOCONF
fdcc:95a:ea79:fb2c:5200:e0ff:fe3f:400

VLAN
...

Summary Ports Power L3 routing Event log Location Tools 1

Ping

Source interface: 10.200.33.4

IP or domain name

Ping or Ping switch

Terminal

Opens a troubleshooting console to this device, similar to an IOS-XE CLI window.

Close Terminal

Detach

Detach (full)

This terminal allows limited access to read-only IOS-XE commands, such as `show`.

800801-MBL-ESW03#show platform hardware fed switch active fwd-asic drop exceptions

****EXCEPTION STATS ASIC INSTANCE 0 (asic/core 0/0)****

Asic/core	NAME	prev	current	delta
0 0	NO_EXCEPTION	0	4039063516	4039063516
0 0	IPV4_CHECKSUM_ERROR	0	0	0
0 0	ROUTED_AND_IP_OPTIONS_EXCEPTION	0	125401061	125401061
0 0	CTS_FILTERED_EXCEPTION	0	0	0
0 0	SIA_TTL_ZERO	0	0	0
0 0	ALLOW_NATIVE_EXCEPTION_COUNT	0	7158	7158
0 0	ALLOW_DOT1Q_EXCEPTION_COUNT	0	28103384899	28103384899
0 0	ALLOW_PRIORITY_TAGGED_EXCEPTION_COUNT	0	0	0
0 0	ALLOW_UNKNOWN_ETHER_TYPE_EXCEPTION	0	0	0
0 0	IP_SOURCE_GUARD_VIOLATION	0	0	0
0 0	SECURE_L3IF_LEARNING_VIOLATION	0	0	0

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