

Validate Layer 2 Hardware on Catalyst 9000 Series Switches

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Introduction

This document describes how to validate Layer 2 hardware programming and forwarding on Catalyst 9400 Series switches.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on the Catalyst 9400 (UADP 2.0) series switch.

Note: The software version used in this document is 16.6.1, but this should remain applicable for later versions of Cisco IOS-XE.

Note: You can use this document for other types of Catalyst 9000 switches, but ignore any command that references a line card.

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

Background Information

- The Catalyst 9400 Supervisor1 (C9400-SUP-1) has 3 UADP 2.0 forwarding ASICs (0, 1, 2).
- Each UADP 2.0 forwarding ASIC has: A dual Core (0, 1) - this did not exist in previous generations of UADP 2.0 ASICs. SIFs (Stack Interfaces) - used to connect to the other 2 UADP 2.0 ASICs via an internal stack ring. NIFs (Network Interfaces) - used to connect to 1 or more Line cards via the backplane.
- All packet forwarding decisions for the Line cards and the Supervisor uplink interfaces are made by the 3 UADP 2.0 forwarding ASICs on the active Supervisor.
- The Line cards used in this example have 1 Line card single core stub ASIC which is not involved in packet forwarding decisions.
- The Line card stub ASIC on the Line card connects to 1 or more of the 3 UADP 2.0 forwarding ASICs on the Supervisor via the backplane.
- The 3 UADP 2.0 forwarding ASICs on the Supervisor make all packet forwarding decisions.

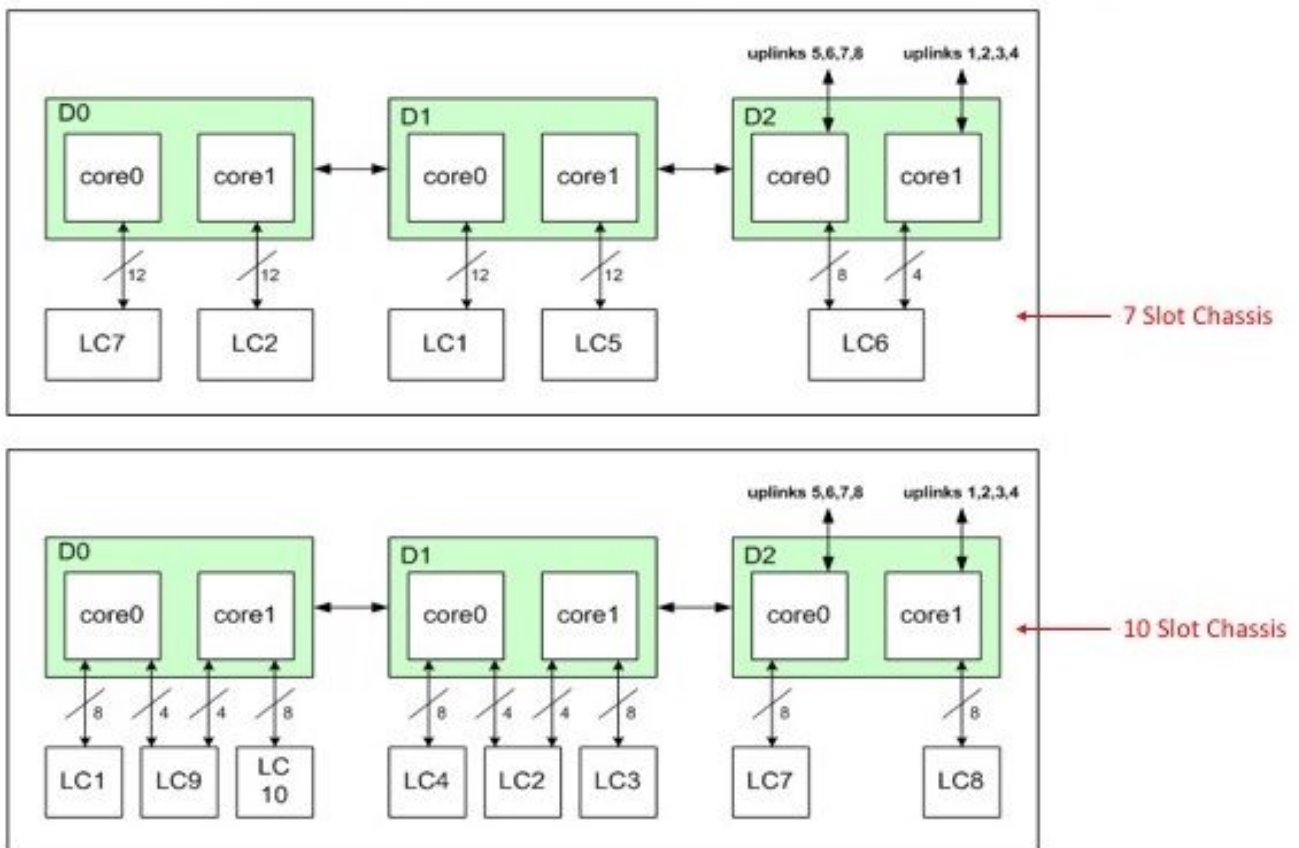
Terminology

Acronym	Definition
RP	Route Processor
FP	Forwarding Processor
FED	Forwarding Engine Driver. The software process that programs the Supervisor Forwarding ASIC.
Object-manager	FP software MAC entries that are stored as asynchronous objects in the object database.
LSMPI	Linux Shared Memory Punt Interface. The transport between the data plane (hardware-UA 2.0) and control plane (software-CPU).
IFM	Interface Manager software process.

IF_ID	Interface IDentifier is a unique value that represents a specific interface. It is used during internal programming in the switch.
Inst	Instance. Indicates that the UADP 2.0 Asic/Core an interface is connected to: 0=Asic0/Core1, 1=Asic0/Core1, 2=Asic1/Core0, 3=Asic1/Core1, 4=Asic2/Core0, 5=Asic2/Core1.
Asic	Specifies which UADP 2.0 an interface is associated with: 0=UADP 2.0 #0, 1=UADP 2.0 #1, 2=UADP 2.0 #2.
Core	Specifies which core on the UADP 2.0 interface is associated with: 0=core0, 1=core1.
Port	Ordinal instance number of a port within a slot. Within the same slot all port numbers are unique.
SubPort	Identifies a port within a port group (Cntx) for front panel ports that are sub-ported (Cntx & SubPort together identify a unique port that is Sub-ported).
Mac	Interface identifier that is used when an interface is running MACsec (security authentication and encryption).
Cntx	Context. A group number a port belongs to when a front panel interface is sub-ported (Cntx & SubPort together identify a unique port that is Sub-ported).
LPN	Logical Port Number associated with an interface.
GPN	Global Port Number associated with an interface.
Type NIF	Network Interface; NRU = Network Redundant Uplink
IF_IS	Interface IDentifier. This is a unique value representing a specific interface. It is used during various programming internally in the switch.
Port_LE	Port Logical Entity. This is the interface configuration.
AOM	Asynchronous object manager. The FP programs information into the object database as a object.
VP	Virtual Port
MATM	MAC Address Table Manager
RP	Route Processor
OM_PTR	Object Manager Pointer
Tbl_ID	Table Identifier = vlan
CMAN	Chassis Manager
FP	Forwarding Processor
fp_port	The front panel ports.
Sif	Stack interface (towards the other 2 UADP 2.0 forwarding ASICs on the Supervisor).
Nif	Network interface (towards the front panel interface)
IGR / EGR	Ingress / Egress
IQS	Ingress Queue Scheduler
SQS	Stack Queue Scheduler
PBC	Packet Buffer Complex
AQM	Active Queue Management. This does congestion management checks.
AQMRed	Active Queue Management Random early detection.
EQC	Egress Queue Controller
ESM	Egress Scheduler Management
RWE	Rewrite Engine. Adds or deletes header information from the packet.
IOMD	Input Output Module Driver

fp_port	The front panel port.
Nif	Network interface (towards the front panel interface)
SLI	System Link Interface (towards the Supervisor)
IGR / EGR =	Ingress / Egress
AQMRed	Active Queue Management Random early detection.
OCI	Out-of-band Control Interface = internal communication channel between the Line card and active Supervisor
MATM	MAC Address Table Manager
MAC Move Count	This is the count for when a MAC address moves (is learned) on a new interface. The move count can occur when an end host is physically moved from one interface to another, a wireless host roams from one Access Point (AP) to another AP connected on a different interface, or spanning-tree path changes or loops.

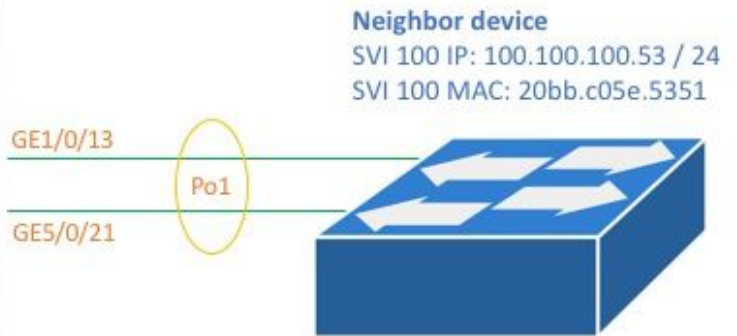
Line Card (LC) to UADP 2.0 Mapping



Line Card to UADP

Topology

Catalyst 9400 - Macallan
 SVI 100 IP: 100.100.100.1 / 24
 SVI 100 MAC: 2c5a.0f1c.28e1



C9400#show version

```
Cisco IOS XE Software, Version 16.06.01
Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 16.6.1, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Sat 22-Jul-17 05:51 by mcpre
--snip--
```

C9400#show module

Chassis Type: C9407R

Mod	Ports	Card Type	Model	Serial No.
1	48	48-Port 10/100/1000 (RJ-45)	C9400-LC-48T	JAE211703RC
2	48	48-Port UPOE 10/100/1000 (RJ-45)	C9400-LC-48U	JAE21150CGD
3	10	Supervisor 1 Module	C9400-SUP-1	JAE21240235
4	10	Supervisor 1 Module	C9400-SUP-1	JAE21240235
5	48	48-Port UPOE 10/100/1000 (RJ-45)	C9400-LC-48U	JAE21150CG9

Mod	MAC addresses	Hw	Fw	Sw	Status
1	E4AA.5D54.C84C to E4AA.5D54.C87B	0.6	16.6.1r	[FC 16.06.01	ok
2	E4AA.5D54.B430 to E4AA.5D54.B45F	0.6	16.6.1r	[FC 16.06.01	ok
3	2C5A.0F1C.28EC to 2C5A.0F1C.28F5	0.6	16.6.1r	[FC 16.06.01	ok
4	2C5A.0F1C.28F6 to 2C5A.0F1C.28FF	0.6	16.6.1r	[FC 16.06.01	ok
5	E4AA.5D54.B658 to E4AA.5D54.B687	0.6	16.6.1r	[FC 16.06.01	ok

Mod	Redundancy Role	Operating Redundancy Mode	Configured Redundancy Mode
3	Active	sso	sso
4	Standby	sso	sso

C9400#show running-config interface port-channel 1

```
interface Port-channel1
switchport trunk allowed vlan 100
switchport mode trunk
```


Interface State : READY
Interface Status : ADD, UPD
Interface Ref-Cnt : 7
Interface Type : ETHER
Port Type : SWITCH PORT
Port Location : LOCAL
Slot : 1
Unit : 0
Slot Unit : 13
SNMP IF Index : 14
GPN : 1105
EC Channel : 1
EC Index : 1
Port Handle : 0x72000285
LISP v4 Mobility : false
LISP v6 Mobility : false
QoS Trust Type : 0

Port Information

Handle [0x72000285]
Type [Layer2]
Identifier [0x13]
Slot [1]
Unit [13]

Port Physical Subblock

Affinity [local]
Asic Instance [2 (A:1,C:0)]
AsicPort [12]
AsicSubPort [4]
MacNum [0]
ContextId [0]
LPN [13]
GPN [113]
Speed [1GB]
type [NIF]
PORT_LE [0x7fe5c5aabc28]
L3IF_LE [0x0]
EC GPN [1105]
EC L3IF_LE [0x0]
EC Port Mask [0xaaaaaaaaaaaaaaaa]
DI [0x7fe5c5ab5c48]

Port L2 Subblock

Enabled [Yes]
Allow dot1q [Yes] ---> interface Gig1/0/13 is configured as a trunk
Allow native [Yes]
Default VLAN [1]
Allow priority tag ... [Yes]
Allow unknown unicast [Yes]
Allow unknown multicast [Yes]
Allow unknown broadcast [Yes]
Allow unknown multicast [Enabled]
Allow unknown unicast [Enabled]
IPv4 ARP snoop [No]
IPv6 ARP snoop [No]
Jumbo MTU [1500]
Learning Mode [1]

Port QoS Subblock

Trust Type [0x2]
Default Value [0]
Ingress Table Map [0x0]
Egress Table Map [0x0]
Queue Map [0x0]

Port Netflow Subblock

Port Policy Subblock

List of Ingress Policies attached to an interface
 List of Egress Policies attached to an interface
 Ref Count : 7 (feature Ref Counts + 1)

IFM Feature Ref Counts
 FID : 100, Ref Count : 1
 FID : 57, Ref Count : 1
 FID : 115, Ref Count : 1
 FID : 17, Ref Count : 1
 FID : 78, Ref Count : 1
 FID : 30, Ref Count : 1
 IFM Feature Sub block information
 FID : 57, Private Data : 0x7fe5c685e748
 FID : 17, Private Data : 0x7fe5c5e85f38
 FID : 30, Private Data : 0x7fe5c5e85aa8

This command displays the hardware configuration details for Gig1/0/3 based on the PORT_LE value from the previous command.

Value	Definition
Value 0	The value is not set.
Value 1	The value set in most cases.

```
C9400#show platform hardware fed active fwd-asic abstraction print-resource-handle
0x7fe5c5aabc28 1
Handle:0x7fe5c5aabc28 Res-Type:ASIC_RSC_PORT_LE Res-Switch-Num:0 Asic-Num:2 Feature-
ID:AL_FID_IFM Lkp-ftr-id:LKP_FEAT_INGRESS_PRECLASS1_IPV4 ref_count:1
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: index2:0xc mtu_index/13u_ri_index2:0x4 sm
handle [ASIC 2]: 0x7fe5c5abb588
```

```
Detailed Resource Information (ASIC#2)
-----
LEAD_PORT_ALLOW_BROADCAST value 1 Pass LEAD_PORT_ALLOW_CAPWAP value 0 Pass LEAD_PORT_ALLOW_CTS
value 0 Pass LEAD_PORT_ALLOW_DOT1Q_TAGGED value 1 Pass LEAD_PORT_ALLOW_MULTICAST value 1 Pass
LEAD_PORT_ALLOW_NATIVE value 1 Pass LEAD_PORT_ALLOW_NON_CTS value 0 Pass
LEAD_PORT_ALLOW_PRIORITY_TAGGED value 1 Pass LEAD_PORT_ALLOW_UNICAST value 1 Pass
LEAD_PORT_ALLOW_UNKNOWN_ETHER_TYPE value 0 Pass LEAD_PORT_ALLOW_UNKNOWN_UNICAST value 1 Pass
LEAD_PORT_ALLOW_VLAN_LOAD_BALANCE_GROUP value 15 Pass LEAD_PORT_ALLOW_VRF value 0 Pass
LEAD_PORT_ARP_OR_ND_SNOOPING_ENABLED_IPV4 value 0 Pass LEAD_PORT_ARP_OR_ND_SNOOPING_ENABLED_IPV6
value 0 Pass LEAD_PORT_AUTH_MODE value 0 Pass LEAD_PORT_CAPWAP_TUNNEL value 0 Pass
LEAD_PORT_CONTENT_MATCHING_ENABLED value 0 Pass LEAD_PORT_CTS_ENABLED value 0 Pass
LEAD_PORT_CUSTOMER_PORT value 0 Pass LEAD_PORT_DAI_OR_ND_TRUST_MODE_IPV4 value 0 Pass
LEAD_PORT_DAI_OR_ND_TRUST_MODE_IPV6 value 0 Pass LEAD_PORT_DATA_GLEAN_LEARN_IPV4 value 0 Pass --
snip--
```

Etherchannel Programming

In these Etherchannel programming example outputs, the RP programs the FP, the FP programs the FED, the FED then programs the Supervisor forwarding ASIC hardware. RP software entries are stored as objects in the object database and the FP software entries are stored as asynchronous objects in the object database.

```
C9400#show etherchannel summary
--snip--
Group Port-channel Protocol Ports
-----+-----+-----+-----
1 Po1(SU) LACP Gi1/0/13(P) Gi5/0/21(P)
```

Group Mask is a non-zero in this output. It is used in the hash process to determine the link in the etherchannel where any traffic flow egresses.

C9400#show platform software interface rp active brief

Forwarding Manager Interfaces Information

Name	ID	QFP ID
Null0	1	0
GigabitEthernet1/0/1	7	0
GigabitEthernet1/0/2	8	0
GigabitEthernet1/0/3	9	0
-snip-		
GigabitEthernet1/0/13	19	0
-snip-		
GigabitEthernet5/0/21	143	0
-snip-		
Port-channel1	748	0
-snip-		

C9400#show platform software fed active etherchannel 1 group-mask

Group Mask Info

Aggport IIF Id: 00000000000002EC ---> hex 0x2EC = dec 748

Active Port: : 2 -----> 2 active interfaces in the etherchannel = the Member ports below

Member Ports

If Name	If Id	local	Group Mask
GigabitEthernet1/0/13	0000000000000013	true	5555555555555555 ---> hex 0x13 = dec 19
GigabitEthernet5/0/21	000000000000008f	true	aaaaaaaaaaaaaaaa ---> hex 0x8f = dec 143

This command shows the configuration for the Port-channel 1:

C9400#show platform software fed active ifm if-id 0x000002ec

Interface IF_ID : 0x00000000000002ec

Interface Name : Port-channel1

Interface Block Pointer : 0x7fe5c685df98

Interface State : READY

Interface Status : ADD, UPD

Interface Ref-Cnt : 5

Interface Type : ETHERCHANNEL

Port Type : SWITCH PORT

Channel Number : 1

SNMP IF Index : 720

Port Handle : 0x50002f6

#Of Active Ports : 2

Base GPN : 1104

Index[2] : 0000000000000013 ---> Gig1/0/13 from previous command output

Index[3] : 000000000000008f ---> Gig5/0/21 from previous command output

Port Information

Handle [0x50002f6]

Type [L2-Ethchannel]

Identifier [0x2ec]

Unit [1]

Port Logical Subblock

L3IF_LE handle [0x0]

Num physical port . [2]

GPN Base [1104]

Num physical port on asic [0] is [0]

DiBcam handle on asic [0].... [0x0]

Num physical port on asic [1] is [0]

DiBcam handle on asic [1].... [0x0]

Num physical port on asic [2] is [1] -----> Gig1/0/13 is on ASIC instance 2 (Supervisor

ASIC 1, core 0)

DiBcam handle on asic [2].... [0x7fe5c6ae3608]

Num physical port on asic [3] is [1] -----> Gig5/0/21 is on ASIC instance 3 (Supervisor

ASIC 1, core 1)

DiBcam handle on asic [3].... [0x7fe5c685d7e8]

Num physical port on asic [4] is [0]

DiBcam handle on asic [4].... [0x0]

Num physical port on asic [5] is [0]

DiBcam handle on asic [5].... [0x0]

Port L2 Subblock

Enabled [No]

Allow dot1q [No]

Allow native [No]

Default VLAN [0]

Allow priority tag ... [No]

Allow unknown unicast [No]

Allow unknown multicast[No]

Allow unknown broadcast[No]

Allow unknown multicast[Enabled]

Allow unknown unicast [Enabled]

IPv4 ARP snoop [No]

IPv6 ARP snoop [No]

Jumbo MTU [0]

Learning Mode [0]

Port QoS Subblock

Trust Type [0x7]

Default Value [0]

Ingress Table Map [0x0]

Egress Table Map [0x0]

Queue Map [0x0]

Port Netflow Subblock

Port Policy Subblock

List of Ingress Policies attached to an interface

List of Egress Policies attached to an interface

Ref Count : 5 (feature Ref Counts + 1)

IFM Feature Ref Counts

FID : 115, Ref Count : 1

FID : 78, Ref Count : 1

No Sub Blocks Present

This command shows the configuration for mapping interfaces.

Acronym/Instance

Definition

IFM

Interface Manager

Instance

Gig1/0/13 is on ASIC instance 2 (UADP 2.0 ASIC 1, core 0) with Interface ID 0x13

Instance

Gig5/0/21 is on ASIC instance 3 (UADP 2.0 ASIC 1, core 1) with Interface ID 0x8f

C9400#show platform software fed active ifm mappings

```
Interface IF_ID Inst Asic Core Port SubPort Mac Cntx LPN GPN Type Active GigabitEthernet1/0/1
0x7 2 1 0 0 4 4 1 101 NIF Y GigabitEthernet1/0/2 0x8 2 1 0 1 1 4 4 2 102 NIF Y --snip--
GigabitEthernet1/0/13 0x13 2 1 0 12 4 0 0 13 1105 NIF Y --snip-- GigabitEthernet5/0/21 0x8f 3 1
1 20 4 5 5 21 1104 NIF Y --snip--
```

Global Etherchannel Configuration

C9400#show platform software ether-channel rp active global-config

Forwarding Manager EtherChannel Global Configuration Information


```

LEAD_VLAN_ARP_OR_ND_SNOOPING_ENABLED_IPV4 value 0 Pass
LEAD_VLAN_ARP_OR_ND_SNOOPING_ENABLED_IPV6 value 0 Pass
LEAD_VLAN_BLOCK_L2_LEARN value 0 Pass
LEAD_VLAN_CONTENT_MATCHING_ENABLED value 0 Pass
LEAD_VLAN_DEST_MOD_INDEX_TVLAN_LE value 0 Pass
LEAD_VLAN_DHCP_SNOOPING_ENABLED_IPV4 value 0 Pass
LEAD_VLAN_DHCP_SNOOPING_ENABLED_IPV6 value 0 Pass
LEAD_VLAN_ENABLE_SECURE_VLAN_LEARNING_IPV4 value 0 Pass
LEAD_VLAN_ENABLE_SECURE_VLAN_LEARNING_IPV6 value 0 Pass
LEAD_VLAN_EPOCH value 0 Pass
LEAD_VLAN_L2_PROCESSING_STP_TCN value 0 Pass
LEAD_VLAN_L2FORWARD_IPV4_MULTICAST_PKT value 0 Pass
LEAD_VLAN_L2FORWARD_IPV6_MULTICAST_PKT value 0 Pass
LEAD_VLAN_L3_IF_LE_INDEX_PRIO value 1 Pass
LEAD_VLAN_L3IF_LE_INDEX value 111 Pass
LEAD_VLAN_LOOKUP_VLAN value 10 Pass -----> MVID 10 = vlan 100
LEAD_VLAN_MCAST_LOOKUP_VLAN value 10 Pass
LEAD_VLAN_RIET_OFFSET value 1 Pass
LEAD_VLAN_SNOOPING_FLOODING_ENABLED_IGMP_OR_MLD_IPV4 value 0 Pass
LEAD_VLAN_SNOOPING_FLOODING_ENABLED_IGMP_OR_MLD_IPV6 value 1 Pass
LEAD_VLAN_SNOOPING_PROCESSING_STP_TCN_IGMP_OR_MLD_IPV4 value 0 Pass
LEAD_VLAN_SNOOPING_PROCESSING_STP_TCN_IGMP_OR_MLD_IPV6 value 0 Pass
LEAD_VLAN_VLAN_CLIENT_LABEL value 0 Pass
LEAD_VLAN_VLAN_CONFIG value 0 Pass
LEAD_VLAN_VLAN_FLOOD_ENABLED value 0 Pass
LEAD_VLAN_VLAN_ID_VALID value 1 Pass
LEAD_VLAN_VLAN_LOAD_BALANCE_GROUP value 15 Pass
LEAD_VLAN_VLAN_ROLE value 0 Pass
LEAD_VLAN_VLAN_FLOOD_MODE_BITS value 3 Pass
LEAD_VLAN_LVX_VLAN value 0 Pass
LEAD_VLAN_EGRESS_DEJAVU_CANON value 0 Pass
LEAD_VLAN_EGRESS_INGRESS_VLAN_MODE value 0 Pass
LEAD_VLAN_EGRESS_LOOKUP_VLAN value 0 Pass
LEAD_VLAN_EGRESS_SGACL_DISABLED value 3 Pass
LEAD_VLAN_EGRESS_VLAN_CLIENT_LABEL value 0 Pass
LEAD_VLAN_EGRESS_VLAN_ID_VALID value 1 Pass
LEAD_VLAN_EGRESS_VLAN_LOAD_BALANCE_GROUP value 15 Pass
LEAD_VLAN_EGRESS_INTRA_POD_BCAST value 0 Pass
LEAD_VLAN_EGRESS_INTER_POD_BCAST value 0 Pass
LEAD_VLAN_MAX value 0 Pass

```

```

Detailed Resource Information (ASIC#3) ----> ASIC instance 3 = Supervisor ASIC 1, core 1
--snip--
Detailed Resource Information (ASIC#4) ----> ASIC instance 4 = Supervisor ASIC 2, core 0
--snip-
Detailed Resource Information (ASIC#5) ----> ASIC instance 5 = Supervisor ASIC 2, core 1
--snip--

```

Spanning Tree Programming

```
C9400#show spanning-tree vlan 100
```

```

VLAN0100
Spanning tree enabled protocol rstp Root ID Priority 32868 Address 20bb.c05e.5300 Cost 4 Port
2473 (Port-channel1) Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec Bridge ID Priority
32868 (priority 32768 sys-id-ext 100) Address 2c5a.0f1c.28c0 Hello Time 2 sec Max Age 20 sec
Forward Delay 15 sec Aging Time 300 sec Interface Role Sts Cost Prio.Nbr Type -----
- - - - -
----- Gi1/0/1 Desg FWD 19 128.1 Shr
Gi2/0/11 Desg FWD 4 128.107 P2p Po1 Root FWD 3 128.2473 P2p Peer(STP)

```

```
C9400#show etherchannel summary
```

--snip--

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Gi1/0/13(P) Gi5/0/21(P)

These commands display the spanning tree forwarding state for Port-channel 1.

C9400#**show platform software interface rp active brief**
Forwarding Manager Interfaces Information

Name	ID	QFP ID
Null0	1	0
GigabitEthernet1/0/1	7	0
GigabitEthernet1/0/2	8	0
GigabitEthernet1/0/3	9	0
Port-channel1	748	0

C9400#**show platform software fed active vp summary interface if_id 748**

if_id	vlan_id	pvlan_mode	pvlan_vlan	stp_state	vtp pruned
748	100	trunk	1	forwarding	No

The next commands display the spanning tree hardware forwarding state for VLAN 100.

C9400#**show platform software fed active vp summary vlan 100**

if_id	vlan_id	pvlan_mode	pvlan_vlan	stp_state	vtp pruned
748	100	trunk	1	forwarding	No

C9400#**show platform hardware fed active vlan 100 ingress**
VLAN STP State in hardware

vlan id is:: 100
Interfaces in forwarding state: : Gi2/0/11(Tagged), Gi1/0/1(Tagged), Gi1/0/13(Tagged), Gi5/0/21(Tagged)
flood list: : Gi2/0/11, Gi1/0/1, Gi1/0/13, Gi5/0/21

C9400#**show platform hardware fed active vlan 100 egress**
VLAN STP State in hardware

vlan id is:: 100
Interfaces in forwarding state: : Gi2/0/11(Tagged), Gi1/0/1(Tagged), Gi1/0/13(Tagged), Gi5/0/21(Tagged)

Check for spanning-tree stability. Ensure that the Topology Change Notifications (TCN) are infrequently seen.

```
C9400#show spanning-tree vlan 100 detail
```

```
VLAN0100 is executing the rstp compatible Spanning Tree protocol
  Bridge Identifier has priority 32768, sysid 10, address 2c5a.0f1c.28c0
  Configured hello time 2, max age 20, forward delay 15, transmit hold-count 6
  Current root has priority 32868, address 2c5a.0f1c.5300
  Root port is 2473 (Port-channel1), cost of root path is 4
  Topology change flag not set, detected flag not set
  Number of topology changes 1 last change occurred 2w6d ago
    from Port-channel1
  Times: hold 1, topology change 35, notification 2
    hello 2, max age 20, forward delay 15
  Timers: hello 0, topology change 0, notification 0, aging 300
```

```
--snip--
```

L2 Forwarding Programming

```
C9400#show etherchannel summary
```

```
--snip--
```

```
Group Port-channel Protocol Ports
```

```
-----+-----+-----+-----
1      Po1(SU)        LACP      Gi1/0/13(P) Gi5/0/21(P)
```

```
C9400#ping 100.100.900.53
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 100.100.900.53, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/5 ms
```

```
C9400#show mac address-table dynamic vlan 100
```

```
Mac Address Table
```

```
-----
```

```
Vlan Mac Address      Type      Ports
----  -
100  0000.0200.0800  DYNAMIC  Gi1/0/1
100  20bb.c05e.5318  DYNAMIC  Po1
100  20bb.c05e.5351  DYNAMIC  Po1
```

```
Total Mac Addresses for this criterion: 3
```

Software Programming

In the next output examples, the RP programs the FP, the FP programs the FED, the FED then finally programs the Supervisor forwarding ASIC hardware. RP software MAC entries are stored as objects in the object database and the FP software MAC entries are stored as asynchronous objects in the object database.

```
C9400#show platform software matm rp active mac 20bb.c05e.5351 1 100 ---> 100 = vlan
```

```
Tbl_Type  Tbl_ID    MAC_Address  Type  Ports  AOM_ID/OM_PTR
MAT_VLAN   100 20bb.c05e.5351  1    1    OM: 0x3700860010
List of Ports: 748
```

```
C9400#show platform software interface rp active brief
```

Forwarding Manager Interfaces Information

Name	ID	QFP ID

Null0	1	0
GigabitEthernet1/0/1	7	0
GigabitEthernet1/0/2	8	0
GigabitEthernet1/0/3	9	0
-snip-		
Port-channel1	748	0
-snip-		

C9400#show platform software matm fp active mac 20bb.c05e.5351

```
Tbl_Type  Tbl_ID  MAC_Address  Type  Ports  AOM_ID/OM_PTR
MAT_VLAN  100 20bb.c05e.5351  1  1  6567 created
List of Ports: 748
```

C9400#show platform software object-manager fp active object 6567

Object identifier: 6567

Description: matm mac entry type VLAN, id 100, 20bb.c05e.5351

Status: Done, Epoch: 0, Client data: 0x799633f8

Hardware Programming - Method 1

C9400#show platform software fed active matm macTable vlan 100

```
VLAN MAC Type Seq# macHandle siHandle diHandle *a_time *e_time ports
100 2c5a.0f1c.28e1 0X8002 0 0x7fe5c5eaf1c8 0x7fe5c5924f38 0x0 0 0
Vlan100
100 20bb.c05e.5351 0X1 589 0x7fe5c6b03d68 0x7fe5c6865f78 0x7fe51001b458 300 1
Port-channel1
100 0000.0200.0800 0X1 610 0x7fe5c6b07888 0x7fe5c6b076e8 0x7fe5c5972ce8 300 1
GigabitEthernet1/0/1
Total Mac number of addresses:: 3
*a_time=aging_time(secs) *e_time=total_elapsed_time(secs)
```

Type:

MAT_DYNAMIC_ADDR 0x1 MAT_STATIC_ADDR 0x2 ---> Type = dynamically learned MAC

address entry

```
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
```

macHandle Programming

**Acronym
/Term**

Definition

vlan:10 MVID 10. VLAN 100 uses mapped VLAN ID (MVID) 10 internally inside the switch.
gpn:1104 Global port number of Port-channel 1.
mac:0x20bbc MAC address 20bb.c05e.5351

05e5351

This is a macHandle Programming output example:

```
C9400#show platform hardware fed active fwd-asic abstraction print-resource-handle
0x7fe5c6b03d68 1
Handle:0x7fe5c6b03d68 Res-Type:ASIC_RSC_HASH_TCAM Res-Switch-Num:0 Asic-Num:255 Feature-
ID:AL_FID_L2 Lkp-ftr-id:LKP_FEAT_L2_SRC_MAC_VLAN ref_count:1
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: handle [ASIC: 0]: 0x7fe5c6aed898 handle
[ASIC: 1]: 0x7fe5c6b00fd8 handle [ASIC: 2]: 0x7fe5c6858208
Features sharing this resource:Cookie length: 12
5e c0 bb 20 51 53 0a 80 07 00 00 00
```

Detailed Resource Information (ASIC#0)

```
-----
Number of HTM Entries: 1
Entry 0: (handle 0x7fe5c6aed898) Abs_hash_index: 294 KEY - vlan:10 mac:0x20bbc05e5351 l3_if:0
gpn:1104 epoch:0 static:0 flood_en: 0 vlan_lead_wless_flood_en: 0 client_home_asic: 0 MASK -
vlan:0 mac:0x0 l3_if:0 gpn:0 epoch:0 static:0 flood_en:0 vlan_lead_wless_flood_en: 0
client_home_asic: 0 SRC_AD - need_to_learn:0 lrn_v:0 catchall:0 static_mac:0 chain_ptr_v:0
chain_ptr: 0 static_entry_v:0 auth_state:0 auth_mode:0 auth_behavior_tag:0 traf_m:0 is_src_ce:0
DST_AD - si:0xcd bridge:0 replicate:0 blk_fwd_o:0 v4_rmac:0 v6_rmac:0 catchall:0 ign_src_lrn:0
port_mask_o:0 afd_cli_f:0 afd_lbl:0 prio:3 dest_mod_idx:0 destined_to_us:0 pv_trunk:1 smr:0
Detailed Resource Information (ASIC#1) --snip-- Detailed Resource Information (ASIC#2) --snip--
```

C9400#show platform software fed active vlan 100

VLAN Fed Information

Vlan Id	IF Id	LE Handle	STP Handle	L3 IF Handle	SVI IF ID
100	0x0000000000420011	0x00007fe5c4616ef8	0x00007fe5c4617778	0x00007fe5c50dac28	0x000000000000002ea 10

C9400#show platform software fed active ifm mappings etherchannel

Mappings Table

Chan	Interface	IF_ID
1	Port-channel1	0x000002ec

C9400#show platform software fed active ifm if-id 0x000002ec <-- IF_ID from previous output

```
Interface IF_ID : 0x000000000000002ec
Interface Name : Port-channel1
Interface Block Pointer : 0x7fe5c685df98
Interface State : READY
Interface Status : ADD, UPD
Interface Ref-Cnt : 5
Interface Type : ETHERCHANNEL
Port Type : SWITCH PORT
Channel Number : 1
SNMP IF Index : 720
Port Handle : 0x50002f6
#Of Active Ports : 2
Base GPN : 1104
Index[2] : 0000000000000013
Index[3] : 000000000000008f
```

Port Information


```

Handle ..... [0x50002f6]
Type ..... [L2-Ethchannel]
Identifier ..... [0x2ec]
Unit ..... [1]
Port Logical Subblock
L3IF_LE handle .... [0x0]
Num physical port . [2]
GPN Base ..... [1104]
--snip--

```

Note: the interface that the mac learned on was a single interface instead of a port-channel, this command is used to determine the GPN to interface mapping

```

C9400#show platform software fed active ifm mappings gpn
Mappings Table

```

```

GPN   Interface           IF_ID
-----
101   GigabitEthernet1/0/1   0x00000007
102   GigabitEthernet1/0/2   0x00000008
103   GigabitEthernet1/0/3   0x00000009
--snip--

```

siHandle Programming

Acronym /Term **Definition**

siHandle station index Handle. The packet rewrite info (RI = Rewrite Index) & outgoing interface info (Destination Index).

Replication Bitmap for dual core on single Supervisor ASIC:

Acronym/Term	Definition
Local ASIC (LD = Local Data)	Destination on the same ASIC on the same core as source.
Core copy (CD = Core Data)	Destination on same ASIC on another core.
Remote ASIC (RD = Remote Data)	Destination on another ASIC.

```

C9400#show platform hardware fed active fwd-asic abstraction print-resource-handle
0x7fe5c6865f78 1

```

```

Handle:0x7fe5c6865f78 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-
ID:AL_FID_L3_UNICAST_IPV4 Lkp-ftr-id:LKP_FEAT_INVALID ref_count:2
priv_ri/priv_si Handle: 0x7fe5c6864938Hardware Indices/Handles: index0:0xcd
mtu_index/l3u_ri_index0:0x0 index1:0xcd mtu_index/l3u_ri_index1:0x0 index2:0xcd
mtu_index/l3u_ri_index2:0x0 index3:0xcd mtu_index/l3u_ri_index3:0x0 index4:0xcd
mtu_index/l3u_ri_index4:0x0 index5:0xcd mtu_index/l3u_ri_index5:0x0
Features sharing this resource:64 (1)
55 (1)
Cookie length: 56
00 00 00 00 00 00 00 00 64 00 00 00 00 00 00 00 00 00 00 00 07 00 20 bb c0 5e 53 51 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

```

Detailed Resource Information (ASIC#0) ---> **ASIC instance 0 = Supervisor ASIC 0, core 0**

```

-----
Station Index (SI) [0xcd]

```

```
RI = 0x29 -----> Rewrite index (no MAC rewrite for L2 forwarding)
DI = 0x51c2 -----> Destination index = outgoing interface
stationTableGenericLabel = 0
stationFdConstructionLabel = 0
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0x1
Replication Bitmap: LD RD CD
```

```
Detailed Resource Information (ASIC#1) ----> ASIC instance 1 = Supervisor ASIC 0, core 1
--snip--
Detailed Resource Information (ASIC#2) ----> ASIC instance 2 = Supervisor ASIC 1, core 0
--snip--
Detailed Resource Information (ASIC#3) ----> ASIC instance 3 = Supervisor ASIC 1, core 1
--snip--
Detailed Resource Information (ASIC#4) ----> ASIC instance 4 = Supervisor ASIC 2, core 0
--snip--
Detailed Resource Information (ASIC#5) ----> ASIC instance 5 = Supervisor ASIC 2, core 1
--snip--
```

```
C9400#show platform hardware fed active fwd-asic resource asic all destination-index range
0x51c2 0x51c2
```

```
ASIC#0:
--snip--
ASIC#1:
--snip--
```

```
ASIC#2: -----> ASIC Instance 2 = Supervisor ASIC 1, core 0
Destination Index (DI) [0x51c2]
portMap = 0x00000000 00001000 ----> binary 0001 0000 0000 0000 = Port 12 (see next command
output)
cmil = 0 (read right to left, zero based)
rcpPortMap = 0
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
```

```
ASIC#3: -----> ASIC instance 3 = Supervisor ASIC 1, core 1
Destination Index (DI) [0x51c2]
portMap = 0x00000000 00100000 ----> binary 0001 0000 0000 0000 0000 0000 = Port 20 (see next
command output)
cmil = 0 (read right to left, zero based)
rcpPortMap = 0
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
```

```
ASIC#4:
```

```
--snip--
ASIC#5:
--snip--
```

C9400#**show platform software fed active ifm mappings**

Interface	IF_ID	Inst	Asic	Core	Port	SubPort	Mac	Cntx	LPN	GPN	Type	Active
GigabitEthernet1/0/1	0x7	2	1	0	0	0	4	4	1	101	NIF	Y
GigabitEthernet1/0/2	0x8	2	1	0	1	1	4	4	2	102	NIF	Y
--snip--												
GigabitEthernet1/0/13	0x13	2	1	0	12	4	0	0	13	1105	NIF	Y
--snip--												
GigabitEthernet5/0/21	0x8f	3	1	1	20	4	5	5	21	1104	NIF	Y
--snip--												

C9400#**show etherchannel summary**

```
--snip--
```

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Gi1/0/13(P) Gi5/0/21(P)

There is no expected MAC rewrite information since this is a Layer 2 MAC forwarding entry.

C9400#**show platform hardware fed active fwd-asic resource asic all rewrite-index range 0x29 0x29 1**

ASIC#0:

Rewrite Data Table Entry,
ASIC#:0, rewrite_type:1, **RI:41 ---> dec 41 = hex 0x29**

MAC Addr:
MAC Addr: 20:bb:c0:5e:53:51,
L3IF LE Index 111

ASIC#1:

Rewrite Data Table Entry,
ASIC#:1, rewrite_type:1, RI:41

MAC Addr:
MAC Addr: 20:bb:c0:5e:53:51,
L3IF LE Index 111

ASIC#2:

--snip--

ASIC#3:

--snip--

ASIC#4:

--snip--

ASIC#5:

--snip--

C9400#**show mac address-table address 20bb.c05e.5351**

Mac Address Table

```
-----
```

Vlan	Mac Address	Type	Ports
100	20bb.c05e.5351	DYNAMIC	Po1

Total Mac Addresses for this criterion: 1

diHandle Programming

Acronym	Definition
diHandle	destination index Handle. This is the outgoing interface information.

```
C9400#show platform hardware fed active fwd-asic abstraction print-resource-handle
0x7fe51001b458 1
Handle:0x7fe51001b458 Res-Type:ASIC_RSC_DI Res-Switch-Num:0 Asic-Num:255 Feature-
ID:AL_FID_INVALID Lkp-ftr-id:LKP_FEAT_INVALID ref_count:21
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: index0:0x51c2 mtu_index/l3u_ri_index0:0x0
index1:0x51c2 mtu_index/l3u_ri_index1:0x0 index2:0x51c2 mtu_index/l3u_ri_index2:0x0
index3:0x51c2 mtu_index/l3u_ri_index3:0x0 index4:0x51c2 mtu_index/l3u_ri_index4:0x0
index5:0x51c2 mtu_index/l3u_ri_index5:0x0
Features sharing this resource:Cookie length: 8
01 00 00 00 c2 51 00 00
```

```
Detailed Resource Information (ASIC#0)
--snip--
Detailed Resource Information (ASIC#1)
--snip--
```

```
Detailed Resource Information (ASIC#2) ----> ASIC Instance 2 = Supervisor ASIC 1, core 0
```

```
-----
Destination Index (DI) [0x51c2]
portMap = 0x00000000 00001000 -----> binary 0001 0000 0000 0000 = Port 12 (see next
command output)
cmi1 = 0 (read right to left, zero based)
rcpPortMap = 0
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
```

```
Detailed Resource Information (ASIC#3) ----> ASIC Instance 3 = Supervisor ASIC 1, core 1
```

```
-----
Destination Index (DI) [0x51c2]
portMap = 0x00000000 00100000 ----> binary 0001 0000 0000 0000 0000 0000 = Port 20 (see next
command output)
cmi1 = 0 (read right to left, zero based)
rcpPortMap = 0
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
```

```
Detailed Resource Information (ASIC#4) --snip-- Detailed Resource Information (ASIC#5) --snip--
```

```
C9400#show platform software fed active ifm mappings
Interface IF_ID Inst Asic Core Port SubPort Mac Cntx LPN GPN Type Active GigabitEthernet1/0/1
0x7 2 1 0 0 0 4 4 1 101 NIF Y GigabitEthernet1/0/2 0x8 2 1 0 1 1 4 4 2 102 NIF Y --snip--
```

```
GigabitEthernet1/0/13 0x13 2 1 0 12 4 0 0 13 1105 NIF Y --snip-- GigabitEthernet5/0/21 0x8f 3 1
1 20 4 5 5 21 1104 NIF Y --snip--
```

```
C9400#show etherchannel summary
```

```
--snip--
```

Group	Port-channel	Protocol	Ports
1	Po1(SU)	LACP	Gi1/0/13(P) Gi5/0/21(P)

Hardware Programming - Method 2

Acronym /Term	Definition
vlan:10	MVID 10. VLAN 100 uses mapped VLAN ID (MVID) 10 internally inside the switch.
gpn:1104	Global port number of Port-channel 1.
mac:0x20bbc05e5351	MAC address 20bb.c05e.5351

Hardware programming method 2 example output:

```
C9400#show platform hardware fed active matm macTable vlan 100
```

```
--snip--
```

```
HEAD: MAC address 20bb.c05e.5351 in VLAN 100
KEY: vlan 10, mac 0x20bbc05e5351, l3_if 0, gpn 1104, epoch 0, static 0, flood_en 0,
vlan_lead_wless_flood_en 0, client_home_asic 0
MASK: vlan 0, mac 0x0, l3_if 0, gpn 0, epoch 0, static 0, flood_en 0, vlan_lead_wless_flood_en
0, client_home_asic 0
SRC_AD: need_to_learn 0, lrn_v 0, catchall 0, static_mac 0, chain_ptr_v 0, chain_ptr 0,
static_entry_v 0, auth_state 0, auth_mode 0, traf_mode 0, is_src_ce 0
DST_AD: si 0xc7, bridge 0, replicate 0, blk_fwd_o 0, v4_mac 0, v6_mac 0, catchall 0, ign_src_lrn
0, port_mask_o 0, afd_cli_f 0, afd_lbl 0, priority 3, dest_mod_idx 0, destined_to_us 0, pv_trunk
1
```

```
--snip--
```

```
C9400#show platform software fed active vlan 100
```

```
VLAN Fed Information
```

Vlan Id	IF Id	LE Handle	STP Handle	L3 IF Handle	SVI IF ID
MVID					
100	0x00000000000420011	0x000007fe5c4616ef8	0x000007fe5c4617778	0x000007fe5c50dac28	0x000000000000002ea 10

```
C9400#show platform software fed active ifm mappings etherchannel
```

```
Mappings Table
```

Chan	Interface	IF_ID
1	Port-channel1	0x000002ec

```
--snip--
```

```
C9400#show platform software fed active ifm if-id 0x000002ec
```

```
Interface IF_ID : 0x00000000000002ec
Interface Name : Port-channel1
Interface Block Pointer : 0x7fe5c685df98
Interface State : READY
Interface Status : ADD, UPD
```

```

Interface Ref-Cnt : 5
Interface Type : ETHERCHANNEL
Port Type : SWITCH PORT
Channel Number : 1
SNMP IF Index : 720
Port Handle : 0x50002f6
#Of Active Ports : 2
Base GPN : 1104
Index[2] : 0000000000000013
Index[3] : 000000000000008f

```

```

Port Information
Handle ..... [0x50002f6]
Type ..... [L2-Ethchannel]
Identifier ..... [0x2ec]
Unit ..... [1]
Port Logical Subblock
L3IF_LE handle .... [0x0]
Num physical port . [2]
GPN Base ..... [1104]
--snip--

```

Note: If the interface that the mac learned on was a single interface instead of a port-channel the next command is used to determine the gpn to interface mapping:

```

C9400#show platform software fed active ifm mappings gpn
Mappings Table

```

GPN	Interface	IF_ID
101	GigabitEthernet1/0/1	0x00000007
102	GigabitEthernet1/0/2	0x00000008
103	GigabitEthernet1/0/3	0x00000009

```

--snip--

```

TCAM Utilization

Check the TCAM utilization for the MAC address entries on each Supervisor ASIC instance to ensure the switch does not run out of TCAM space to store entries in hardware.

```

C9400#show platform hardware fed active fwd-asic resource tcam utilization

```

```

CAM Utilization for ASIC Instance [0]

```

```

--snip--

```

```

CAM Utilization for ASIC Instance [1]

```

```

--snip--

```

```

CAM Utilization for ASIC Instance [2]

```

```

--snip--

```

```

CAM Utilization for ASIC Instance [3]---> ASIC instance 3 = Supervisor ASIC 1, Core 1

```

```

Table Max Values Used Values ----->

```

-----> Unicast MAC addresses	65536/1024	13/1	-----> prefix/mask
IGMP and Multicast groups	16384/1024		0/7
L2 Multicast groups	16384/1024		1/9
Directly or indirectly connected routes	49152/65536		0/0
NAT/PAT SA address and Port	0		0
QoS Access Control Entries	18432		34
Security Access Control Entries	18432		0
Ingress Netflow ACEs	1024		0
Policy Based Routing ACEs	2048		9

Egress Netflow ACEs	2048	8
Input Microflow policer ACEs	0	0
Output Microflow policer ACEs	0	0
Flow SPAN ACEs	1024	13
Control Plane Entries	1024	0
Tunnels	1024	0
Lisp Instance Mapping Entries	1024	0
Input Security Associations	512	3
Output Security Associations and Policies	512	0
SGT_DGT	8192/512	0/0
CLIENT_LE	4096/256	2/0
INPUT_GROUP_LE	1024	0
OUTPUT_GROUP_LE	1024	0
Macsec SPD	256	0

CAM Utilization for ASIC Instance [4]
--snip--
CAM Utilization for ASIC Instance [5]
--snip--

Successful Hardware Programming

All features (whether it be a mac address, an interface, a vlan, and so on) are stored in the object database and programmed into the hardware as objects.

The RP programs the FP, the FP programs the FED, and the FED then finally programs the Supervisor forwarding ASIC hardware. RP software entries are stored as objects in the object database and the FP software entries are stored as asynchronous objects in the object database.

When the FP programs the FED (which in turn programs the Supervisor forwarding ASIC), the FED sends an acknowledgement back to the FP. The FP then forwards it to the RP to indicate that the hardware programming completed successfully. If FED hardware programming is missing or incorrect you can use this next command to check for issues and/or acknowledgements.

```
C9400#show platform software object-manager fp active statistics
Forwarding Manager Asynchronous Object Manager Statistics
```

```
Object update: Pending-issue: 0, 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: 3269
Stale-objects: 0
Resolve-objects: 0
Error-objects: 0
Paused-types: 0
```

If the previous command shows non-zero objects in pending issue state, use this command to find the object number involved:

```
C9400#show platform software object-manager fp active pending-issue-update
```

Then use this command to determine the stuck process associated with the object number:

```
C9400#show platform software object-manager fp active object {object#}
```

On the RP side, use this command to check for delete pending (Del Pend) for an object that the

FP did not acknowledge.

```
C9400#show platform software object-manager rp active object-type-info
```

```
Object type Name Count Del Pend Layer -----  
----- CC cc 5 0 2 SPA spa 0 0 4 PORT_DPIDB port_dpidx 164 0 10 CHANNEL_DPIDB  
channel_dpidx 0 0 12 VIRTUAL_DPIDB virtual_dpidx 503 0 13 SW_DPIDB sw_dpidx 0 0 17 VLAN vlan 0 0  
19  
--snip--
```

Health Check

Control Plane Traffic and Policy

Check for the CoPP (Control Plane Policy) drops in hardware-UADP 2.0 for traffic punted to software-CPU. This can impact MAC learning and Spanning-tree stability.

```
C9400#show policy-map control-plane
```

```
Control Plane
```

```
Service-policy input: system-cpp-policy
```

```
--snip--
```

```
Class-map: system-cpp-police-sw-forward (match-any)  
 0 packets, 0 bytes  
 5 minute offered rate 0000 bps, drop rate 0000 bps  
Match: none  
police:  
  rate 1000 pps, burst 244 packets  
  conformed 1298 bytes; actions:  
    transmit  
  exceeded 0 bytes; actions:  
    drop
```

```
--snip--
```

```
Class-map: system-cpp-police-l2-control (match-any)  
 0 packets, 0 bytes  
 5 minute offered rate 0000 bps, drop rate 0000 bps  
Match: none  
police:  
  rate 500 pps, burst 122 packets  
  conformed 239197001 bytes; actions:  
    transmit  
  exceeded 0 bytes; actions:  
    drop
```

```
--snip--
```

```
Class-map: system-cpp-default (match-any)  
 0 packets, 0 bytes  
 5 minute offered rate 0000 bps, drop rate 0000 bps  
Match: none  
police:  
  rate 1000 pps, burst 244 packets  
  conformed 0 bytes; actions:  
    transmit  
  exceeded 0 bytes; actions:  
    drop
```


4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	1024	16	0	0
9	0	0	0	0
10	13600	200	0	0
11	0	0	0	0
12	0	0	0	0
13	1298	3	0	0
14	80520	9158	0	0
15	2189268	23733	0	0
16	0	0	0	0
17	0	0	0	0

CPP Classes to queue map

```

=====
PlcIdx CPP Class                               : Queues
-----
0      system-cpp-police-data                   : ICMP GEN/BROADCAST/ICMP Redirect/
10 system-cpp-police-sys-data : Learning cache ovfl/Crypto Control/Exception/EGR Exception/NFL
SAMPLED DATA/Gold Pkt/RPF Failed/ 13 system-cpp-police-sw-forward : Sw forwarding/LOGGING/L2 LVX
Data Pack/ 9 system-cpp-police-multicast : Transit Traffic/MCAST Data/ 15 system-cpp-police-
multicast-end-station : MCAST END STATION / 7 system-cpp-police-punt-webauth : Punt Webauth/ 1
system-cpp-police-l2-control : L2 Control/ 5 system-cpp-police-stackwise-virt-control :
Stackwise Virtual Control/ 2 system-cpp-police-routing-control : Routing Control/Low Latency/ 3
system-cpp-police-control-low-priority : General Punt/ 4 system-cpp-police-l2lvx-control : L2
LVX Cont Pack/ 8 system-cpp-police-topology-control : Topology Control/ 11 system-cpp-police-
dot1x-auth : DOT1X Auth/ 12 system-cpp-police-protocol-snooping : Proto Snooping/ 14 system-cpp-
police-forus : Forus Address resolution/Forus traffic/ 5 system-cpp-police-stackwise-virt-
control : Stackwise Virtual Control/ 16 system-cpp-default : DHCP Snooping/Unused/EWLC
Control/EWLC Data/

```

Check CPU punt path (hardware-UADP 2.0 towards software-CPU) statistics from a software (CPU) perspective.

```

C9400#show platform software infrastructure lsmpi
LSMPI interface internal stats:
enabled=0, disabled=0, throttled=0, unthrottled=0, state is ready
Input Buffers = 8801257
Output Buffers = 5506129
rxdone count = 8801257
txdone count = 5506128
Rx no particletype count = 0
Tx no particletype count = 0
Txbuf from shadow count = 0
No start of packet = 0
No end of packet = 0
Punt drop stats:
Bad version 0
Bad type 0
Had feature header 0
Had platform header 0
Feature header missing 0
Common header mismatch 0
Bad total length 0
Bad packet length 0
Bad network offset 0
Not punt header 0
Unknown link type 0

```

```

No swidb 0
Bad ESS feature header 0
No ESS feature 0
No SSLVPN feature 0
No PPP bridge feature 0
Punt For PPP bridge type packets 0
Punt For Us type unknown 0
EPC CP RX Pkt cleansed 0
Punt cause out of range 0
IOSXE-RP Punt packet causes:
    42879 Layer2 control and legacy packets
    3644168 ARP request or response packets
    7584 For-us data packets
    1794 Mcast Directly Connected Source packets
    1573 Mcast PIM signaling packets
    750076 For-us control packets
38058 Layer2 bridge domain data packet packets
    3823736 Layer2 control protocols packets

```

FOR_US Control IPv4 protcol stats:

750076 [proto=0] packets

Packet histogram(500 bytes/bin), avg size in 125, out 126:

Pak-Size	In-Count	Out-Count
0+:	8228322	5207592
500+:	41355	1717
1000+:	4331	2402
1500+:	35860	20017

Lsmpl11/3 is up, line protocol is up <-- CPU interface

```

Hardware is LSMPI
MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not set
Unknown, Unknown, media type is unknown media type
output flow-control is unsupported, input flow-control is unsupported
ARP type: ARPA, ARP Timeout 04:00:00
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/1500/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
    8309868 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts (0 IP multicasts)
    0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast, 0 pause input
    5231728 packets output, 659535525 bytes, 0 underruns 0 output errors, 0 collisions, 0
interface resets 0 unknown protocol drops 0 output buffer failures, 0 output buffers swapped out

```

C9400#show platform software infrastructure lsmpi punt

```

LSMPI punt statistics
    Total packets consumed:          876
    Total packets forwarded:        8468766
    First frag packets:              0
    Total packets consumed & forwarded: 0

```

Cause	Total	Total	Length	Dot1q encap
Other	SKB			

linktype	invalid	consumed	forwarded	error	exceeded
MPLS ICMP Can't Fragment		0	0	0	0
0					
IPv4 Options		0	0	0	0
0					
Layer2 control and legacy		0	0	0	0
0					
PPP Control		0	0	0	0
0					
CLNS IS-IS Control		0	0	0	0
0					
HDLC keepalives		0	0	0	0
0					

--snip--

Check CPU inject path (software-CPU towards hardware-Supervisor) statistics from a software (CPU) perspective.

C9400#**show platform software infrastructure inject**

Statistics for L3 injected packets:

5233473 total inject pak, 3 failed

0 sent, 859329 prerouted

0 non-CEF capable, 855296 non-unicast

859826 IP, 0 IPv6

0 MPLS, 0 Non-IP Tunnel

0 UDLR tunnel, 0 P2MP replicated mcast

0 Non-IP Fastswitched over Tunnel, 4373497 legacy pak path

0 Other packet

0 IP fragmented

644 normal, 391 nexthop

858788 adjacency, 150 feature

0 undefined

3 pak find no adj, 0 no adj-id

137322 sb alloc, 856085 sb local

0 p2mcast failed count 0 p2mcast enqueue fail

0 unicast dhcp

0 mobile ip

0 IPv6 NA

0 IPv6 NS

0 Transport failed cases

0 Grow packet buffer

per feature packet inject statistics

150 Feature multicast

0 Feature Edge Switching Service

0 Feature Session Border Controller

0 Feature interrupt level

0 Feature use outbound interface

0 Feature interrupt level with OCE

0 Feature ICMPv6 error message

0 Feature Session Border Controller media packet injection

0 Feature Tunnel Ethernet over GRE

0 Feature Secure Socket Layer Virtual Private Network

0 Feature EPC Wireshark injecting packets

Statistics for L2 injected packets:

0 total L2 inject pak, 0 failed

0 total BD inject pak, 0 failed

0 total EFP inject pak, 0 failed

0 total VLAN inject pak, 0 failed

Check CPU punt/inject path statistics from a FED (UADP 2.0) perspective.

C9400#show platform software fed active lsmpi stat

LSMPI Statistics

Transmit: -----> FED transmit = FED (Supervisor) punt to CPU

Packet Count : 8469445
Bytes Count : 1055390613
particle Count : 8951009
particle with App : 7258
Ring Full Error : 0
No Buff Error : 0
TX Ring Free : 2047
TX Ring Busy : 0
TX Ring Size : 2048
TXDone Ring Free : 6816
TXDone Ring Busy : 9567
TXDone Ring Size : 16384

Receive: -----> FED receive = CPU inject to FED (Supervisor)

Packet Count : 5450099
Bytes Count : 675084903 Particle Count : 5695697 Particles with App : 4294966854 RX
Done Count : 5696139 No SOP : 0 No EOP : 0 Not Enough Buf : 0 Max Not Enough Buf : 0 RX Ring
Free : 4095 RX Ring Busy : 0 RX Ring Size : 4096 RXDone Ring Free : 8191 RXDone Ring Busy : 0
RXDone Ring Size : 8192 -----

Check the CPU punt path (hardware-Supervisor towards software-CPU) statistics from a FED (Supervisor) perspective.

C9400#show platform software fed active punt cause summary

Statistics for all causes

Cause	Cause Info	Rcvd	Dropped
7	ARP request or response	3644168	0
11	For-us data	1524	0
12	Mcast Directly Connected Source	1794	0
25	Mcast PIM signaling	1573	0
55	For-us control	750461	0
58	Layer2 bridge domain data packet	38058	0
96	Layer2 control protocols	3825228	0

Check the health of the 31 individual CPU punt queues from a FED (Supervisor) perspective.

C9400#show platform software fed active cpu-interface

queue	retrieved	dropped	invalid	hol-block
Routing Protocol	790844	0	0	0
L2 Protocol	2774488	0	0	0
sw forwarding	0	0	0	0
broadcast	0	0	0	0
icmp	0	0	0	0
icmp redirect	0	0	0	0
logging	0	0	0	0
rpf-fail	1573	0	0	0
DOT1X authentication	0	0	0	0
Forus Traffic	1524	0	0	0
Forus Resolution	3644192	0	0	0
Wireless q5	0	0	0	0
Wireless q1	0	0	0	0

Wireless q2	0	0	0	0
Wireless q3	0	0	0	0
Wireless q4	0	0	0	0
Learning cache	0	0	0	0
Topology control	1198807	0	0	0
Proto snooping	0	0	0	0
BFD Low latency	0	0	0	0
Transit Traffic	0	0	0	0
Multi End station	38058	0	0	0
Health Check	0	0	0	0
Health Check	0	0	0	0
Crypto control	0	0	0	0
Exception	0	0	0	0
General Punt	0	0	0	0
NFL sampled data	0	0	0	0
STG cache	0	0	0	0
EGR exception	0	0	0	0
FSS	0	0	0	0
Multicast data	1794	0	0	0

C9400#show platform software fed active punt cpuq all
Punt CPU Q Statistics

=====

-snip-

```

CPU Q Id          : 1
CPU Q Name        : CPU_Q_L2_CONTROL
Packets received from ASIC      : 2669864 -----> Packets received by the FED process from
the Supervisor forwarding ASICs
Send to IOSd total attempts    : 2669864 -----> Packets sent from the FED process to IOSd
Send to IOSd failed count      : 0
RX suspend count               : 0
RX unsuspend count             : 0
RX unsuspend send count       : 0
RX unsuspend send failed count : 0
RX consumed count              : 0
RX dropped count               : 0
RX non-active dropped count     : 0
RX conversion failure dropped  : 0
RX INTACK count                : 2243784
RX packets dq'd after intack   : 5074
Active RxQ event               : 2243785
RX spurious interrupt          : 322266

```

```

CPU Q Id          : 2
CPU Q Name        : CPU_Q_FORUS_TRAFFIC
Packets received from ASIC      : 1524
Send to IOSd total attempts    : 1524
Send to IOSd failed count      : 0
RX suspend count               : 0
RX unsuspend count             : 0
RX unsuspend send count       : 0
RX unsuspend send failed count : 0
RX consumed count              : 0
RX dropped count               : 0
RX non-active dropped count     : 0
RX conversion failure dropped  : 0
RX INTACK count                : 1347
RX packets dq'd after intack   : 8

```

```
Active RxQ event          : 1347
RX spurious interrupt     : 38
```

-snip-

Check the CPU inject path (software-CPU towards hardware-Supervisor) statistics from a FED (Supervisor) perspective.

```
C9400#show platform software fed active inject cause summary
```

Statistics for all causes

Cause	Cause Info	Rcvd	Dropped
1	L2 control/legacy	4331682	0
2	QFP destination lookup	290	0
3	QFP IPv4/v6 nexthop lookup	391	0
7	QFP adjacency-id lookup	859393	265
8	Mcast specific inject packet	150	0
12	ARP request or response	601	0

Check the health of the 2 individual CPU inject queues from a FED (UADP 2.0) perspective.

```
C9400#show platform software fed active inject cpuq all
```

Inject CPU Q Statistics

=====

```
CPU Q Id          : 0
CPU Q Name      : TX_CPUQ_PRIO_LOW ---> low priority CPU inject queue
Packets received from IOSd : 168342
Enq to pkt driver total attempts : 168277
Enq to pkt driver failed count : 0
Count of TX CMPL received : 168277
TX suspend count : 0
TX unsuspend count : 0
TX dropped count : 265
TX punted count : 0
TX App enq failed : 0
```

```
CPU Q Id          : 7
CPU Q Name      : TX_CPUQ_PRIO_HI ---> high priority CPU inject queue
Packets received from IOSd : 5024664
Enq to pkt driver total attempts : 5024664
Enq to pkt driver failed count : 0
Count of TX CMPL received : 5024664
TX suspend count : 0
TX unsuspend count : 0
TX dropped count : 0
TX punted count : 0
TX App enq failed : 0
```

Stats for all txq:

```
-----
TX chunk malloc fail count : 0
-----
```

MAC Table Event Statistics

```
C9400#show platform software fed active matm stats
```

MATM counters

```
Total non-cpu mac entries      : 10
Mac Learn SPI Msg Count        : 0
Mac Learn SPI Err Count        : 0
Mac Delete SPI Msg Count       : 0
Mac Delete SPI Err Count       : 0
Mac Learn Count                : 967
Mac Add Count                  : 989
Mac AL add Count               : 971
Mac Del Count                  : 957
Mac AL Del Count               : 961
Mac Move Count                 : 2 ---> MAC moves between interfaces (see details above)
Mac AL Move Count              : 0
Mac Clear Count                : 0
Mac Del all count              : 6
Mac table create Count         : 9
Mac VP event Count             : 5
Mac Update info Count          : 0
Mac Vlan age config Event Count : 0
Mac Vlan Link Event Count      : 6
Mac SVI linkEvent Count        : 3
Mac Bsync Event Count          : 0
Mac Isync Event Count          : 0
Mac Recon Start Count          : 0
Mac Recon Event Count          : 0
Mac IFM event Count            : 75
Mac FEC Event Count            : 0
Mac Aging Tick Count           : 0
Mac Retry event Count          : 0
Mac Hw Update Err Count        : 0
Mac In retryQ Count            : 0
```

C9400#**configure terminal**

C9400(config)#**mac address-table notification ?**

```
change      Enable/Disable MAC Notification feature on the switch
mac-move    Enable Mac Move Notification
threshold   Configure L2 Table monitoring
```

C9400(config)#**mac address-table notification mac-move ---> enabled by default, syslog generated for any MAC move (show logging)**

C9400(config)#**mac address-table notification change ?**

```
history-size  Number of MAC notifications to be stored
interval      Interval between the MAC notifications
<cr>         <cr>
```

C9400(config)#**mac address-table notification change ---> disabled by default**

C9400#**show mac address-table notification mac-move**

MAC Move Notification: **enabled**

C9400#**show mac address-table notification change**

MAC Notification Feature is Enabled on the switch Interval between Notification Traps : 1 secs
Number of MAC Addresses Added : 0 Number of MAC Addresses Removed : 0 Number of Notifications
sent to NMS : 0 Maximum Number of entries configured in History Table : 1 Current History Table
Length : 0 MAC Notification Traps are Disabled History Table contents -----

UADP 2.0 Exception Drops

This command details any reasons that a UADP 2.0 forwarding ASIC drops a packet:

```
C9400#show platform hardware fed active fwd-asic drops exceptions
****EXCEPTION STATS ASIC INSTANCE 0 (asic/core 0/0)****
===== Asic/core |
NAME | prev | current | delta
===== 0 0
NO_EXCEPTION 0 0 0 0 IPV4_CHECKSUM_ERROR 0 0 0 0 ROUTED_AND_IP_OPTIONS_EXCEPTION 0 0 0 0
CTS_FILTERED_EXCEPTION 0 0 0 0 SIA_TTL_ZERO 0 0 0 0 ALLOW_NATIVE_EXCEPTION_COUNT 0 0 0 0
ALLOW_DOT1Q_EXCEPTION_COUNT 0 0 0 0 ALLOW_PRIORITY_TAGGED_EXCEPTION_COUNT 0 0 0 0
ALLOW_UNKNOWN_ETHER_TYPE_EXCEPTION 0 0 0 0 IP_SOURCE_GUARD_VIOLATION 0 0 0 0
SECURE_L3IF_LEARNING_VIOLATION 0 0 0 0 AUTH_DRIVEN_DROP 0 0 0 0 VLAN_LOADBALANCE_GROUP_DENY
0 0 0 0 RPF_UNICAST_FAIL 0 0 0 0 RPF_UNICAST_FAIL_SUPPRESS 0 0 0 0
RPF_UNICAST_CHECK_INCOMPLETE 0 0 0 0 RPF_MULTICAST_FAIL 0 0 0 0 PKT_DROP_COUNT 0 0 0 0
SOURCE_ROUTE_EXCEPTION 0 0 0 0 IGR_MISC_FATAL_ERROR 0 0 0 0 BLOCK_FORWARD 0 0 0 0
POLICER_DROP 0 0 0 0 DENY_ROUTE 0 0 0 0 DENY_BRIDGE 0 0 0 0 STATIC_MAC_VIOLATION 0 0 0 0
STATIC_IP_VIOLATION 0 0 0 0 FPM_DROP_PACKET 0 0 0 0 IGR_EXCEPTION_L4_ERROR 0 0 0 0
IGR_EXCEPTION_L5_ERROR 0 0 0 0 IGR_EXCEPTION_HARDWARE_PARSE_EXCEPTION 0 0 0 0
IGR_EXCEPTION_INVALID_VLAN_DROP 0 0 0 0 IGR_EXCEPTION_31 0 0 0 0
FRAGMENTING_IPV4_WITH_OPTIONS 0 0 0 0 FRAGMENTING_IPV6_WITH_EXTENSIONS 0 0 0 0 ICMP_REDIRECT
0 0 0 0 MTU_FAIL_PUNT_TO_CPU_NO_IP_UNREACHABLE 0 0 0 0
LINK_LOCAL_CHECK_FAIL_NO_IP_UNREACHABLE 0 0 0 0 IP_UNICAST_TTL_REACHED_ZERO 0 0 0 0
MISC_FATAL_ERROR 0 0 0 0 STP_OR_FLEXLINK_DROP 0 0 0 0 PROTECTED_PORT_DROP 0 0 0 0
PVLAN_ISOLATED_CHECK_FAILED 0 0 0 0 PVLAN_COMMUNITY_CHECK_FAILED 0 0 0 0
DEJA_VU_CHECK_FAILED 0 0 0 0 NOT_VLAN_LOAD_BALANCE_GROUP_ALLOWED 0 0 0 0 RSPAN_DROP 0 0 0 0
0 SPLIT_HORIZON_DROP 0 0 0 0 SYSTEM_TTL_DROP 0 0 0 0 PRUNED 0 0 0 0 DENY_NO_IP_UNREACHABLE
0 0 0 0 IP_MULTICAST_TTL_REACHED_ZERO 0 0 0 0 MTU_FAIL_DROP_BRIDGED 0 0 0 0
MTU_FAIL_DROP_BRIDGED_IP_ROUTED 0 0 0 0 MTU_FAIL_ERSPAN 0 0 0 0
LINK_LOCAL_CHECK_FAIL_L3M_VALID 0 0 0 0 DENY_NOT_NO_IP_UNREACHABLE 0 0 0 0
MTU_FAIL_PUNT_TO_CPU_NOT_NO_IP_UNREACHABLE 0 0 0 0 LINK_LOCAL_CHECK_FAIL_NOT_NO_IP_UNREACHABLE
0 0 0 0 COPY_TO_CPU 0 0 0 0 EGR_L3_ERROR 0 0 0 0 EGR_L4_ERROR 0 0 0 0 EGR_L5_ERROR 0 0 0
0 0 EGR_HARDWARE_PARSE_EXCEPTION 0 0 0 0 EGR_SHOW_FORWARD_DROP 0 0 0 ****EXCEPTION STATS ASIC
INSTANCE 1 (asic/core 0/1)****
===== Asic/core |
NAME | prev | current | delta
===== 0 1
NO_EXCEPTION 13168 16679 3511 0 1 IPV4_CHECKSUM_ERROR 0 0 0 0 1 ROUTED_AND_IP_OPTIONS_EXCEPTION
81 103 22
--snip--
```

Supervisor Statistics - Supervisor to Line Card Data Path

Check the active Supervisor UADP 2.0 forwarding ASIC statistics that are associated with a specific front panel interface. In this example, the interface Gig1/0/13 is used.

Output Example:

- Check which interfaces on the Line card are part of the same port group.
- Each port group shared 8 Gbps of bandwidth from the Line card stub ASIC towards the Supervisor forwarding ASIC.
- Each port group is associated with one of the SLI (System Link Interface) on the Line card stub ASIC towards the Supervisor forwarding ASIC.

```
C9400#show platform hardware cman fp active data-path 1 13 detail ---> Slot 1, interface 13
```


rx8192to16383ByteFrames	0	tx8192to16383ByteFrames	0
rx4096to8191ByteFrames	0	tx4096to8191ByteFrames	0
rx2048to4095ByteFrames	0	tx2048to4095ByteFrames	0
rx1519to2047ByteFrames	51	tx1519to2047ByteFrames	0
rx1024to1518ByteFrames	15	tx1024to1518ByteFrames	0
rx512to1023ByteFrames	17	tx512to1023ByteFrames	187
rx256to511ByteFrames	3406	tx256to511ByteFrames	9407
rx128to255ByteFrames	6567	tx128to255ByteFrames	6580
rx65to127ByteFrames	11295	tx65to127ByteFrames	8583
rx64ByteFrames	18362	tx64ByteFrames	18458

---> Input queue (Igr = Ingress)

IgrPacketCounters:		EgrPacketCounters:	
packetsIn	97777	packetsIn	580324
packetsOut	97777	packetsEnqueueFcd_val	0
packetsDropped	3383	packetsMarkedForDrop	278
fpsSourcedPadErrorCount	0	padErrorPacketsIn	0
igrSourcedPadErrorCount	0	padErrorPacketsOut	0

For RWE for core 0:

RweTotalEnqStats:	
packetCount	580324
RweTotalDeqStats:	
packetCount	580046
FragmentCount	580046

For EQC for core 0:

EqcTotalEnqStats:	
Count	580704
EqcTotalDeqStats:	
Count	580324

For aqmRedQueueStats for asic port 12:

AqmRedQueueStats: (sum of all queues)

---> Output queue (Aqm = Active queue management)

acceptByteCnt0	0
acceptFrameCnt0	0
acceptByteCnt1	6407742
acceptFrameCnt1	43070
acceptByteCnt2	39609
acceptFrameCnt2	395
dropByteCnt0	0
dropFrameCnt0	0
dropByteCnt1	0
dropFrameCnt1	0
dropByteCnt2	0
dropFrameCnt2	0
outOfSoftBufDropByteCnt	0
outOfSoftBufDropFrameCnt	0
maxQebDropByteCnt	0
maxQebDropFrameCnt	0

For PBC for core 0:

PbcIngressErrorDropCount:		PbcEgressErrorDropCount:	
iCount	0	eS0Count	0
iCount	0	eS1Count	0
PbcCreditCount:		PbcEnqFcErrorDropCount:	
creditCount	64	fCount	0
rwePbcStall	0		

For local/core 0 Switching:

SqsCumulativeStatistics	
totalEnqStat	1368200
totalDeqStat	1368200

```

totalDropStat          0
SqsCumulativeStatisticsB
totalEngStat           173449513
totalDeqStat           173449513
totalDropStat          0

```

```

=====
For local/core 1 Switching:

```

```

SqsCumulativeStatistics
totalEngStat           890114
totalDeqStat           890114
totalDropStat          0
SqsCumulativeStatisticsB
totalEngStat           105061923
totalDeqStat           105061923
totalDropStat          0

```

```

=====
For Sif 0 Switching:

```

SifRacInsertedCnt:		SifSifPbcCnt0:	
SifRacInsertedCnt[0]	2295051	Count	81302675
SifRacInsertedCnt[1]	1738892	SifSifPbcCnt1:	
SifRacInsertedCnt[2]	1666479	Count	58187651
SifRacInsertedCnt[3]	2773364	SifRacCopiedCnt:	
SifRacInsertedCnt[4]	3126116	SifRacCopiedCnt[0]	35850468
SifRacInsertedCnt[5]	2066567	SifRacCopiedCnt[1]	19265491
		SifRacCopiedCnt[2]	23814855
		SifRacCopiedCnt[3]	32727259
		SifRacCopiedCnt[4]	38376676
		SifRacCopiedCnt[5]	22176467

```

=====
For Sif 1 Switching:

```

SifRacInsertedCnt:		SifSifPbcCnt0:	
SifRacInsertedCnt[0]	11713808	Count	40956521
SifRacInsertedCnt[1]	8319576	SifSifPbcCnt1:	
SifRacInsertedCnt[2]	8816344	Count	40956521
SifRacInsertedCnt[3]	15404080	SifRacCopiedCnt:	
SifRacInsertedCnt[4]	16161715	SifRacCopiedCnt[0]	8615615
SifRacInsertedCnt[5]	9745420	SifRacCopiedCnt[1]	7489596
		SifRacCopiedCnt[2]	7608895
		SifRacCopiedCnt[3]	8717898
		SifRacCopiedCnt[4]	9685735
		SifRacCopiedCnt[5]	7866174

Check the flow control status from a Supervisor perspective for the front panel interface. This helps identify if there is any congestion on the interface.

```

C9400#show platform hardware cman fp active flowcontrol status
slot 1:Port 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 EsmF - - - -
- - - - - IqsC - - - - -
Port 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 EsmF - - - - -
- - - - - IqsC - - - - -
slot 2:
Port 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 EsmF - - - - -
- - - - - IqsC - - - - -
Port 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 EsmF - - - - -
- - - - - IqsC - - - - -
slot 3: Port 01
02 03 04 05 06 07 08 09 10 EsmF - - - - - IqsC 01 - - - - -
slot 4: Port 01 02 03
04 05 06 07 08 09 10 EsmF - - - - - IqsC - - - - -
slot 5: Port 01 02 03
04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 EsmF - - - - -
- - - - - IqsC - - - - -
Port 25 26 27 28 29 30
31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 EsmF - - - - -
- - - - - IqsC - - - - -
slot 6: Possibly linecard is not
inserted slot 7: Possibly linecard is not inserted

```

Check that control traffic is flowing from a Supervisor forwarding ASIC perspective between the Supervisor forwarding ASIC on the active Supervisor and the Line card stub ASIC on the Line card via the OCI interfaces.

```
C9400#show platform hardware cman fp active oci status
```

```
processing oci information:
```

```
chassis_type:      1
sup slot:          4
sup num oci ports: 8
```

```
slot_id 1 : oci_enable Enabled   Link Status 0 (UP)
             asic_id 1 core_id 0 oci_port 3 mac_id 0
             NruRxByteGroupStats: rxBytes 417829462717812           NruTxByteGroupStats: txBytes
588911286106332

slot_id 2 : oci_enable Enabled   Link Status 0 (UP)
             asic_id 0 core_id 0 oci_port 1 mac_id 1
             NruRxByteGroupStats: rxBytes 417938235716344           NruTxByteGroupStats: txBytes
588917607864892

slot_id 5 : oci_enable Enabled   Link Status 0 (UP)
             asic_id 1 core_id 0 oci_port 4 mac_id 1
             NruRxByteGroupStats: rxBytes 53195855717244           NruTxByteGroupStats: txBytes
588915422236932

slot_id 6 : oci_enable Enabled   Link Status 1 (DOWN)
             asic_id 2 core_id 0 oci_port 6 mac_id 0
             NruRxByteGroupStats: rxBytes 0                         NruTxByteGroupStats: txBytes 0

slot_id 7 : oci_enable Enabled   Link Status 1 (DOWN)
             asic_id 0 core_id 0 oci_port 2 mac_id 2
             NruRxByteGroupStats: rxBytes 0                         NruTxByteGroupStats: txBytes 0
```

Line Card Statistics - Supervisor to Line Card Data Path

Check the Line card Line card stub ASIC statistics that are associated with a specific front panel interface. In this example, the interface Gig1/0/13 is the focus.

Output example:

- Packets received from Gig 1/0/13, enter the Network Interface receiving port and progress through IQS to the stack interface.
- From there, a packet either goes out the stack interface to another Supervisor ASIC , or comes back through the SQS, AQM, EQC, ESM, RWE, and then goes out the Network interface transmit of Gig 1/0/13.
- Packets sent from other Supervisor ASICs interfaces that egress out of Gig 1/0/13 enter Sif and then pass through SQS, AQM, EQC, ESM, RWE and then goes out the NifTx of Gig 1/0/13.
- For AQM there are 8 Tx queues. If you see drops from these queues, you can use this command to determine which one of the queues is experiencing drops: show platform hardware fed active goes queue stats interface Gig 1/0/13

```
C9400#show platform hardware iomd 1/0 data-path 13 detail ----> slot 1, interface 13
```

```
lcpportmap.xml: ---> Line Card (lc) ASIC instance 0 is associated with interface Gig1/0/13
```

id 13 asic 0 asicport 12 mac 23 contextid 12 intl_port_sup0 9 intl_port_sup1 1 maxspeed DEV_PORT_SPEED_1G asic_subport 4

fp_portmap.xml: ---> Supervisor ASIC 1, core 0 is associated with front panel (fp) interface Gig1/0/13

id 13 asic 1 core 0 port 12 mac 0 subport 4 contextid 0 maxspeed DEV_PORT_SPEED_1G gpn 113 active 1

data path:

slot 3 +---ACTIVE SUP---+ | | ---> Supervisor ASIC 1, core 0 on the slot 3 active Supervisor associated with interface Gig1/0/13

```
| ASIC 1 |
| Core 0 |
| Asic Port 12 |
| (Mac 0) |
| Nif_Rx NifTx |
+-----+
```

SLI MAC 9

```
+-----+
| | |
+-----+
```

card ASIC ---> Line Card 1. The statistic output below is only for this Line card ASIC

```
| ASIC 0 |
| Asic Port 12 |
| (Mac 23) |
| NIF_Rx NIF_Tx |
+-----+
```

Front Port 1/0/13

```
^ |
| |
| |
| |
V
```

=====

Nif MAC 23 Inforation:

NifRxByteGroupStats:

```
rxBytes 4457854
NifRxByteDestinationGroupStats:
rxUnicastBytes 1163684
rxMulticastBytes 3294170
rxBroadcastBytes 0
```

NifRxPortStatusGroupStats:

```
rxUnicastFrames 18155
rxMulticastFrames 21235
rxBroadcastFrames 0
rxPauseFrames 0
rxCos0PauseFrames 0
rxCos1PauseFrames 0
rxCos2PauseFrames 0
rxCos3PauseFrames 0
rxCos4PauseFrames 0
rxCos5PauseFrames 0
rxCos6PauseFrames 0
rxCos7PauseFrames 0
rxOamProcessedFrames 0
```

NifRxPortStatusGroupStats:

```
rxCollisionFragments 0
rxFcsErrorFrames 0
rxInvalidOversizeFrames 0
rxMacOverrunFrames 0
rxIpgViolationFrames 0
```

NifTxByteGroupStats:

```
txBytes 6440428
NifTxByteDestinationGroupStats:
txUnicastBytes 1164528
txMulticastBytes 5250491
txBroadcastBytes 25409
```

NifTxFrameDestinationGroupStats:

```
txUnicastFrames 18158
txMulticastFrames 24625
txBroadcastFrames 51
txPauseFrames 0
txCos0PauseFrames 0
txCos1PauseFrames 0
txCos2PauseFrames 0
txCos3PauseFrames 0
txCos4PauseFrames 0
txCos5PauseFrames 0
txCos6PauseFrames 0
txCos7PauseFrames 0
txOamFrames 0
```

NifTxPortStatusGroupStats:

```
txLateCollisionFrames 0
txsystemFcsErrorFrames 0
txOversizeFrames 0
txMacUnderrunFrames 0
txDeferredFrames 0
```

rxOamDroppedFrames	0	txExcessiveDeferralFrames	0
rxSymbolErrorFrames	0	txOkMultipleCollisionFrames	0
rxValidOversizeFrames	0	txOkSingleCollisionFrames	0
rxValidUndersizeFrames	0	goldFramesTruncated	0
NifRxSizeGroupStats:		NifTxSizeGroupStats:	
rx32768toMtuFrames	0	tx32768toMtuFrames	0
rx16384to32767ByteFrames	0	tx16384to32767ByteFrames	0
rx8192to16383ByteFrames	0	tx8192to16383ByteFrames	0
rx4096to8191ByteFrames	0	tx4096to8191ByteFrames	0
rx2048to4095ByteFrames	0	tx2048to4095ByteFrames	0
rx1519to2047ByteFrames	51	tx1519to2047ByteFrames	0
rx1024to1518ByteFrames	15	tx1024to1518ByteFrames	0
rx512to1023ByteFrames	17	tx512to1023ByteFrames	186
rx256to511ByteFrames	3374	tx256to511ByteFrames	9318
rx128to255ByteFrames	6505	tx128to255ByteFrames	6518
rx65to127ByteFrames	11237	tx65to127ByteFrames	8526
rx64ByteFrames	18191	tx64ByteFrames	18286

---> Input queue (Igr = Ingress)

IgrPacketCounters:		EgrPacketCounters:	
packetsIn	97078	packetsIn	576307
packetsOut	97078	packetsEnqueueFcd_val	0
packetsDropped	0	packetsMarkedForDrop	0
fpsSourcedPadErrorCount	0	padErrorPacketsIn	0
igrSourcedPadErrorCount	0	padErrorPacketsOut	0

For agmRedQueueStats for asic port 12:

---> Output queue (Agm = Active queue management)	AqmRedQueueStats:	(sum of all queues)
	acceptByteCnt0	0
	acceptFrameCnt0	0
	acceptByteCnt1	0
	acceptFrameCnt1	0
	acceptByteCnt2	6440428
	acceptFrameCnt2	42834
	dropByteCnt0	0
	dropFrameCnt0	0
	dropByteCnt1	0
	dropFrameCnt1	0
	dropByteCnt2	0
	dropFrameCnt2	0
	outOfSoftBufDropByteCnt	0
	outOfSoftBufDropFrameCnt	0
	maxQebDropByteCnt	0
	maxQebDropFrameCnt	0

SLI MAC 9 - SUP 0: (an ACTIVE sup in slot 3)

SliTxByteGroupStats:		SliRxByteGroupStats:	
txBytes	4457854	rxBytes	6440428

SLI MAC 1 - SUP 1:

SliTxByteGroupStats:		SliRxByteGroupStats:	
txBytes	0	rxBytes	0

Check the flow control status from a Line card perspective for the front panel interface. This helps identify any congestion on the interface.

- Values are "-" when there is no flow control otherwise the queue number experiencing flow control (congestion) is indicated.

- Flow control received by the interface is passed from the Line card ASIC on the Line card to the Supervisor ASIC on the Supervisor where AQM drops typically be seen on the Supervisor Supervisor ASIC. The OCI (Out-of-band Control Interface) is the internal communication channel between the Line card and active Supervisor that is used to signal the flow control from Line card to Supervisor.

```
C9400#show platform hardware iomd 1/0 flowcontrol status ---> slot 1
```

```
Slot 1 - number of ports 48
```

```
slot 1:  Port 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
         IsmF  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
         IqmC  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
         Port 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
         IsmF  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
         IqmC  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -  -
```

Check that control traffic is flowing from a Line card stub ASIC perspective between the Line card stub ASIC on the Line card and the Supervisor forwarding ASIC on the active and standby Supervisors via the OCI interfaces.

- OCI = Out-of-band Control Interface = internal communication channels between the Line card and active and standby Supervisors

```
C9400#show platform hardware iomd 1/0 oci status ---> slot 1
```

```
Asic 0, Mac 10, Tx OCI Config 0, OCI Merge FALSE, OCI Enabled, Link Status 0 (UP)
Network Port Range 0---47, Local Port Range 0---47
NifRxByteGroupStats:  rxBytes 177402572782108          NifTxByteGroupStats:  txBytes
141925777717156
```

```
Asic 0, Mac 11, Tx OCI Config 0, OCI Merge FALSE, OCI Enabled, Link Status 0 (UP)
Network Port Range 0---47, Local Port Range 0---47
NifRxByteGroupStats:  rxBytes 963489284              NifTxByteGroupStats:  txBytes 770809988
```

Check which interfaces on the Line card are part of the same port group which shares 8 Gbps of bandwidth from the Line card stub ASIC on the Line card towards the Supervisor forwarding ASIC on the active Supervisor. Each port group is associated with one of the SLI (System Link Interface) on the Line card stub ASIC towards the Supervisor.

```
C9400#show platform hardware iomd 1/0 portgroups ---> slot 1
```

```
Port Interface Status Interface Group Max <-- aggregate bandwidth for 8 ports
Group Bandwith Bandwidth
```

```
1    TenGigabitEthernet1/0/1    up    1G
1    TenGigabitEthernet1/0/2    down  1G
1    TenGigabitEthernet1/0/3    admindown 1G
1    TenGigabitEthernet1/0/4    down  1G
1    TenGigabitEthernet1/0/5    down  1G    8G
1    TenGigabitEthernet1/0/6    down  1G
1    TenGigabitEthernet1/0/7    down  1G
1    TenGigabitEthernet1/0/8    down  1G
```


2	TenGigabitEthernet1/0/9	down	1G	
2	TenGigabitEthernet1/0/10	down	1G	
2	TenGigabitEthernet1/0/11	down	1G	
2	TenGigabitEthernet1/0/12	down	1G	
2	TenGigabitEthernet1/0/13	up	1G	8G
2	TenGigabitEthernet1/0/14	down	1G	
2	TenGigabitEthernet1/0/15	down	1G	
2	TenGigabitEthernet1/0/16	down	1G	
3	TenGigabitEthernet1/0/17	down	1G	
3	TenGigabitEthernet1/0/18	down	1G	
3	TenGigabitEthernet1/0/19	down	1G	
3	TenGigabitEthernet1/0/20	down	1G	
3	TenGigabitEthernet1/0/21	down	1G	8G
3	TenGigabitEthernet1/0/22	down	1G	
3	TenGigabitEthernet1/0/23	down	1G	
3	TenGigabitEthernet1/0/24	down	1G	
4	TenGigabitEthernet1/0/25	down	1G	
4	TenGigabitEthernet1/0/26	down	1G	
4	TenGigabitEthernet1/0/27	down	1G	
4	TenGigabitEthernet1/0/28	down	1G	
4	TenGigabitEthernet1/0/29	down	1G	8G
4	TenGigabitEthernet1/0/30	down	1G	
4	TenGigabitEthernet1/0/31	down	1G	
4	TenGigabitEthernet1/0/32	down	1G	
5	TenGigabitEthernet1/0/33	down	1G	
5	TenGigabitEthernet1/0/34	down	1G	
5	TenGigabitEthernet1/0/35	down	1G	
5	TenGigabitEthernet1/0/36	down	1G	
5	TenGigabitEthernet1/0/37	down	1G	8G
5	TenGigabitEthernet1/0/38	down	1G	
5	TenGigabitEthernet1/0/39	down	1G	
5	TenGigabitEthernet1/0/40	down	1G	
6	TenGigabitEthernet1/0/41	down	1G	
6	TenGigabitEthernet1/0/42	down	1G	
6	TenGigabitEthernet1/0/43	down	1G	
6	TenGigabitEthernet1/0/44	down	1G	
6	TenGigabitEthernet1/0/45	down	1G	8G
6	TenGigabitEthernet1/0/46	down	1G	
6	TenGigabitEthernet1/0/47	down	1G	
6	TenGigabitEthernet1/0/48	up	1G	