

This article describes how to troubleshoot licensing on a Cisco NX-OS device.

<b>Guide Contents</b>
<a href="#">Troubleshooting Overview</a>
<a href="#">Troubleshooting Installs, Upgrades, and Reboots</a>
<a href="#">Troubleshooting Licensing</a>
<a href="#">Troubleshooting VDCs</a>
<a href="#">Troubleshooting CFS</a>
<a href="#">Troubleshooting Ports</a>
<a href="#">Troubleshooting vPCs</a>
<a href="#">Troubleshooting VLANs</a>
<a href="#">Troubleshooting STP</a>
<a href="#">Troubleshooting Routing</a>
<a href="#">Troubleshooting Unicast Traffic</a>
<a href="#">Troubleshooting WCCP</a>
<a href="#">Troubleshooting Memory</a>
<a href="#">Troubleshooting Packet Flow Issues</a>
<a href="#">Troubleshooting FCoE (this section)</a>
<a href="#">Before Contacting Technical Support</a>
<a href="#">Troubleshooting Tools and Methodology</a>

## Contents

- [1 Information About Troubleshooting FCoE Issues](#)
  - ◆ [1.1 VFC in error disabled state because of missing F1 module license](#)
  - ◆ [1.2 Verify FLOGI was processed successfully for VFC interface](#)
  - ◆ [1.3 Verify ELP was processed successfully for VFC interface](#)
  - ◆ [1.4 VFC \(VF/VE\) interface is not up on FCoE enabled VSAN](#)
  - ◆ [1.5 Packet does not reach SUP or FCoE data packet gets dropped](#)
  - ◆ [1.6 Packets should match inband packets:](#)
  - ◆ [1.7 Troubleshooting ? Hardware Errors](#)
  - ◆ [1.8 Troubleshooting ? IdxMap verification](#)
  - ◆ [1.9 Troubleshooting ? MPMMap verification](#)
  - ◆ [1.10 Troubleshooting ? FIP BPDU Classification](#)
  - ◆ [1.11 Troubleshooting ? SMM FIP Redirect Criteria](#)
  - ◆ [1.12 Troubleshooting ? SMM FIP Redirect ?Action](#)
  - ◆ [1.13 Troubleshooting ? FMM \(FCoE MAC Match\)](#)
  - ◆ [1.14 Troubleshooting ? Port-Type \(ILM Table\)](#)
  - ◆ [1.15 FIB verification ? Verifying routes](#)

## Information About Troubleshooting FCoE Issues

This article describes how to troubleshoot FCoE issues on a Cisco NX-OS device.

## VFC in error disabled state because of missing F1 module license

### Example:

```
sw2-gd73-storage-vdc# show interface vfc2/2

vfc2/2 is down (Error Disabled - Ethernet interface module is not licensed)
          /*** If FCoE license is not enabled for F1 module          ***/

          /*** then VFC interface will remain in error disabled state ***/
Bound interface is Ethernet2/2

Hardware is Ethernet
Port WWN is 20:42:00:26:51:cf:55:00

Admin port mode is F, trunk mode is on
snmp link state traps are enabled

Port vsan is 256
477 fcoe in packets

48312 fcoe in octets
1616 fcoe out packets

2181244 fcoe out octets
Interface last changed at Mon Feb 4 11:19:20 2012
```

### Recommended Action:

#### 1) Enable FCoE license for F1 module (from default VDC)

```
sw2-gd73# conf

Enter configuration commands, one per line. End with CNTL/Z.
sw2-gd73(config)# show mod

Mod  Ports  Module-Type                Model                Status
---  ---  ---
2    32    1/10 Gbps Ethernet Module  N7K-F132XP-15       ok /*** F1 module

5     0     Supervisor module-1X       N7K-SUP1             active *
6     0     Supervisor module-1X       N7K-SUP1             ha-standby

sw2-gd73(config)# license fcoe module 2
sw2-gd73(config)# show license fcoe

Module-Number  Package-Name
-----
2              FCOE-N7K-F132XP    /*** FCoE license has successfully been ***/
                /*** checked out for F1 module 2 ***/

sw2-gd73(config)#
```

```
sw2-gd73# switchto vdc storage-vdc
sw2-gd73-storage-vdc# show license usage FCOE-N7K-F132XP
```

```
FCoE Package: FCOE-N7K-F132XP
Installed count is: 0
```

```
License reserved for module: 2
```

```
Application          Vdc          Module
```

```
-----
fcoe                  storage-vdc  2
/*** License usage details shown in storage VDC ***/
-----
```

```
sw2-gd73-storage-vdc#
```

## Verify FLOGI was processed successfully for VFC interface

### Recommended Action:

- 1) "show flogi database" should show an entry for VFC interface with host PWWN/NWWN

```
sw2-gd71# show flogi database
INTERFACE      VSAN    FCID      PORT NAME      NODE NAME
vfc21          3839    0xaf0000  50:0a:09:85:89:2a:b3:f8 50:0a:09:80:89:2a:b3:f8

vfc22          3839    0xaf0001  21:00:00:c0:dd:10:28:b1 20:00:00:c0:dd:10:28:b1
Total number of flogi = 2.

sw2-gd71#
```

- 2) "Show fcoe database" should show an entry for VFC interface with host PWWN/MAC address

```
sw2-gd71# show fcoe database

INTERFACE      FCID      PORT NAME      MAC ADDRESS
vfc21          0xaf0000  50:0a:09:85:89:2a:b3:f8 00:c0:dd:10:e9:c5

vfc22          0xaf0001  21:00:00:c0:dd:10:28:b1 00:c0:dd:10:28:b1
sw2-gd71#
```

- 3) "Show interface vfc <no>" should declare VFC interface as up on VSAN where successful FLOGI happened

```
sw2-gd71# show interface vfc 21
vfc21 is trunking (Not all VSANs UP on the trunk)
  Bound interface is Ethernet2/1
  Hardware is Ethernet

  Port WWN is 20:00:00:24:f7:16:5d:02
  Admin port mode is F, trunk mode is on
```

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```
snmp link state traps are enabled
Port mode is TF

Port vsan is 3839
Speed is auto

Trunk vsans (admin allowed and active) (1,3839)
Trunk vsans (up) (3839)

Trunk vsans (isolated) ()
Trunk vsans (initializing) (1)

5 minute average counters not available
Current counters not available

Interface last changed at Tue Sep 28 11:08:41 2010
sw2-gd71# show fcns database (should show an entry for each successful FLOGI)
VSAN 3839:

FCID          TYPE  PWWN                               (VENDOR)          FC4-TYPE:FEATURE
0x020000      N     21:00:00:c0:dd:10:f3:a5 (Qlogic)          scsi-fcp:init

Total number of entries = 1

sw2-gd75# show fc2 plogi_pwwn (should show an entry with host PWWN for each successful
HIX  ADDRESS      VSAN  S_ID  D_ID  IFINDEX  FL  STATE          PWWN
672 dfc8e540      3839 fffffa 020000 1e000015 0000      2 21:00:00:c0:dd:10:f3:a5
678 dfc8e1c0      3839 fffffc 020000 1e000015 0000      2 21:00:00:c0:dd:10:f3:a5
sw2-gd75#
```

## Verify ELP was processed successfully for VFC interface

### Recommended Action:

- 1) "Show fcoe database" should show an entry for VFC interface with peer FCF MAC and VSAN

```
sw1-gd74# show fcoe database

VE Ports:
INTERFACE      MAC ADDRESS          VSAN
vfc18          aa:b1:ba:58:03:fc    3839

sw1-gd74#
```

- 2) "show system internal fcfwd mpmap vfcs" should show both local and peer FCF MAC details

```
sw1-gd74# show system internal fcfwd mpmap vfcs

FCoE VFC Information<span id="fck_dom_range_temp_1362765161072_218" /><span id="fck_dom_ran
ID | if-index |S|M|T| Members | MAC(s)
```

```
{ }-----  
vfc18 |0x1e209700|D|E||0x1a097000|Ethernet4/8 (U)|f8:66:f2:e4:c4:63 /*** *Local FCF MAC  
      |          | |||          |          |6c:9c:ed:43:db:cf /*** Peer FCF MAC  
sw1-gd74#
```

3) "Show interface vfc <no>" should declare VFC interface as up on VSAN where successful ELP happened

```
sw1-gd74# show interface vfc 18  
  
vfc18 is trunking (Not all VSANs UP on the trunk)  
Bound interface is Ethernet4/8  
  
Hardware is Ethernet  
Port WWN is 27:02:00:0d:ec:fc:63:78  
  
Peer port WWN is 00:00:00:00:00:00:00:00  
Admin port mode is E, trunk mode is on  
  
snmp link state traps are enabled  
Port mode is TE  
  
Port vsan is 3839  
Speed is 10 Gbps  
  
Trunk vsans (admin allowed and active) (1,3839)  
Trunk vsans (up) (3839)  
Trunk vsans (isolated) ()  
Trunk vsans (initializing) (1)  
  
5 minute average counters not available  
Current counters not available  
  
Interface last changed at Tue Sep 28 12:26:47 2010  
sw1-gd74#switch# show system internal fcfwd sfib unicast vsan 2 (sfib should have an unicast)  
vsan 2 - # of routes 2  
0x980020/0xffffffff -> vfc45  
  
0x98ffff/0xffffffff -> sup-fc (high)
```

## VFC (VF/VE) interface is not up on FCoE enabled VSAN

### Recommended Action:

1. Check LLDP/DCBX status (Verify that DCBX negotiation has successfully gone through on port where VFC is bound to, relevant for F port)

```
sw2-gd73# show lldp dcbx interface ethernet 2/1  
  
Local DCBXP Control information:  
Operation version: 00 Max version: 00 Seq no: 1 Ack no: 2  
  
Type/  
Subtype Version En/Will/Adv Config  
  
004/000 000 Y/N/Y 8906001b21 08  
003/000 000 Y/N/Y 0808
```

```

002/000      000      Y/N/Y      1123200019 19191900 00000004
Peer's DCBXP Control information:

Operation version: 00 Max version: 00 Seq no: 2 Ack no: 1
Type/      Max/Oper

Subtype     Version     En/Will/Err Config
002/000     000/000     Y/Y/N      0001000032 32000000 00000002

003/000     000/000     Y/Y/N      0801
004/000     000/000     Y/Y/N      8906001b21 08891400 1b2108

sw2-gd73#
    
```

2. Check MPMMap status (both on Sup and FCoE LC, bind information for VFC should be available in MPMMap)

```

sw2-gd73# show system internal fcfwd mpmap vfcs

                                FCoE VFC Information

ID   | if-index |S|M|T|           Members           |           MAC(s)
}-----
1718|0x1e0006b5|D|E|-|0x16000018|eth-pc 25      (U) |aa:b1:9b:68:*03:fc
    |           | | | |           |           |00:00:00:00:00:00
}-----

21|0x1e000014|D|F|-|0x1a080000|Ethernet2/1      (U)*|aa:b1:9b:68:03:fc
}-----

22|0x1e000015|D|F|-|0x160000ff|eth-pc 256      (U)*|aa:b1:9b:68:03:fc
}-----

28|0x1e00001b|D|E|-|0x1a087000|Ethernet2/8      (U)*|aa:b1:9b:68:03:fc
    |           | | | |           |           |6a:ef:2b:30:03:fc
}-----

sw2-gd73#
    
```

3. VLAN-VSAN mapping status (FCoE enabled VLAN should be operational)

```

sw2-gd73# sh vlan fcoe

Original VLAN ID      Translated VSAN ID      Association State
-----
3839                  3839                    Operational
4079                  299                     Operational

sw2-gd73#
    
```

4. EthPM status (Check EthPM status for port where VFC is bound to)

VFC (VF/VE) interface is not up on FCoE enabled VSAN

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```
sw2-gd73# show running-config interface ethernet 2/1

!Command: show running-config interface Ethernet2/1
!Time: Sun Sep 26 10:36:07 2010

version 5.2(1)
interface Ethernet2/1

    switchport mode trunk
    switchport trunk allowed vlan 1,3839,4079

/*** VFC's allowed VSAN those are FCoE enabled should be in Ethernet ports allowed
/*** VLAN list, native vlan should be configured and operationally up to allow vlan
/*** discovery packet
    speed 10000

    medium p2p
    no shutdown

sw2-gd73#
sw2-gd73# show int br | inc 2/1

Eth2/1      1      eth trunk up      none      10G(D)  --
sw2-gd74# show interface ethernet 2/1 trunk

Port          Native  Status      Port
              Vlan
Eth2/1        1      trunking    --
Port          Vlans Allowed on Trunk
Eth2/1        1-3967,4048-4093
Port          Vlans Err-disabled on Trunk
Eth2/1        none
Port          STP Forwarding
Eth2/1        1,3839

/*** Native VLAN and FCoE enabled VLAN should be up and STP forwarding ***/

sw2-gd74#
```

### 5. IDXmap status (Check if Ethernet interface where VFC is bound to is part of idxmap list)

```
sw2-gd73# show system internal fcfwd idxmap port-to-interface
```

### 6. Check VFC and VFC's VSAN operation status (VFC and VFC's VSAN should not be error disabled, VFC's VSAN valid status Waiting for FLOGI/Initializing/UP)

```
switch# show interface vfc 310 trunk vsan

vfc310 is trunking
    Vsan 1 is down (Error Disabled - VLAN not FCoE Enabled)
    Vsan 2 is up (None) -->
    Vsan 3 is down (Error Disabled - VLAN not FCoE Enabled)

switch#
```

## 7. Check if VLAN discovery has gone through (For F port only)

```
switch# debug fcoe_mgr trace (Check for following trace)
```

```
"Sending VLAN <VLAN> for FCF <FCF>"
```

Also look for "show platform software fcoe\_mgr event-histroy interface vfc <number>" and look for "FCOE\_MGR\_VFC\_EV\_FIP\_VLAN\_DISCOVERY" in state machine details

## 8. Check if FCF discovery has gone through

```
switch# show platform software fcoe_mgr info interface vfc <number>
```

```
FSM current state: FCOE_MGR_VFC_ST_PHY_UP
```

```
PSS Runtime Config:-
```

```
Type: 3
Bound IF: Eth2/1
```

```
FCF Priority: 128 (Global)
```

```
PSS Runtime Data:-
```

```
IOD: 0x00000000, WWN: 20:02:00:26:98:08:61:02
Created at: Thu Oct 21 01:09:18 2010
```

```
FC Admin State: up
Oper State: up, Reason: down
```

```
Eth IF Index: Eth2/1
Port Vsan: 299 /*** Check port VSAN is fcoe enabled ***/
```

```
Port Mode: F port
Config Vsan: 1,299,3839
```

```
Oper Vsan: 299/*** Oper VSAN is FCoE enabled ***/
/*** Expect FLOGI/ELP on these are operationally UP VSANs only ***/
```

```
Solicits on vsan: 299
/*** Solicitation happened on these set of VSANs ***/
/*** (relevant for F port) ***/
```

```
FIP Capable ? : TRUE
```

```
UP using DCBX ? : FALSE
```

```
PSS VN Port data:- /*** VN port information ***/
```

```
FC ID 131072 -
vfc index 503316500 vfc name vfc21
```

```
vsan id 299
enode_mac 00:c0:dd:14:58:c7
```

```
vfc wwn 50:0a:09:84:89:fb:6c:4f
(For E port)
```

"show fcoe database" should show an entry for VFC on VSAN if FCF discovery goes through suc

## 9. Check if FLOGI/ELP has gone through



```
"show flogi databsae"  
  
"show flogi internal error"  
"show port internal event-history error"  
  
"show fc2 internal event-histroy error"
```

## Packet does not reach SUP or FCoE data packet gets dropped

### Recommended Action:

1. Check Packet Drop statistics (Check relevant drop field on asic instance where VFC is bound)

```
"Show hardware internal statistics pktflow dropped"
```

2. Check CBL status (If CBL drop happens on port/VLAN which is FCoE enabled and bound to VFC interface)

```
module-2# show ha internal forwarding 0 table cbl-vlan port 0  
  
                                (INST 0, PORT 0)  
                                INGRESS                                |  
|  
| Disable State | 0,2-4031,4036-4078,4080-4095  
| Forward State | 1, 3839, 2, 4032-4035,4079  
  
/***FCoE enabled VLAN must be forwarding on operationally UP vlan for a given  
/*** ethernet interface on N7K, FCoE enabled mapped VSAN should be operationally  
/*** up on MDS, VLAN should be in BLOCKED state  
| Blocked State |  
  
| Learn State   |  
|  
                                EGRESS                                |  
| Disable State | 0,2-4031,4036-4078,4080-4095  
| Forward State | 1, 2, 3839, 4032-4035,4079''','''  
  
/*** same as defined on ingress ***/  
| Blocked State |  
  
| Learn State   |  
module-2#
```

3. FCF MAC programming

```
module-2# show ha internal forwarding 0 registers | inc FCF_MAC  
  
1c68 ORI_DI_CFG_FCF_MAC_P0__1 0000aab1  
1c6c ORI_DI_CFG_FCF_MAC_P0__0 9b6803fc  
  
/*** P0_0 and P0_1 Should match with MAC address programmed
```

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```
/** under MAC(s) column of "show system internal fcfwd mpmap vfcs"

/** for a given vfc interface
    1c90 ORI_DI_CFG_FCF_MAC_P1__1          0000aab1

    1c94 ORI_DI_CFG_FCF_MAC_P1__0          9b6803fcmodule-2#

module-2# show ha internal mac ASIC <instance> dump reg eb | inc FCOE
[0x874]ORI_EB_CFG_FCOE_ETHERTYPE:          0x00008906

[0x875]ORI_EB_CFG_FCOE_VERSION:           0x00000000
[0x879]ORI_EB_CFG_V2_AT_FCOE:            0x00000009

[0x88f]ORI_EB_CFG_FC_TO_FCOE_EOF__0:     0x41464200
        _FCOE_FC_CRC_EN[10]              0x1

        _FCOE_DA_OVERRIDE_EN[30]         0x1
/** DA override register must set for Orion-CR and beyond

/** version LC for VE link which is up on ethernet interface
        _FCOE_SA_OVERRIDE_EN[31]         0x1

/** SA override register must set for Orion-CR and beyond
/** version LC for VE link which is up on ethernet

interface[0x8a6]ORI_EB_CNT_PORT0_TOTAL_FCOE: 0x00000000
[0x8ab]ORI_EB_CNT_PORT0_FCOE_CRC:         0x00000000

        _FCOE_FC_CRC_EN[10]              0x1
        _FCOE_DA_OVERRIDE_EN[30]         0x1

        _FCOE_SA_OVERRIDE_EN[31]         0x1
[0x93e]ORI_EB_CFG_PORT0_FCOE_DA:         0x00000000
[0x93e]ORI_EB_CFG_PORT0_FCOE_DA__1:      0x00000000

[0x93f]ORI_EB_CFG_PORT0_FCOE_DA__0:      0x00000000
[0x940]ORI_EB_CFG_PORT0_FCOE_SA:         0x0000aab1

/**DA/SA overrride MAC register information must match with MAC address
/** defined in "show system internal fcfwd mpmap vfcs"

/** for a given VFC interface
/** Under MAC(s) column first MAC should be set in

/**Port 0/1, SA_0 and SA_1 register,
/** 2nd MAC (only applicable for VE) should be set in

/** Port0/1, DA_0 and DA_1 register

    [0x940]ORI_EB_CFG_PORT0_FCOE_SA__1: 0x0000aab1
    [0x941]ORI_EB_CFG_PORT0_FCOE_SA__0: 0x9b6803fc
    [0x942]ORI_EB_CFG_PORT1_FCOE_DA:    0x00000000

    [0x942]ORI_EB_CFG_PORT1_FCOE_DA__1: 0x00000000
    [0x943]ORI_EB_CFG_PORT1_FCOE_DA__0: 0x00000000

    [0x944]ORI_EB_CFG_PORT1_FCOE_SA:    0x0000aab1
    [0x944]ORI_EB_CFG_PORT1_FCOE_SA__1: 0x0000aab1

    [0x945]ORI_EB_CFG_PORT1_FCOE_SA__0: 0x9b6803fc
module-2#
```

## 4. FCoE enabled on VLAN (If FCoE packets don't get forwarded then check following)

```

module-2# show ha internal dftm bd_table fe <asic inst> vlan <vlan>

/*** Check VLAN which is operational according to "show vlan fcoe"
Detailed Vlan BD Table info for FE : <asic inst>

Port: 0 VLAN: <vlan> BDDDB_INDEX: <BD> ACL_LABEL: 0
Detailed Vlan BD Table info for FE : <asic inst>

Port: 1 VLAN: <vlan> BDDDB_INDEX: < BD> ACL_LABEL: 0
module-2#

module-2# show ha internal forwarding <asic inst> table bddb start_addr <BD> end_addr <BD>

          BDDDB TABLE SRAM -----

                                (INST# 0)
Note: any fields marked with * are only valid in OrionCR

Note: any fields marked with * are only valid in OrionCR
[ 3]| mc_ftag_base       : 0 mc_ftag_num           : 1 ftag           : fff
[ 3]| ftag_m_null       : n ftag_u_null           : n ce_vlan        : dis
/*** dis for MDS, enable on N7K ***/
[ 3]| def_gw_en         : dis def_gw           : 0 age_unit       : 0
[ 3]| age_grp_sel       : 0 ipv6_pim_snp        : dis ipv6_mld_snp : dis
[ 3]| ipv4_pim_snp      : dis ipv4_igmp_snp    : en pt_cam_en     : en
[ 3]| drp_sa_miss       : n drp_da_miss        : y ntf_sa_miss_in : y
[ 3]| ntf_da_miss_in   : n fcoe_en            : y                 : y
/*** Must be FCoE enabled ***/
[ 3]| uc_miss_cp_sup    : n mc2_gen_en         : y use_ox_id      : y
[ 3]| cp_mc3_to_sup     : n dl_pi              : n dl_np          : n
[ 3]| bd                : 8 en_proxy_learn    : n l3_mc_fwd_en   : n
[ 3]| svi_en_ipv4       : n svi_en_ipv6        : n ntf_sa_miss_eg  : n
[ 3]| dont_ff           : y hash_fcoe_lxr     : y in_if_chk_en   : y
[ 3]| opt_mc_fwd_en     : y rbacl_en          : y otv_en*        : n
-----
module-2#

```

## 5. FIB route table programming (If any fcldid cam related drop found then check FIB entry)

[http://wikicentral.cisco.com/confluence/display/GROUP/RIB\\_FIB\\_FOR\\_VFC](http://wikicentral.cisco.com/confluence/display/GROUP/RIB_FIB_FOR_VFC)

## 6. Zone ACL programming (If any ACL drop found then check zoning acls following way)

```

sw2-gd75# sh fcoe database

INTERFACE          FCID          PORT NAME          MAC ADDRESS
vfc21              0x020000     50:0a:09:84:89:fb:6c:4f 00:c0:dd:14:58:c7
vfc22              0x020001     21:00:00:c0:dd:10:f3:a5 00:c0:dd:10:f3:a5

sw2-gd75#

sw2-gd75# sh zoneset active

```

## Cisco\_Nexus\_7000\_Series\_NX-OS\_Troubleshooting\_Guide\_--\_Troubleshooting\_FCoE

```
zoneset name zoneset-1 vsan 3839

zone name zone-12 vsan 3839

* fcid 0x020000 [pwnn 50:0a:09:84:89:fb:6c:4f]
* fcid 0x020001 [pwnn 21:00:00:c0:dd:10:f3:a5 ]

switch#attach mod <fcoe mod>

module# show ha internal forwarding asic <instance> tcam acl ingress start_addr
0x0 end_addr 0x3ff valid | inc 0x020000 (should show zoning acl entry)
```

### 7. Verify PAUSE enable/disable status (debugging congestion issue)

```
module-10# sh hardware internal mac port 1 qos configuration
```

```
QOS State for port 1 (Asic 0 Internal port 0)
GD
```

```
TX PAUSE:
```

VL#	ENABLE	RESUME	REFRESH	REF_PERIOD	QUANTA
0	OFF	OFF	OFF	0x0	0x0
1	OFF	OFF	OFF	0x0	0x0
2	OFF	OFF	OFF	0x0	0x0
3	ON	ON	ON	0x0	0x0
/*** PAUSE should be enabled on no drop VL ***/					
/*** (here VL 3 according to 7e template) ***/					
4	OFF	OFF	OFF	0x0	0x0
5	OFF	OFF	OFF	0x0	0x0
6	OFF	OFF	OFF	0x0	0x0
7	OFF	OFF	OFF	0x0	0x0
LFC	OFF	ON	ON	0x1000	0xffff

### 8. QoS MTU size checking (verify MTU size for no drop VL in case packet gets dropped due to MTU size)

```
module-2# show ha internal mac port <ethernet port number where VFC is bound>
qos configuration | inc MTU
```

```
VL 0-7 MTU: 1522 1522 1522 2180
/*** should be set to 2180 for no drop VL ***/ 1522 1522 1522 1522
Port MTU (No dropping action): 9472
```

```
module-2#
```

### 9. Elam Capture (For other kind of drop verify packet captured through ELAM, check drop packet having 8906/8914)

```
switch# attach mod <number>
```

```
module# test ha internal forwarding <asic instance> elam trigger di/de drop (for ingress/eg
module# show ha inforwarding <asic instance> elam capture (show look for packet drop with p
```

## Packets should match inband packets:

### Recommended Action:

You can verify that the packets match inband packets as shown the following example:

```

module-4# show hardware internal statistics device l2lu all

|-----|
| Device:Orion Fwding Driver      Role:L2                               |
|
| Last cleared @ Wed Jul 15 20:40:08 2009
|-----|

Instance:0
ID   Name                                     Value                               Ports
-   -
28   smallcnt ACL redirected pkts            0000000000000703                   1-2 -

2008 Ingress packets that don't have MIM    0000000000000703                   1 -
2009 Ingress good packets sent to IB       0000000000000703                   1 -

module-4# sh ha in statistics device mac all

|-----|
| Device:Orion MAC Driver         Role:MAC                               |
| Last cleared @ Wed Jul 15 20:40:09 2009
|-----|

Instance:0

ID   Name                                     Value                               Ports
-   -
0    IB num packets received from DI0        0000000000000703                   1 -
13   IB num credited packets requested by VQ  0000000000000703                   1-2 -

15   IB num supervisor packets requested by VQ 0000000000000703                   1-2 -
18   IB num credited packets sent to FT       0000000000000703                   1-2 -

22   IB num credited superframes sent to FT    0000000000000703                   1-2 -
100  PL0 Ingress RTOT pkts VL0                0000000000000703                   1 -

108  PL0 Ingress RFCOE VL0                    0000000000000703                   1 -
116  PL0 Ingress ROCT octets VL0              0000000000126440                   1 -

124  PL0 Ingress RFCOE octets VL0             0000000000126440                   1 -
156  PL0 Ingress RTOT pkts unicast VL0        0000000000000703                   1 -

790  GD Total received frames                 0000000000000703                   1 -
874  GD Shim rx count                        0000000000000703                   1 -

881  GD Post decryption, accept uncontrolled  0000000000000703                   1 -
883  GD Received frames w/ len of (64, 127]  0000000000000001                   1 -

884  GD Received frames w/ len of (127, 255] 0000000000000702                   1 -
954  GD GMAC transition from nosync to sync int 0000000000000001                   1 -

```

## Cisco\_Nexus\_7000\_Series\_NX-OS\_Troubleshooting\_Guide\_--\_Troubleshooting\_FCoE

ACL:

```
module-4# show system internal access-list input entries detail
/** this should have hardware address programmed by fcoe mgr */
Flags: F - Fragment entry E - Port Expansion
```

D - DSCP Expansion M - ACL Expansion

take the hardware address from the above and use it in the next show command, example used

```
module-4# show hardware internal forwarding 0 tcam acl ingress start_addr 0x4B end_addr 0x4
```

```
--- ACL TCAM/RAM{}- (INST# 0, ingress) ---
[4b]| acl type          :          3 (          12)

[4b]| key_type          :          0/          3
[4b]| key_sub_type      :          3/          3
[4b]| vlan              :          1/          fff /** verify this
[4b]| port_index        :          0/          1 /** verify this
[4b]| ethertype         :          8914/         ffff /** verify this
[4b]| lkup_cnt          :          1/          3
[4b]| acl_result_type   :          0
[4b]| priority          :          2
[4b]| permit_vld        :          0
[4b]| vl_vld            :          0
[4b]| vlan_ftag_vld     :          0
[4b]| ftag_vld          :          0
[4b]| reason_code_vld   :          1 /** verify this should be 1
[4b]| redirect_vld     :          1 /** verify this should be 1
[4b]| fc_d_id_vld       :          0
[4b]| fc_s_id_vld       :          0
[4b]| fc_lun_vld        :          0
[4b]| oda_ooo_vld       :          0
[4b]| osa_dl_vld        :          0
[4b]| dscp_vld          :          0
[4b]| cap_eth           :          0
[4b]| cap_fc            :          0
[4b]| permit            :          0
[4b]| dont_cnt_rpkt     :          0
[4b]| vl                :          0
[4b]| add_bcna_i        :          0
[4b]| vlan              :          0
[4b]| ftag              :          0
[4b]| reason_code        :          41 /** hex, in dec - 65 - FIP snooping code
[4b]| mp_table_ptr       :          402 /** hex, ptr - this has the add to sup
[4b]| mp_table_num       :          1 /** multi-path table number
[4b]| dest_fcf           :          0
[4b]| dc3vxhdr_rdt       :          0
[4b]| fc_d_id            :          0
[4b]| fc_s_id            :          0
[4b]| fc_lun             :          0
[4b]| oda_ooo            :          0
[4b]| osa_dl             :          0
[4b]| dscp               :          0
```

```
module-4# show hardware internal forwarding 0 table mp start_addr 0x402 end_addr 0x402
```

```
----- MULTIPATH TABLE SRAM -----
```

```
----- (INST# 0) -----
```

```
| Index | cp_to_sup1 | cp_to_sup2 | lid_idx |
|-----|-----|-----|-----|
| [402] | 0 | 0 | 0 |
```

the lid\_idx is the value to check, if this entry is wrong it won't go to sup

```
module-4# show hardware internal forwarding 0 acl-statistics ingress /** this command sho
```

## Cisco\_Nexus\_7000\_Series\_NX-OS\_Troubleshooting\_Guide\_--\_Troubleshooting\_FCoE

have an entry for hardware address programmed by fcoe mgr, then pktmgr will receive the fra  
Instance: 0, direction: 1

```
----- ACL Statistics -----  
(Inst #0, Direction Ingress)  
-----
```

```
Index Frames Bytes  
[0002] 0000000000000169e 000000000000fe5ec
```

INBAND - check the atype=8 value, should match linecard value:  
switch# show hardware internal sup-fc0 atype-pkt-count

```
ATYPE:          Pkt Count:  
0                0x12  
1                0x534  
2                0x0  
3                0x0  
4                0x0  
5                0x0  
6                0x0  
7                0x0  
8                0x2bf  
9                0x0  
10               0x0  
11               0x0  
12               0x0  
13               0x0  
14               0x0  
15               0x0
```

```
switch# sh ha in sup-fc0 dicounts 0 /*** this is for ethernet 4/1
```

```
Hi Prio Voq Enabled:
```

```
Hi Prio Voq Status:0x1
```

```
Lo Prio Voq Enabled:
```

```
Lo Prio Voq Status:0x1
```

```
Enabled: Yes
```

```
tx di dma frame cnt          0
```

```
rx di dma frame cnt          356
```

```
rx di frame cnt              356
```

```
Packets removed when port went down: 0
```

```
Packets removed when hi voq down: 0
```

```
Packets removed when lo voq down: 0
```

```
Packets dropped as voq is large: 0
```

```
Hi Packets dropped because port was down: 0
```

```
Lo Packets dropped because port was down: 0
```

```
Packets dropped when lo voq was down: 0
```

```
Packets dropped when hi voq was down: 0
```

```
Total packets successfully sent for this di:0
```

```
Total Hi Priority Pkts queued for SW Tx for this di: 0
```

```
Total Hi Priority Pkts queued for HW Tx for this di: 0
```

```
Total Low Priority Pkts queued for SW Tx for this di: 0
```

```
Total Low Priority Pkts queued for HW Tx for this di: 0
```

```
Total packets received from this si:703
```

```
Total packets received by this di:0
```

```
Packets waited for long time in Tx queue:0
```

```
Old packets dropped after Rx:0
```

```
RX Bad DI:0
```

```
TxHi0: Head:cf8c0020 (0x1f8c0020) HW:cf8c0020 (0x1f8c0020) Tail:cf8c0020 (0x1f8c  
0020) HW:cf8c0020 (0x1f8c0020)
```

```
cf8c0020 (0x1f8c0020) next:00000000(0x0) buf:0x0 tl:0 st:0x0 bs:0 pkt:0x0
```

```
TxLo0: Head:cf8c8020 (0x1f8c8020) HW:cf8c8020 (0x1f8c8020) Tail:cf8c8020 (0x1f8c  
8020) HW:cf8c8020 (0x1f8c8020)
```

```
cf8c8020 (0x1f8c8020) next:00000000(0x0) buf:0x0 tl:0 st:0x0 bs:0 pkt:0x0
```

NETSTACK/PKTMGR - check the rx\_recv in the driver and then for client 8914 check the transm

## Cisco\_Nexus\_7000\_Series\_NX-OS\_Troubleshooting\_Guide\_--\_Troubleshooting\_FCoE

```
switch# sh system internal pktmgr driver
```

```
-----  
Driver: bc-fcoe  
-----
```

```
State:                Up  
Filter:               0xeeee  
fd:                   15  
Enabled:              Yes  
Discard In:           0  
Discard Out:          0  
No of Ifs:            1  
Tx lot:               128  
Reader:               1  
Writer:               1  
Hdr len:              96  
tx_sent:              0  
tx_rate:              0  
tx_max_rate:          0  
rx_recv:              702  
rx_rate:              0  
rx_max_rate:          0
```

```
switch# sh system internal pktmgr client
```

```
Client uuid: 124, 1 filters
```

```
Filter 0: EthType 0x2000, Snap 8192, Dmac 0100.0ccc.cccc  
Options: TO 0, Flags 0x1, AppId 0, Epid 0  
Ctrl SAP: 946, Data SAP 363 (1)
```

```
Counters:
```

```
rx:                   0  
rx_rate:              9187201950444158976  
tx:                   64  
tx_rate:              9187201948296708096
```

```
Client uuid: 601, 1 filters
```

```
Filter 0: EthType 0x88cc, Dmac 0180.c200.000e  
Options: TO 0, Flags 0x1, AppId 0, Epid 0  
Ctrl SAP: 456, Data SAP 456 (1)
```

```
Counters:
```

```
rx:                   0  
rx_rate:              9187201950444158976  
tx:                   128  
tx_rate:              9187201948296675456
```

```
Client uuid: 699, 1 filters
```

```
Filter 0: EthType 0x8914,  
Options: TO 0, Flags 0x1, AppId 0, Epid 0  
Ctrl SAP: 473, Data SAP 473 (1)
```

```
Counters:
```

```
rx:                   0  
rx_rate:              9187201950444158976  
tx:                   0  
tx_rate:              9187201948305063936
```

```
Number of clients: 3
```

```
debugs of help - debug pktmgr frame
```

```
FCoE MGR:
```

FC2 - make sure there are no drops in FC2. If there are drops check what these drops are:

```
switch# sh fc2 port brief
```

```
0 fc2_very_bad_frames_rx  
IX ST MODE EMUL TXPKTS TXDROP TXERR RXPKTS RXDROP  
0 D 1 0 0 0 0 1 1  
10 U 1 0 678 0 0 1 0  
11 U 1 0 1 0 0 1 0  
12 U 1 0 1 0 0 1 0
```

Packets should match inband packets:



13	U	1	0	1	0	0	1	0
14	U	1	0	1	0	0	1	0
15	U	1	0	1	0	0	1	0
16	U	1	0	1	0	0	1	0
17	U	1	0	1	0	0	1	0
18	U	1	0	1	0	0	1	0
19	U	1	0	1	0	0	1	0
1a	U	1	0	1	0	0	1	0
1b	U	1	0	1	0	0	1	0
1c	U	1	0	1	0	0	1	0
1d	U	1	0	1	0	0	1	0
1e	U	1	0	1	0	0	1	0
1f	U	1	0	1	0	0	1	0
20	U	1	0	1	0	0	1	0
21	U	1	0	1	0	0	678	0
fe	U	1	0	352	0	0	0	0
ff	U	1	0	351	0	0	703	0

PIXM related show commands -

```
sh system internal pixm info interface ethernet 4/1
```

```
sh system internal pixm info pioid-table
```

```
show sys int pixm info ltl-type phy
```

ETHPM related show commands -

```
show system internal ethpm info interface ethernet 4/1
```

```
show system internal ethpm event-history errors
```

## Troubleshooting ? Hardware Errors

### Recommended Action:

The following helps to troubleshoot hardware errors:

- ?show hardware internal errors module <module-number>? will print any errors which may cause the packet to be dropped
- CLI can be run from the sup or alternately run on the module after attaching to the module

```
module-6# show hardware internal errors
```

```

|-----|
| Device:Clipper MAC Role:MAC Mod: 6 |
| Last cleared @ Tue Apr 24 04:13:34 2012 |
| Device Statistics Category :: ERROR |
|-----|
|-----|
| Device:Clipper XBAR Role:QUE Mod: 6 |
| Last cleared @ Tue Apr 24 04:13:35 2012 |
| Device Statistics Category :: ERROR |
|-----|
|-----|
| Device:Clipper FWD Role:L2 Mod: 6 |
| Last cleared @ Tue Apr 24 04:13:34 2012 |
| Device Statistics Category :: ERROR |
|-----|
|-----|
| Device:Clipper L3 Driver Role:L3 Mod: 6 |
| Last cleared @ Tue Apr 24 04:13:35 2012 |
| Device Statistics Category :: ERROR |

```

```

-----
|
|-----
| Device: Sacramento Xbar ASIC Role: FABRIC Mod: 6 |
| Last cleared @ Tue Apr 24 04:13:35 2012
| Device Statistics Category :: ERROR
|-----
|
|-----
| Device: Clipper MAC Role: MAC Mod: 6 |
| Last cleared @ Tue Apr 24 04:13:34 2012
| Device Statistics Category :: CONGESTION
|-----
|
|-----
| Device: Clipper XBAR Role: QUE Mod: 6 |
| Last cleared @ Tue Apr 24 04:13:35 2012
| Device Statistics Category :: CONGESTION
|-----
module-6#

```

## Troubleshooting ? IdxMap verification

### Recommended Action:

The following helps to troubleshoot idxmap verification:

- IDXMap is a kernel table used by FC-components to look up all FC and ethernet interfaces and the corresponding Dis
- ?show system internal fcfwd idxmap interface-to-port? should have
  - ◆ Sup-fc0 interface details
  - ◆ All ethernet interfaces allocated to the storage VDC and the corresponding DI
  - ◆ Ethernet port-channel interfaces and corresponding Dis

```
sw8-gd76-sup2-storage-vdc# show system internal fcfwd idxmap interface-to-port
```

Interface to Port Table: (All values in hex)

```

-----
|          | |          | | |lcl| | S | P |          |          |          |
|no|          | |idx|if | L | O |          |          |          |
|of|          | | |ty-| O | R | mts | port| if |
|          | |GI| GI |VL|LCI|pe | T | T | node| mode|flags|
-----
16000108 Epo265          | 1| 406| 0| 00| 16| 00| 00| 0101| 0000| 0000|
06081000 sup-fc0          | 1| 10ea| 0| 01| 06| 00| 01| 0101| 0000| 0000|
160002bb Epo700          | 1| 402| 0| 00| 16| 00| 00| 0101| 0000| 0000|
1a200000 Ethernet5/1      | 1| 0| 0| 00| 1a| 04| 00| 0502| 0000| 0000|
1a201000 Ethernet5/2      | 1| 1| 0| 01| 1a| 04| 01| 0502| 0000| 0000|
1a202000 Ethernet5/3      | 1| 2| 0| 02| 1a| 04| 02| 0502| 0000| 0000|
1a203000 Ethernet5/4      | 1| 3| 0| 03| 1a| 04| 03| 0502| 0000| 0000|

```

## Troubleshooting ? MPMMap verification

### Recommended Action:

The following helps to troubleshoot mpmap verification:

- IDXMap is a kernel table which stores the VFC to Ethernet binding information
- ?show system internal fcfwd mpmap vfc? should have all the VFCs which have a Ethernet interface binding

```
sw8-gd76-sup2-storage-vdc# show system internal fcfwd mpmap vfc
```

FCoE VFC Information						
ID	if-index	S	M	T	Members	MAC (s)
vfc-po700	0x1e1002bb	D	E	-	0x160002bb eth-pc 700	(U) *  64:a0:e7:44:8e:81  00:26:98:04:62:82
vfc6/16	0x1e228f00	D	E	-	0x1a28f000 Ethernet6/16	(U) *  6c:9c:ed:43:35:a7  58:8d:09:7c:d8:e7
vfc-po70	0x1e100045	D	E	-	0x16000045 eth-pc 70	(U) *  64:a0:e7:44:8e:82  00:26:98:04:62:83
vfc5/10	0x1e220900	D	F	-	0x1a209000 Ethernet5/10	(U) *  cc:ef:48:eb:62:21
vfc526	0x1e00020d	D	E	-	0x1a219000 Ethernet5/26	(U) *  cc:ef:48:eb:62:31  68:ef:bd:a8:31:f3

## Troubleshooting ? FIP BPDU Classification

### Recommended Action:

To verify whether the PL block BPDU classification for the FIP is enabled use the following CLI (in this case I use port 6/16 as an example)

```
module-6# show hardware internal clm bpdu port 16 action
```

```
in parse
token = 285212929
token = 130
#-Type|      MAC          -(mask)| EthType - (mask) |
0 F | 01:80:c2:00:00:c0  (0x0) | 0x0      (0x1) |
1 F | 01:00:0c:cc:cc:c0  (0x0) | 0x0      (0x1) |
2 F | 01:00:0c:cd:cd:d0  (0x0) | 0x0      (0x1) |
3 F | 00:00:00:00:00:00  (0x1) | 0x22f4   (0x0) |
4 F | 00:00:00:00:00:00  (0x1) | 0x8914   (0x0) |
5 F | 00:00:00:00:00:00  (0x0) | 0x0      (0x1) |
6 F | 00:00:00:00:00:00  (0x0) | 0x0      (0x1) |
0 R | 00:18:0c:20:00:00  (0x0) | 0x0      (0x1) |
1 R | 00:18:0c:20:00:02  (0x0) | 0x0      (0x1) |
0 U | 00:00:00:00:00:00  (0x0) | 0x0      (0x1) |
```

## Troubleshooting ? SMM FIP Redirect Criteria

### Recommended Action:

To check the SMM table for the FIP entries first check the match criteria and based on the index where you find the match for 0x8914 lookup the equivalent action match

```

module-6# show hardware internal forwarding inst 3 table smm-mcr index 1

      SMM MCR ENTRY
      (INST# 3)
trill_encap (trill packet encap)           : 0x0
trill_encap_en (enable trill encap match)  : 0x0
mim (mim packet)                           : 0x0
mim_en (enable mim packet match)           : 0x0
pg (port group value)                       : 0x0
pg_en (enable port group match)             : 0x0
prot_type (ip protocol type)                : 0x0
prot_type_en (enable ip protocol match)    : 0x0
src_prot (source protocol)                  : 0x0
src_prot_en (enable source protocol match) : 0x0
m_src (1=match src mac, 0=match dst mac)   : 0x0
m_src_dst_en (enable match src or dst mac) : 0x1
mac_mask (mask off dst mac bits)           : 0x0
mac_neg (trigger if no mac match)          : 0x0
mac_addr_W11 (upper 16 bits of mac addr)   : 0x0
mac_addr_W10 (middle 16 bits of mac addr)  : 0x0
mac_addr_W0 (lower 16 bits of mac addr)    : 0x0
use_outer_mac (if set match outer dst mac) : 0x0
use_mac (use mac addr matching)            : 0x0
vdc_mask (mask for vdc profile)            : 0x0
vdc (vdc value to match)                   : 0x0
vdc_en (enable vdc match)                  : 0x0
bd (bridge domain value)                   : 0x0
bd_en (enable bridge domain match)         : 0x0
bpdu (bpdu bit to match)                   : 0x0
bpdu_en (enable bpdu match)                : 0x0
sm_en (match sm_en field in lbd entry)     : 0x7
etype (match with ether type)              : 0x8914
etype_en (enable ether type match)         : 0x1
port_mask (match on port mask)             : 0x1f

```

## Troubleshooting ? SMM FIP Redirect ?Action

### Recommended Action:

Verify SMM Action matching the criteria register for the 0x8914 ether-type frames

```

module-6# show hardware internal forwarding inst 3 table smm-mar start 0x1 end 0x1

      Static MAC Match Action Table -----
      (INST# 3)

[1]| flood_pkt      : n  no_mac_sa_lrn      : y
[1]| redir_pkt      : y  redir_pkt_if_idx  : 3ff
[1]| mim_vl         : 3  repl_mim_vl       : y
[1]| pkt_is_bpdu    : y
[1]| copy_to_sup1   : n  copy_to_sup2    : n
[1]| new_acos       : 5  use_new_acos     : y
[1]| l3_disable     : n  l3_bypass_en     : n

```

```

flood_pkt          = Flood to BD, redirect and DI will be ignored
no_mac_sa_lrn     = Don't learn if static match
redir_pkt         = Redirect
redir_pkt_if_idx  = Redirect DI or final DI if redirect not set
mim_vl           = New COS
repl_mim_vl      = If set use new COS, else preserve header COS
pkt_is_bpdu      = BPDU packet
copy_to_sup1     = CAP1
copy_to_sup2     = CAP2
new_acos         = New ACOS
use_new_acos     = Use new ACOS to replace existing ACOS
l3_disable       = L3 disable
l3_bypass_en     = Enable L3 bypass when static match redirect
    
```

The SMM redirect entry is programmed for 0x8914 with with the redirect DI being 0x3ff. Look up the idxmap to make sure this is the sup-fc0 DI

```

module-6# show system internal fcfwd idxmap interface-to-port | inc 3ff
06081000 sup-fc0          | 1| 3ff| 0| 01| 06| 00| 01| 0101| 0000| 0000|
    
```

## Troubleshooting ? FMM (FCoE MAC Match)

### Recommended Action:

To check the FMM registers for port 6/16 the ASIC instance is 3

(ports 13-16) and the register instance is 3 (port13=0, 14=1, 15=2, 16=3)

```

module-6# show hardware internal clp_l3 inst 3 registers name CLP_LBD_FMM_COND_REG_3
+-----+
| Instance Registers for Clipper L3 Driver
| Inst 3; port(s) 13-16
|
ADDR(0x)  REG NAME                                     VAL(0x)
-----
1a0a     CLP_LBD_FMM_COND_REG_3__2                   00000010
1a0b     CLP_LBD_FMM_COND_REG_3__1                   154e493e
1a0c     CLP_LBD_FMM_COND_REG_3__0
          [00:00] MATCH_EN                           1
          [05:01] PORT_MASK                         8
          [06:06] BD_EN                             0
          [20:07] BD                               0
          [21:21] USE_ODA                           0
          [69:22] MAC_DA                             4055
          [74:70] MAC_DA_MASK                       3924f8ab
          [75:75] PG_EN                             0
          [85:76] PG                               0
          [86:86] MCX_EN                             0
    
```

The port mask should be 8 (0x1000). In case of the port 6/13 the port-mask would have been 1(0x0001) for 6/14 the port-mask value should be 2(0x0010) and so on.

MAC DA value here should be the same as the FCF-MAC. This should match the FCF-MAC value in the mpmap tables for the VE ports and FPMA address for the VF ports.

## Troubleshooting ? Port-Type (ILM Table)

### Recommended Action:

1. To get the index in the ILM table (in this case we are looking for the vfc 6/16 and vlan 3 as an example )

```
sw8-gd71-sup2-storage-vdc# show vlan fcoe
```

Original VLAN ID	Translated VSAN ID	Association State
3	3	Operational

```
module-6# show system internal iftmc hardware interface ethernet 6/16 vdc 2
```

Interface	L2/L3	GBL	Part	CPC
Eth6/16	2	0	1	0

```

Inst In Use      : 0xfad (1111 1010 1101)
Inst To Del     : 0xfad (1111 1010 1101)
Intf Inst       : 0x008 (0000 0000 1000)
Act VLANs      : 3
Del VLANs      : 3
Vlan : 3 mem : 2 flag : 0x0000

```

Inst	PG	TCAM	LDB	ILM	ELM	Ref	Flag
0	0x2	0x10	0xf	0x40	0xe	16	0x1
2	0x2	0x10	0xf	0x40	0xe	16	0x1
3	0x7f	0x12	0x800f	0x42	0x800e	1	0x1
5	0x2	0x10	0xf	0x40	0xe	16	0x1
7	0x2	0x10	0xf	0x40	0xe	16	0x1
8	0x2	0x10	0xf	0x40	0xe	16	0x1
9	0x2	0x10	0xf	0x40	0xe	16	0x1
10	0x2	0x10	0xf	0x40	0xe	16	0x1
11	0x2	0x10	0xf	0x40	0xe	16	0x1

2. For port 6/16 we need to look at inst 3 in the list above and get the ILM index.

## Cisco\_Nexus\_7000\_Series\_NX-OS\_Troubleshooting\_Guide\_--\_Troubleshooting\_FCoE

```
module-6# show hardware internal forwarding inst 3 table ilm index 0x42
```

```
-----  
                ILM ENTRY  
                (INST# 3)  
-----  
[ 66] outer_de_vld      : 0x0  
[ 66] otv_p2p           : 0x0  
[ 66] fcoe_en           : 0x1  
[ 66] mac_ip_chk_arp    : 0x0  
[ 66] v6_rpf_mode       : 0x0  
[ 66] v6_vpn            : 0x1  
[ 66] v6_rpfv3_en       : 0x0  
[ 66] v6_sgt_prio       : 0x0  
[ 66] v6_dgt_prio       : 0x0  
[ 66] ids_mask_sel      : 0x0  
[ 66] per_pkt_ls_en     : 0x0  
[ 66] no_stats          : 0x0  
[ 66] v4_sgt_prio       : 0x3  
[ 66] v4_dgt_prio       : 0x1  
[ 66] diag              : 0x0  
[ 66] df_mask           : 0x0  
[ 66] non_ipv6_vpn      : 0x1  
[ 66] v4_rpfv3_en       : 0x0  
[ 66] ipv4_en           : 0x0  
[ 66] ipv4_mcast_en     : 0x0  
[ 66] v4_rpf_mode       : 0x0  
[ 66] ipv6_mcast_en     : 0x0  
[ 66] ipv4              : 0x0  
[ 66] ipv6              : 0x0  
[ 66] ipv6_en           : 0x0  
[ 66] cpp_en            : 0x1  
[ 66] acl_en            : 0x3  
[ 66] qos_en            : 0x0  
[ 66] acos_sel          : 0x1  
[ 66] label_b           : 0x7f1  
[ 66] label_a           : 0x7f1  
[ 66] ls_hash_sel       : 0x0  
[ 66] base_pol_id       : 0x0  
[ 66] mut_map_index     : 0x0  
[ 66] ilm_trig          : 0x0
```

There are 8 reserved labels ranging from 0x7f0 to 0x7f7, each one corresponding to a FC port-type.

Here's how to interpret the port-type (the label value)

```
PORT_FC_PORT_TYPE_TE 0x7f1 // FC Port mode TE (VE port)
```

```
PORT_FC_PORT_TYPE_F 0x7f2 // FC Port mode F (VF port)
```

## FIB verification ? Verifying routes

### Recommended Action:

To verify routes:

```
module-4# sh fib unicast IOD Mode: in order mode Mod : #adjacency
```

All fields in hex except VSAN

Route Type	IOD Mode	VSAN	D	ID	Fwd Idx	Adj Mod	Met Idx	Adj Idx	Mark	Adj St	VDC	FE
wka	idle	0	ffffff5	b7ea		1	00000	00059	0009	000	03	00
wka	idle	0	ffffff5	b7ea		1	00000	00059	0009	000	03	0b
wka	idle	0	ffffff6	b7ec		1	00001	0005a	0009	000	03	00
wka	idle	0	ffffff6	b7ec		1	00001	0005a	0009	000	03	0b
wka	idle	0	ffffff7	b7ee		1	00002	0005b	0009	000	03	00
wka	idle	0	ffffff7	b7ee		1	00002	0005b	0009	000	03	0b
wka	idle	0	ffffff8	b7f0		1	00003	0005c	0009	000	03	00
wka	idle	0	ffffff8	b7f0		1	00003	0005c	0009	000	03	0b
wka	idle	0	ffffff9	b7f2		1	00004	0005d	0009	000	03	00
wka	idle	0	ffffff9	b7f2		1	00004	0005d	0009	000	03	0b
wka	idle	0	ffffffa	b7f4		1	00005	0005e	0009	000	03	00
wka	idle	0	ffffffa	b7f4		1	00005	0005e	0009	000	03	0b
wka	idle	0	ffffffb	b7f6		1	00006	0005f	0009	000	03	00
wka	idle	0	ffffffb	b7f6		1	00006	0005f	0009	000	03	0b
wka	idle	0	ffffffc	b7f8		1	00007	00060	0009	000	03	00
wka	idle	0	ffffffc	b7f8		1	00007	00060	0009	000	03	0b
wka	idle	0	ffffffd	b7fa		1	00008	00061	0009	000	03	00
wka	idle	0	ffffffd	b7fa		1	00008	00061	0009	000	03	0b
wka	idle	0	ffffffe	b7fc		1	00009	00062	0009	000	03	00
wka	idle	0	ffffffe	b7fc		1	00009	00062	0009	000	03	0b
local	idle	1	ceffff	...		0	00000	deadbeef	0009	000	03	
local	idle	2	112233	b666		1	0000e	00064	0000	000	03	00
local	idle	2	112233	b666		1	0000e	00064	0000	000	03	0b
local	idle	2	c1ffff	b5fc		1	0000a	00063	0009	000	03	00
local	idle	2	c1ffff	b5fc		1	0000a	00063	0009	000	03	0b
ucast	idle	2	eb0000	b3d6		1	0000f	00065	0000	000	03	00
ucast	idle	2	eb0000	b3d6		1	0000f	00065	0000	000	03	0b

From the given command, the following information can be obtained:

- The Route Type indicates the type as before - ?wka/local/Remote etc?
- The presence of routes in each clipper (FE) as indicated in the FE field. If the FE field is blank, as in the case of FCID 0xceffff with VSAN 1, it is because the route is not programmed in h/w (also note Fwd Idx is ?...? and Adj Idx is ?deadbeef?)
- Fwd Idx ? Specifies the FIB TCAM address as well as the FIB UC Result DRAM address. The RDRAM stores the LS-MET base address and num paths (-1 actually)
- Adj Mod ? Specifies the number of paths (VE links / ISLs). This will be 1 for local routes.
- Met Idx ? Specifies the Multipath base address (similar to Mp table base addr in Orion). One difference with Orion is that there is an additional table which has the ?bundle of Adj pointers? called the LS-MET. When there are multiple paths to a destinations, the RDRAM points to the LS-MET base address and a load balance of the link take place at LS-MET level. The LS-MET entry



has the ?adj\_ptr? which tells where the ADJ is in the ADJ Table as well as where the Rewrite Entry is in the RIT table.

- Adj Idx ? Specifies the Adjacency Index when there is only ONE path to the destination. When there is only one path to destination, the RDRAM directly encodes the ?adj\_ptr? instead of the LS-MET base address. VDC Id is obtained from VDC field.