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TROUBLESHOOTING CISCO CATALYST 3750, 3550, AND 2900 SERIES SWITCHES

SESSION RST-3041

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Agenda

- Packet Forwarding
- Multicasting
- Access Control Lists
- QoS
- Miscellaneous

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Data Packet Forwarding Checks

- Problems outside of the switch (topology, scale of problem)
- Configuration error (ACL, VLAN, trunk, channel, speed/duplex, etc…)
- Interface is up and traffic is flowing in/out
- Errors on interfaces (bad port, GBIC/SFP, cabling, oversubscription)
- L2 MAC entry and/or L3 IP route/ARP entry
- Hardware switching/high CPU
- Spanning tree, routing protocols, other features

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Show Interface


```
3550-1# show interface status
Port      Name               Status       Vlan       Duplex  Speed Type
Fa0/1     Server-B1          notconnect   2            full    100 100BaseFX
Fa0/2                        notconnect   routed       full    100 100BaseFX
Fa0/3                        notconnect   1            half    100 100BaseFX
```

```
3550-1# show interfaces counters errors
Port        Align-Err    FCS-Err   Xmit-Err    Rcv-Err UnderSize
Fa0/1               0          0          0          0         0
Port        Single-Col  Multi-Col   Late-Col Excess-Col Carri-Sen     Runts     Giants
Fa0/1               0          0          0          0         0         0          0
Fa0/2               0          0          0          0         0         0          0
```

```
2950# show interfaces counters
Port            InOctets    InUcastPkts    InMcastPkts    InBcastPkts
Fa0/1            5437425           2103          67463            453
Port           OutOctets  OutUcastPkts  OutMcastPkts  OutBcastPkts
Fa0/1                  0             0             0             0
Fa0/2                  0             0             0             0
```

```
2950# show interface fastEthernet 0/1
FastEthernet0/1 is up, line protocol is up (connected)
  Hardware is Fast Ethernet, address is 0005.7428.2901 (bia 0005.7428.2901)
  MTU 1500 bytes, BW 100000 Kbit, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
etc...
```


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Show Interface Error Counters

- **FCS-Err** is the number of valid size frames with FCS (Frame Check Sequence) errors but no framing errors: this is typically a physical issue (cabling, bad port, NIC card,…) but can also indicate a duplex mismatch
- **Align-Err** is the number of frames with alignment errors (frames that do not end with an even number of octets and have a bad CRC) received on the port; these usually indicate a physical problem (cabling, bad port, NIC card,…) but can also indicate a duplex mismatch; when the cable is first connected to the port, some of these errors may occur; also, if there is a hub connected to the port then collisions between other devices on the hub may cause these errors
- **Late-Coll** (Late Collisions) is the number of times that a collision is detected on a particular port late in the transmission process; for a 10mbit/s port this is later than 512 bit-times into the transmission of a packet; five hundred and twelve bit-times corresponds to 51.2 microseconds on a 10 Mbit/s system; this error can indicate a duplex mismatch among other things; for the duplex mismatch scenario the late collision would be seen on the half duplex side; as the half duplex side is transmitting, the full duplex side does not wait its turn and transmits simultaneously causing a late collision; late collisions can also indicate an Ethernet cable/segment that is too long; collisions should not be seen on ports configured as full duplex
- **Single-Coll** (Single Collision) is the number of times one collision occurred before the port transmitted a frame to the media successfully; collisions are normal for port configured as half duplex but should not be seen on full duplex ports; if collisions are increasing dramatically this points to a highly utilized link or possibly a duplex mismatch with the attached device
- **Multi-Coll** (Multiple Collision) is the number of times multiple collisions occurred before the port transmitted a frame to the media successfully; collisions are normal for port configured as half duplex but should not be seen on full duplex ports; if collisions are increasing dramatically this points to a highly utilized link or possibly a duplex mismatch with the attached device

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Show Interface Error Counters (Cont.)

- **Excess-Coll** (Excessive Collisions) is a count of frames for which transmission on a particular port fails due to excessive collisions; an excessive collision happens when a packet has a collision 16 times in a row; the packet is then dropped; excessive collisions is typically an indication that the load on the segment needs to be split across multiple segments but can also point to a duplex mismatch with the attached device; collisions should not be seen on ports configured as full duplex
- **Carri-Sen** (Carrier Sense) occurs every time an Ethernet controller wants to send data on a half duplex connection; the controller senses the wire and check if it is not busy before transmitting; this is normal on an half-duplex Ethernet segment
- **Undersize** are frames received that are smaller than the minimum IEEE 802.3 frame size of 64bytes long (excluding framing bits, but including FCS octets) that were otherwise well formed; check the device sending out these frames
- **Runts** are frames received that are smaller than the minimum IEEE 802.3 frame size (64 bytes for Ethernet) and with a bad CRC; this can be caused by duplex mismatch and physical problems like a bad cable, port, or NIC card on the attached device
- **Giants** exceed the maximum IEEE 802.3 frame size (1518 bytes for non-jumbo Ethernet); try to find the offending device and remove it from the network
- http://www.cisco.com/warp/public/473/164.html#show_interface

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Show Controller Ethernet-Controller

Cisco.com

```
3550-1# show controllers ethernet-controller gig 0/1
  Transmit GigabitEthernet0/1        Receive
  26735655 Bytes                  17910501 Bytes
     36822 Unicast frames            28273 Unicast frames
    154690 Multicast frames         198913 Multicast frames
      2618 Broadcast frames            111 Broadcast frames
         0 Discarded frames           9028 No dest, unicast
         0 Too old frames               38 No dest, multicast
         0 Deferred frames               0 No dest, broadcast
         0  1 collision frames
         0  2 collision frames            0 FCS errors
         0  3 collision frames            0 Oversize frames
         0  4 collision frames            0 Undersize frames
         0  5 collision frames            0 Collision fragments
         0  6 collision frames
         0  7 collision frames        89805 Minimum size frames
         0  8 collision frames       139887 65 to 127 byte frames
         0  9 collision frames         4019 128 to 255 byte frames
         0 10 collision frames         2124 256 to 511 byte frames
         0 11 collision frames          528 512 to 1023 byte frames
         0 12 collision frames            0 1024 to 1518 byte frames
         0 13 collision frames
         0 14 collision frames            0 Flooded frames
         0 15 collision frames            0 Overrun frames
         0 Excessive collisions           1 VLAN filtered frames
         0 Late collisions                0 Source routed frames
         0 Good (1 coll) frames           0 Valid oversize frames
         0 Good(>1 coll) frames           0 Pause frames
         0 Pause frames                   0 Symbol error frames
         0 VLAN discard frames            0 Invalid frames, too large
         0 Excess defer frames            0 Valid frames, too large
         0 Too large frames               0 Invalid frames, too small
     17426 64 byte frames                 0 Valid frames, too small
    147628 127 byte frames
```

http://www.cisco.com/warp/public/4

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TCAM Templates (3750/2970, 3550)

Cisco.com

```
3550# show sdm prefer
 The current template is the default template.
 The selected template optimizes the resources in
 the switch to support this level of features for
 16 routed interfaces and 1K VLANs.

number of unicast mac addresses:    6K
number of igmp groups:              6K
number of qos aces:                 2K
number of security aces:            2K
number of unicast routes:           12K
number of multicast routes:         6K
```

Use these Commands to Help Verify Current # of Entries

← show mac address-table count
← show mac address-table multicast count
← show tcam qos [tcam #] statistics
← show tcam [inacl|outacl] [tcam #] statistics
← show ip cef summary
← show ip mroute count

```
3750# show sdm prefer
 The current template is "desktop default" template.
 The selected template optimizes the resources in
 the switch to support this level of features for
 8 routed interfaces and 1024 VLANs.

  number of unicast mac addresses:              6K
  number of igmp groups + multicast routes:     1K

  number of unicast routes:                     8K
    number of directly connected hosts:         6K
    number of indirect routes:                  2K
  number of policy based routing aces:          0
  number of qos aces:                           512
  number of security aces:                      1K
```

Works on the 2970 Also for Its L2 Features

Use these Commands to Help Verify Current # of Entries

← show mac address-table count
← show ip 1gmp snooping multicast count
← show ip mroute count
← show ip route summary
← show access-lists
← show access-lists
← show platform acl usage [port asic #]

```
3550(config)# sdm prefer access
Changes to the running SDM preferences have been stored, but cannot take effect until the next reload.
Use 'show sdm prefer' to see what SDM preference is currently active.
```

2970 only has 1 Template and so Is Not Configurable

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LAYER 2 PACKET FORWARDING

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Show Mac Address-Table


```
2950# show mac address-table dynamic
          Mac Address Table
-------------------------------------------
Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
   2    0000.0c14.2553    DYNAMIC     Gi0/1
   2    0000.0c45.41a0    DYNAMIC     Gi0/1
   2    0000.9294.01ed    DYNAMIC     Gi0/1
   2    0001.42b2.6780    DYNAMIC     Gi0/1
   2    0006.5370.63c0    DYNAMIC     Gi0/1
   2    0006.5370.63d9    DYNAMIC     Gi0/1
   2    0009.43a7.bb00    DYNAMIC     Gi0/1
   2    0010.7b81.f66d    DYNAMIC     Gi0/1
   1    0001.42b2.6788    DYNAMIC     Gi0/1
   1    0006.5370.63d9    DYNAMIC     Gi0/1
   1    0009.43a7.bb00    DYNAMIC     Gi0/1
Total Mac Addresses for this criterion: 11
```

```
2950# sh mac address-table address 0000.0c14.2553
          Mac Address Table
-------------------------------------------
Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
   2    0000.0c14.2553    DYNAMIC     Gi0/1
Total Mac Addresses for this criterion: 1
```

```
2950# show mac address-table count

Mac Entries for Vlan 2:
---------------------------
Dynamic Address Count  : 8
Static  Address Count  : 0
Total Mac Addresses    : 8

Mac Entries for Vlan 1:
<output omitted>
Total Mac Address Space Available: 8179
```

```
3750# show mac address-table aging-
time
Vlan    Aging Time
----    ----------
   1     300
   2     300
```


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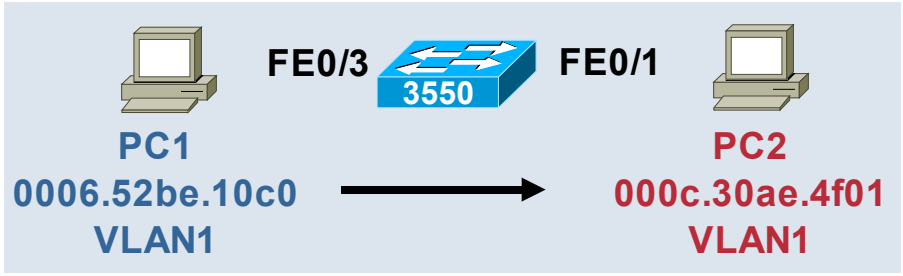
Catalyst 3550 Mac Address HW Checking



How Would a Packet Sent from PC1 to PC2 Be L2 Switched in HW by the 3550?

```
3550-24# show mac address-table dynamic
          Mac Address Table
-------------------------------------------
Vlan    Mac Address       Type        Ports
----    -----------       ----        -----
   1    0006.52be.10c0    DYNAMIC     Fa0/3
   1    0006.52be.10c2    DYNAMIC     Fa0/3
   1    000c.30ae.4f01    DYNAMIC     Fa0/1
Total Mac Addresses for this criterion: 3
```

```
                        In port       SA mac          DA mac
                           |            |               |
3550-24# show forward fast 0/3 0006.52be.10c0 000c.30ae.4f01
got vlan 1, vlaninfo 9001
<output omitted>
Egress q 0
using default sig_control_info 0x0000941A
signature: 00000000, comparison ind: 16, control info: 0000941A control map: 00000200
vlan: 1, vlanid entry: 000E0001 00000000 8C631044 00000000
FastEthernet0/1 vlan 1, dst 000c.30ae.4f01 src 0006.52be.10c0, cos 0x0, dscp 0x
```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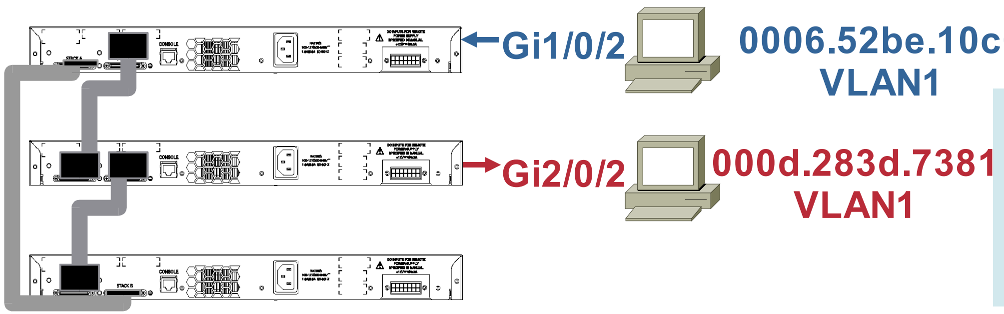
Catalyst 2970/3750 Mac Address HW Checking




```
3750# show switch
                                                        Current
Switch#  Role     Mac Address       Priority     State
---------------------------------------------------------
 1       Slave    000c.30ae.4f00       9         Ready
*2       Master   000d.bd5c.1680       15        Ready
 3       Slave    000c.3065.7840       10        Ready
```

```
3750# show mac address-table dynamic
          Mac Address Table
-------------------------------------------
Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
   1    0006.52be.10c0    DYNAMIC     Gi1/0/2
   1    0006.52be.10c1    DYNAMIC     Gi1/0/2
   1    000d.283d.7381    DYNAMIC     Gi2/0/2
Total Mac Addresses for this criterion: 3
```

```
                                   In port       SA mac           DA mac
3750# session 1                       |             |                |
3750-1# show platform forward gi1/0/2 0006.52be.10c0 000d.283d.7381
<output omitted>
Switch : 1 :
------------
Egress: Asic 2, switch 2
------------------------------------------
Lookup                  Key-Used                     Index-Hit  A-Data
OutptACL 30_0000000D_283D7381-00_00000006_52BE10C0     01FFC    01000000
Port       Vlan      SrcMac          DstMac      Cos   Dscpv
Gi2/0/2    0001  0006.52BE.10C0  000D.283D.7381
```

2970 Supports This Command as Well! (No Stacking However)

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L2 Traceroute


```
3750# traceroute mac ip 2.2.2.3 2.2.2.4 detail
Translating IP to mac .....
2.2.2.3 => 000d.283d.73c1
2.2.2.4 => 0012.442b.3fff

Source 000d.283d.73c1 found on 3750[WS-C3750G-16TD] (2.2.2.1)
1 3750 / WS-C3750G-16TD / 2.2.2.1 :
                Gi2/0/3 [auto, auto] => Gi1/0/4 [auto, auto]
2 3550 / WS-C3550-24-PWR / 2.2.2.2 :
                Fa0/3 [auto, auto] => Fa0/23 [auto, auto]
Destination 0012.442b.3fff found on 3550[WS-C3550-24-PWR]
(2.2.2.2)
Layer 2 trace completed.
```

From ARP table

```
3750# traceroute mac 000d.283d.73c1 0012.442b.3fff detail
Source 000d.283d.73c1 found on 3750[WS-C3750G-16TD] (2.2.2.1)
1 3750 / WS-C3750G-16TD / 2.2.2.1 :
                Gi2/0/3 [auto, auto] => Gi1/0/4 [auto, auto]
2 3550 / WS-C3550-24-PWR / 2.2.2.2 :
                Fa0/3 [auto, auto] => Fa0/23 [auto, auto]
Destination 0012.442b.3fff found on 3550[WS-C3550-24-PWR]
(2.2.2.2)
Layer 2 trace completed.
```

- CDP must be enabled on all switches in the path
- Only unicast addresses are supported
- Addresses must be in the same vlan/IP subnet
- The maximum number of hops identified in the path is 10

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IP PACKET FORWARDING

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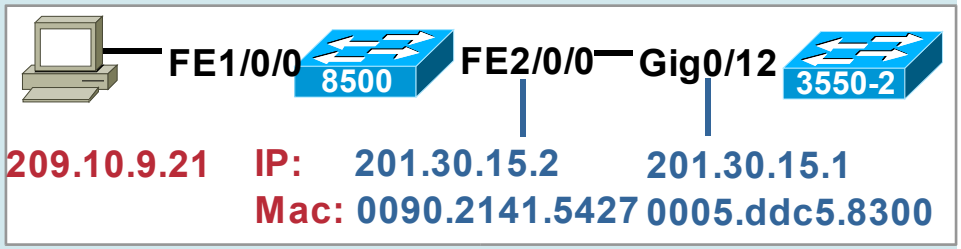
IP Unicast Routing Troubleshooting (SW) (Catalyst 3750/3550)


```
3550-2# show ip route 209.10.9.21
Routing entry for 209.10.9.0/24
  Known via "eigrp 1", distance 90, metric 156160, type internal
  Redistributing via eigrp 1
  Last update from 201.30.15.2 on GigabitEthernet0/12, 00:01:42 ago
  Routing Descriptor Blocks:
  * 201.30.15.2, from 201.30.15.2, 00:01:42 ago, via GigabitEthernet0/12

3550-2# show ip arp 201.30.15.2
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  201.30.15.2              5   0090.2141.5427  ARPA   GigabitEthernet0/12
```

Software copy of the Routing and ARP tables

```
3550-2# show ip cef 209.10.9.21 detail
209.10.9.0/24, version 19, epoch 0, cached adjacency 201.30.15.2
0 packets, 0 bytes
  via 201.30.15.2, GigabitEthernet0/12, 0 dependencies
    next hop 201.30.15.2, GigabitEthernet0/12
    valid cached adjacency

3550-2# show adjacency gigabitEthernet 0/12 detail
Protocol Interface                 Address
IP       GigabitEthernet0/12       201.30.15.2(7)
                                   0 packets, 0 bytes
                                   00902141542700005DDC583000800
                                   ARP        03:49:45
                                   Epoch: 0
3550-2# show interface gig 0/12
GigabitEthernet0/12 is up, line protocol is up (connected)
  Hardware is Gigabit Ethernet, address is 0005.ddc5.8300 (bia 0005.ddc5.8300)
  Internet address is 201.30.15.1/24
```

Software copy of the FIB and Adjacency tables



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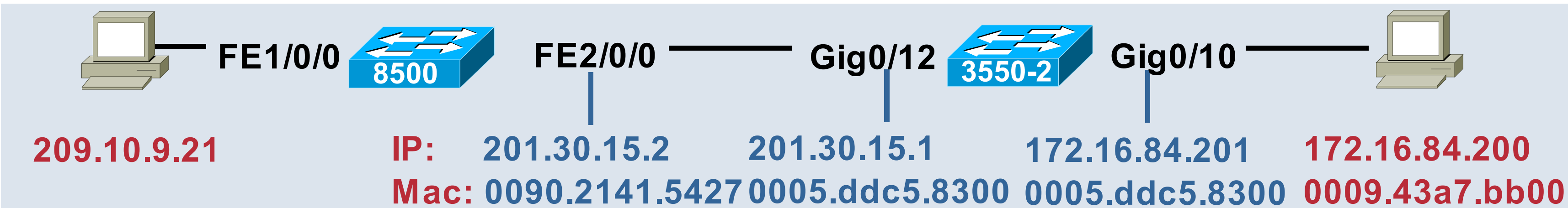
Catalyst 3550 IP Unicast Routing Troubleshooting (HW)

How Would 3550-2 Port Gig 0/10 Handle an Inbound IP Packet Sourced From 172.16.84.200 and Destined to 209.10.9.21?




```
                    In port       SA mac         DA mac           SA IP        DA IP     protoco
                       |             |              |                |            |          |
3550-2# show forward gig 0/10 0009.43a7.bb00 0005.ddc5.8300 ip 172.16.84.200 209.10.9.21 255

got vlan 1025, vlaninfo 8401
signature: 00000007, comparison ind: 10, control info: 2000941A control map: 00000000
vlan: 1025, vlanid entry: 00040007 00000000 88000000 00000000
adjacency: ptr: 0x8 hash: 0 addr: 0xE898 data: E0002401 00902141 54270000
<output omitted>
lookup  key                                      bk adata    rawoff secoff sec
route   42AC1054C8D10A0915 000000000000000000 0  00078008 009794 000034  3
GigabitEthernet0/12 vlan 1025, dst 0090.2141.5427 src 0005.ddc5.8300, cos 0x0, dscp 0x0
```

```
3550-2# show vlan internal usage
VLAN Usage
---- --------------------
1025 GigabitEthernet0/12
```

- The information at the bottom of the ‘show forward’ command is used by 3550-2 to rewrite the packet received on gig 0/10 in hardware and send it towards the destination 209.10.9.21

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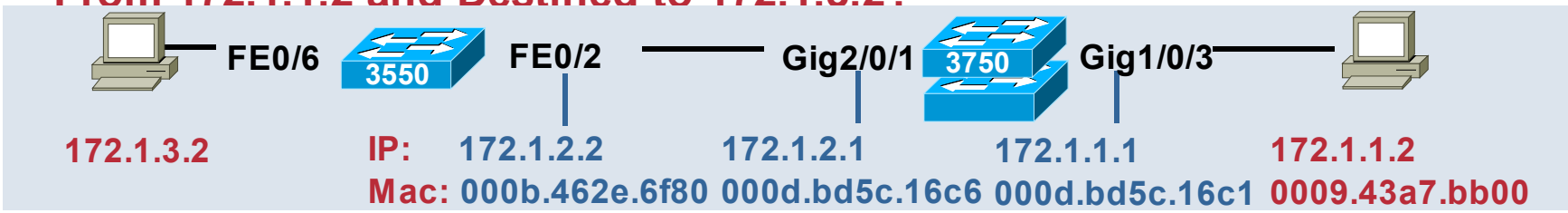
Catalyst 3750 IP Unicast Routing Troubleshooting (HW)

How Would 3750 Port Gig 1/0/3 Handle an Inbound IP Packet Sourced From 172.1.1.2 and Destined to 172.1.3.2?




```
                                In port    SA mac          DA mac          SA IP      DA IP  protocc
3750# session 1                          |          |               |               |          |       |
3750-1# show platform forward gig 1/0/3 0009.43a7.bb0 000d.bd5c.16c1 ip 172.1.1.2 172.1.3.2 255
Global Port Number: 3, Asic Number: 1
Src Real Vlan Id: 1006, Mapped Vlan Id: 18
<output omitted>
Egress: Asic 2, switch 2
Output Packets:
----------------------------------------
Packet 1
 Lookup                    Key-Used                          Index-Hit  A-Data
OutptACL 50_AC010302_AC010102-00_00000000_0000FF00      01FFE    03000000
Port       Vlan      SrcMac           DstMac     Cos  Dscpv
Gi2/0/1    1009 XXXX.XXXX.02C6  000B.462E.6F80
```

```
3750-1# show platform pm if-numbers
Interface gid  gpn  lpn  port slot unit slun
----------------------------------------
Gi1/0/3   3    3    3    1/0  1    3    3
```

```
3750-1# show vlan internal usage
VLAN Usage
---- --------------------
1006 GigabitEthernet1/0/3
1009 GigabitEthernet2/0/1
```

```
3750# show switch
  Current
Switch#  Role     Mac Address      Priority    State
-----------------------------------------------------
 1       Slave    000c.30ae.4f00      9        Ready
*2       Master   000d.bd5c.1680      15       Ready
```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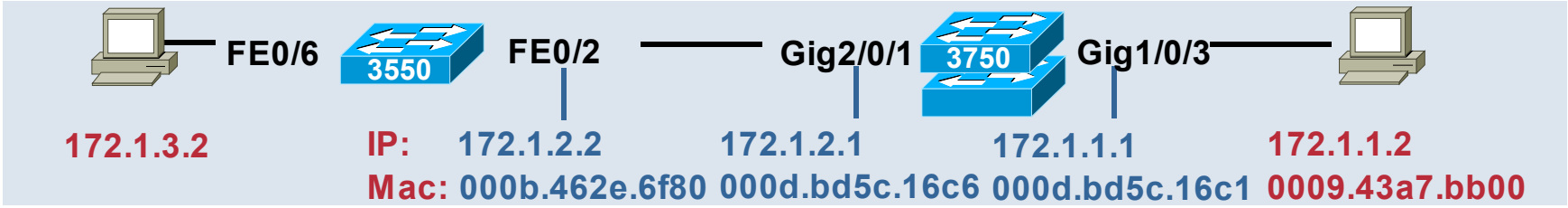
Catalyst 3750 IP Unicast Routing Troubleshooting (HW)

How Would Switch #1 in the 3750 Stack Handle a Packet Destined to 172.1.3.2?




```
3750# session 1
3750-1# show platform ip unicast route 172.1.3.0 255.255.255.0
Fib 172.1.3.0/24 Fibflag:0x0 Bucket:0
        Path(0)AdjIP:172.1.2.2 Vl:1009 000b.462e.6f80 AdjFl:0x00 OI:0x1
        HL3UFlags:0x0
        SFT Entry:hdl:0x5A  HwFL:0x4
```

```
3750-1# show platform ip unicast adjacency 172.1.2.2
172.1.2.2 Vlan:1009 Mac:000B:462E:6F80 OI:3 PDFlags:0x10 MAD:0x146DF6C(RWI:3) Ref:0
        COMPLETE PIFlags:0x0  MAD OK MADProg OK Stn OK Mvid OK MvidLock VlLock:1009
        HLFM_hdl: 0x172AAC4, Stn:0x96
```

```
3750-1# show vlan internal usage
VLAN Usage
---- --------------------
1006 GigabitEthernet1/0/3
1009 GigabitEthernet2/0/1
```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Agenda

- Packet Forwarding
- Multicasting
- Access Control Lists
- QoS
- Miscellaneous

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IP Multicast Support

- IP multicast routing
  (3750 and 3550 EMI only)
- IGMP snooping (ALL)
- CGMP server (3750 and 3550 EMI only)
- MVR (Multicast VLAN Registration: ALL)
- IGMP Querier
  (3750, 3550, 2970 as of 12.2(25)SEA)

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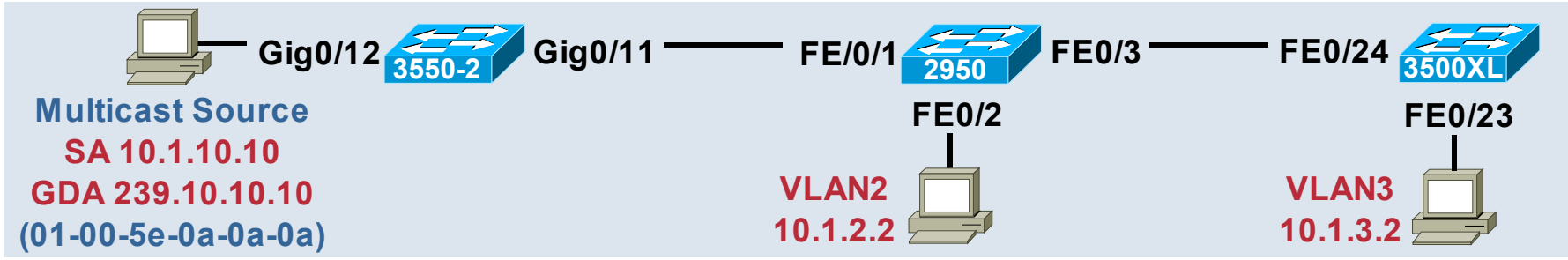
Catalyst 3750/3550 Multicast Router Troubleshooting (SW)

Cisco.com




```
3550-2# show ip mroute
(*, 239.10.10.10), 01:00:56/stopped, RP 0.0.0.0, flags: DC
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan3, Forward/Dense, 00:00:20/00:00:00
    Vlan2, Forward/Dense, 00:00:55/00:00:00

(10.1.10.10, 239.10.10.10), 00:55:25/00:02:58, flags: T
  Incoming interface: GigabitEthernet0/12, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan3, Forward/Dense, 00:00:20/00:00:00, H
    Vlan2, Forward/Dense, 00:00:55/00:00:00, H
```

```
3550-2# show ip igmp group
IGMP Connected Group Membership
Group Address   Interface Uptime    Expires  Last
Reporter
224.0.1.40      Vlan2     02:52:47  00:02:15 10.1.2.1
239.10.10.10    Vlan3     00:00:04  00:02:55 10.1.3.2
239.10.10.10    Vlan2     01:25:52  00:02:22 10.1.2.2
```

```
3550-2# show ip igmp interface vlan 3
Vlan3 is up, line protocol is up
  Internet address is 10.1.3.1/24
  IGMP is enabled on interface
  Current IGMP host version is 2
  Current IGMP router version is 2
  CGMP is enabled on interface
  IGMP query interval is 60 seconds
  IGMP querier timeout is 120 seconds
  IGMP max query response time is 10 seconds
  Last member query response interval is 1000 ms
  Inbound IGMP access group is not set
  IGMP activity: 10 joins, 9 leaves
  Multicast routing is enabled on interface
  Multicast TTL threshold is 0
  Multicast designated router (DR) is 10.1.3.1 (this
system)
  IGMP querying router is 10.1.3.1 (this system)
  No multicast groups joined
```

```
3550-2# debug ip igmp -> queries/reports, joins/leaves
```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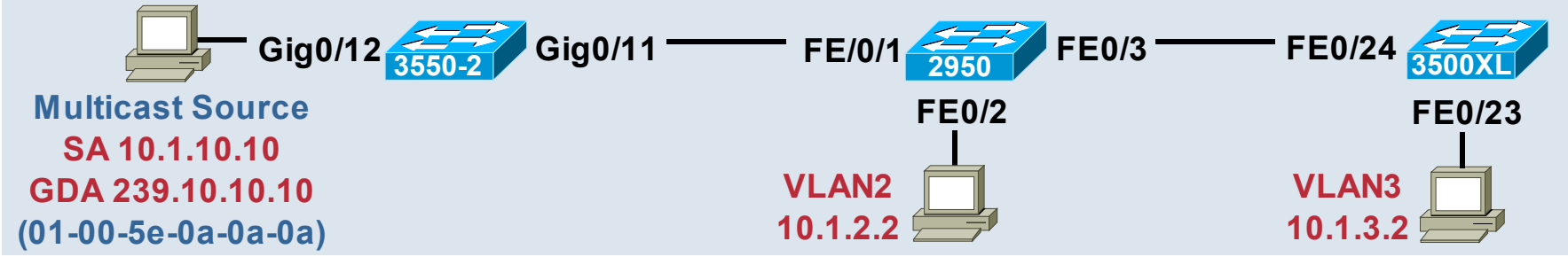
Catalyst 3550 Multicast Router Troubleshooting (HW)

Cisco.com




```
                    In port    SA mac     DA mac           SA IP          DA IP    protocol
                       |          |          |               |              |          |
3550-2# show forward gig 0/12 0.0.1 0100.5e0a.0a0a ip 10.1.10.10 239.10.10.10 255
got vlan 1025, vlaninfo 8401
<output omitted>
GigabitEthernet0/11 vlan 3, dst 0100.5e0a.0a0a src 0005.ddc5.8300, cos 0x0, dscp 0x0
GigabitEthernet0/11 vlan 2, dst 0100.5e0a.0a0a src 0005.ddc5.8300, cos 0x0, dscp 0x0
```

```
3550-2# show vlan internal usage
VLAN Usage
---- --------------------
1025 GigabitEthernet0/12
```

```
3550-2# show interfaces vlan 2
Vlan2 is up, line protocol is up
  Hardware is EtherSVI, address is 0005.ddc5.8300 (bia 0005.ddc5.8300)
```

```
3550-2# show interfaces vlan 3
Vlan3 is up, line protocol is up
  Hardware is EtherSVI, address is 0005.ddc5.8300 (bia 0005.ddc5.8300)
```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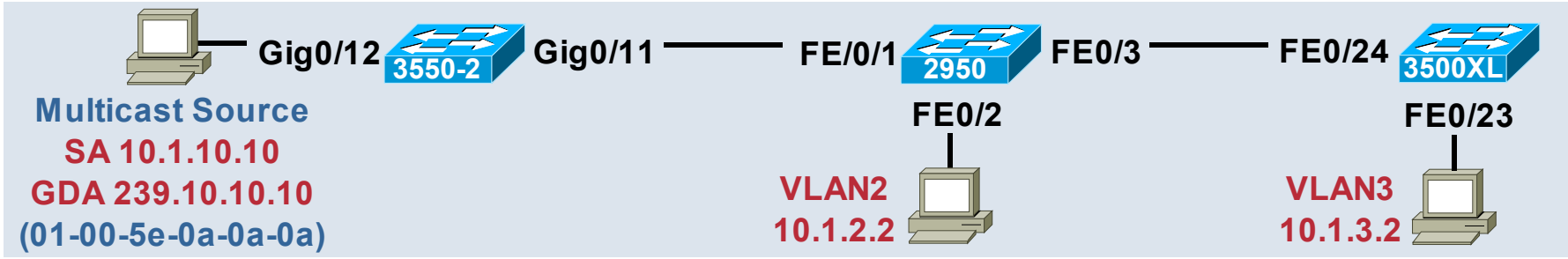
Catalyst 2950 Multicast Switch Troubleshooting

Cisco.com




```
2950# show ip igmp snooping
<output omited>
vlan 2
----------
 IGMP snooping is globally enabled
 IGMP snooping is enabled on this Vlan
 IGMP snooping immediate-leave is enabled on this Vlan
 IGMP snooping mrouter learn mode is pim-dvmrp on this Vlan
 IGMP snooping is running in IGMP_ONLY mode on this Vlan
vlan 3
----------
 IGMP snooping is globally enabled
 IGMP snooping is enabled on this Vlan
 IGMP snooping immediate-leave is disabled on this Vlan
 IGMP snooping mrouter learn mode is pim-dvmrp on this Vlan
 IGMP snooping is running in IGMP_CGMP mode on this Vlan
<output omited>
```

```
2950# show ip igmp snooping mrouter
Vlan    ports
----    -----
   2    Fa0/1(dynamic)
   3    Fa0/1(dynamic)
```

```
2950# show mac address-table multicast
Vlan    Mac Address         Type        Ports
----    -----------         ----        -----
   2    0100.5e0a.0a0a      IGMP        Fa0/1, Fa0/2
   3    0100.5e0a.0a0a      IGMP        Fa0/1, Fa0/3
```

```
2950# show mac address-table multicast count
Vlan    Mac Address         Type        Ports
----    -----------         ----        -----
Total Number of Multicast Addresses: 2
```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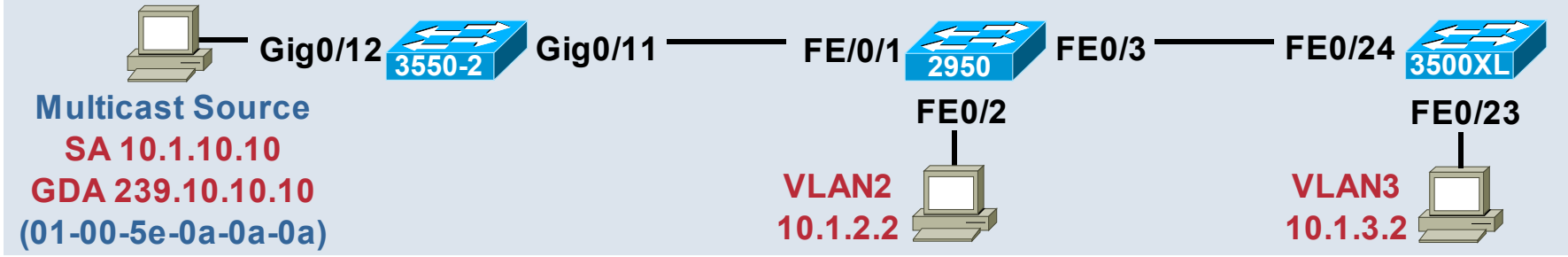
Catalyst 2950 Multicast Switch Troubleshooting



Host 10.1.2.2 leaves the group...

```
2950# debug ip igmp snooping group
group debugging is on
21:20:23: IGMPSN: group: Leave for group 239.10.10.10 received on Vlan 2, port Fa0/2
21:20:23: IGMPSN: group: Deleting port 1 from group 239.10.10.10 on Vlan 2
21:20:23: IGMPSN: group: Deleting group 239.10.10.10
21:20:23: IGMPSN: group: Sending Leave for group 239.10.10.10 on Vlan 2    ← to 3550 (multicast router)
21:20:23: IGMPSN: group: Deleting gce 0100.5e0a.0a0a
```

```
2950# show mac address-table multicast
Vlan    Mac Address       Type        Ports
----    -----------       ----        -----
   3    0100.5e0a.0a0a    IGMP        Fa0/1, Fa0/3
```

```
3550-2# show ip mroute
(10.1.10.10, 239.10.10.10), 03:32:17/00:02:59, flags: T
  Incoming interface: GigabitEthernet0/12, RPF nbr 0.0.0.0
  Outgoing interface list:
    Vlan3, Forward/Dense, 00:00:07/00:00:00, H
```

(Use 'debug ip igmp' to see the leave enter the multicast router – 3550)

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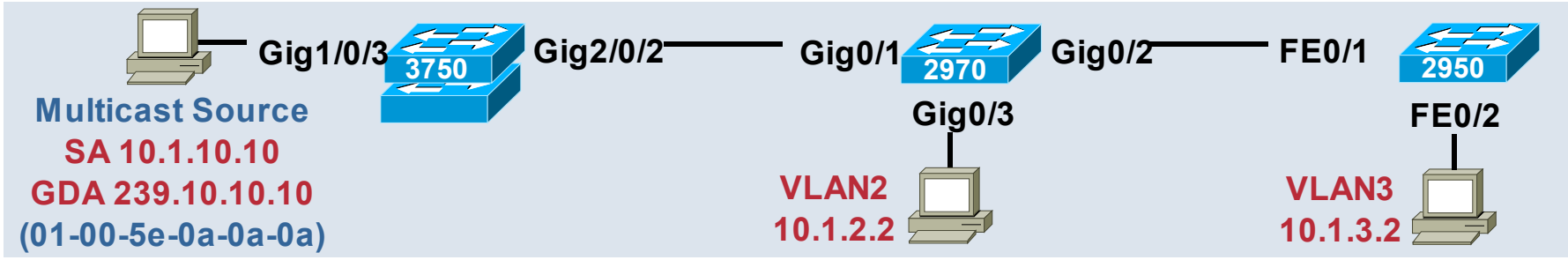
Catalyst 3750 Multicast Router Troubleshooting (HW)




```
                                In port    SA mac     DA mac           SA IP       DA IP    protocol
3750# session 1                    |         |          |                |           |          |
3750-1# show platform forward gig 1/0/3 0.0.1 0100.5e0a.0a0a ip 10.1.10.10 239.10.10.10 255
Global Port Number: 3, Asic Number: 1
Src Real Vlan Id: 1006, Mapped Vlan Id: 19
<output omitted>
Egress: Asic 2, switch 2
Port        Vlan      SrcMac           DstMac     Cos  Dscpv
Gi2/0/2     0002 XXXX.XXXX.02C7  0100.5E0A.0A0A
Gi2/0/2     0003 XXXX.XXXX.02C8  0100.5E0A.0A0A
```

```
3750# show vlan internal usage
VLAN Usage
---- --------------------
1006 GigabitEthernet1/0/3
```

```
3750# show platform pm if-numbers
interface gid  gpn  lpn  port slot unit slun port-type
-------------------------------------------------------
Gi1/0/3   3    3    3    1/0  1    3    3    remote
```

```
3750# show int vlan 2
  Hardware is EtherSVI, address is 000d.bd5c.16c7 (bia 000d.bd5c.16c7)

3750# show int vlan 3
  Hardware is EtherSVI, address is 000d.bd5c.16c8 (bia 000d.bd5c.16c8)
```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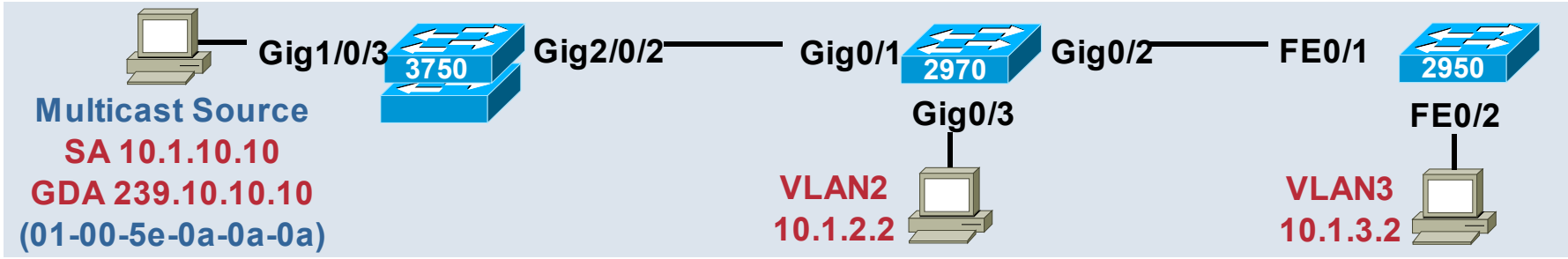
Catalyst 2970 Multicast Switch Troubleshooting (SW)




```
2970# show ip igmp snooping
<output omited>
Vlan 2:
--------
IGMP snooping                          : Enabled
Immediate leave                        : Disabled
Multicast router learning mode         : pim-dvmrp
Source only learning age timer         : 10
CGMP interoperability mode             : IGMP_ONLY

Vlan 3:
--------
IGMP snooping                          : Enabled
Immediate leave                        : Disabled
Multicast router learning mode         : pim-dvmrp
Source only learning age timer         : 10
CGMP interoperability mode             : IGMP_ONLY
<output omited>
```

```
2970# show ip igmp snooping mrouter
Vlan    ports
----    -----
   2    Gi0/1(dynamic)
   3    Gi0/1(dynamic)
```

```
2970# show ip igmp snooping multicast dynamic
Vlan   Group Address     Type    Version   Port List
----   -------------     ----    -------   ---------
2      239.10.10.10      IGMP    v2        Gi0/1, Gi0/3
3      239.10.10.10      IGMP    v2        Gi0/1, Gi0/2
```

```
2970# show ip igmp snooping multicast count
Total number of multicast groups: 2
```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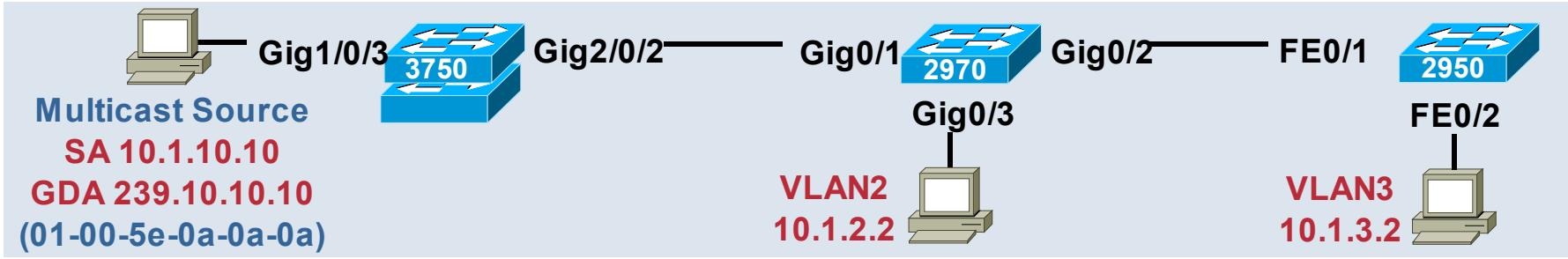
Catalyst 2970 Multicast Switch Troubleshooting (HW)




```
2970# show platform ip igmp snooping hardware
Vlan    Group Address      di        atm         sdi        Switches
----    -------------      --        ---         ---        --------
   2    239.10.10.10       0x1AC7    0x20C4    0x009B       1
   3    239.10.10.10       0x1AC5    0x20C2    0x0097       1
```

```
2970# show platform port-asic dest-map index 0x1ac7
Ports: Gi0/3 Gi0/1

2970# show platform port-asic dest-map index 0x1ac5
Ports: Gi0/2 Gi0/1
```

The 2970 Commands Also Work on the 3750; Use "`remote command all...`" to Make Sure You Check HW Programming on the Correct Switches in the 3750 Stack!

```
                          In port In vlan  SA mac            DA mac       SA IP      DA IP
protocol
                            |       |         |                 |             |          |
|
2970#sh plat forward gig 0/1 vlan 2 000d.bd5c.1682 0100.5e0a.0a0a ip 10.1.10.10 239.10.10.10
255
<output omited>
Lookup                    Key-Used                          Index-Hit  A-Data
OutptACL 50_EF0A0A0A_0A010A0A-00_00000000_0000FF00      01FFE    03000000
Port      Vlan      SrcMac          DstMac      Cos  Dscpv
```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IGMP Querier (Catalyst 3750/3550/2970)


```
Switch# show ip igmp snooping querier vlan 2 detail
Vlan      IP Address      IGMP Version    Port
------------------------------------------------------
--
2         10.1.1.65       v2              Switch

Global IGMP switch querier status
------------------------------------------------------
--
admin state                     : Enabled
admin version                   : 2
source IP address               : 0.0.0.0
query-interval (sec)            : 60
max-response-time (sec)         : 10
querier-timeout (sec)           : 120
tcn query count                 : 2
tcn query interval (sec)        : 10

Vlan 2:   IGMP switch querier status
------------------------------------------------------
--
elected querier is 10.1.1.65       (this switch
querier)
------------------------------------------------------
--
admin state                     : Enabled
admin version                   : 2
source IP address               : 10.1.1.65
query-interval (sec)            : 60
max-response-time (sec)         : 10
querier-timeout (sec)           : 120
tcn query count                 : 2
```

- Introduced via 12.2(25)SEA EMI/SMI software
- Allows IGMP Snooping to operate within any single VLAN without the presence of a multicast router
- Elect the L2 switch with the lowest IP address as the Querier only when there is no multicast router in the VLAN
- Generate the IGMP General Query at a regular interval and in response to a global leave
- VLAN parameters override global ones
- An IP address must be assigned (VLAN or global) and IGMP snooping must be

```
Switch# debug condition vlan 2
Switch# debug ip igmp snooping
querier
```


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Agenda

- Packet Forwarding
- Multicasting
- Access Control Lists
- QoS
- Miscellaneous

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ACL Troubleshooting

- RACL log keyword: A copy of the packets are sent to the CPU
- Use "no ip unreachables" to prevent denied packets from being sent to the CPU
- If hardware reaches its capacity to store an ACL configuration then processing is done in software by the CPU for the entire ACL
  - Check the syslog message for FM-3-UNLOADING:
  - Use SDM templates with the largest ACL TCAM partition if required
- MAC-based ACLs filter IP and non-IP traffic on the 2950 but only non-IP traffic on the other platforms
- Port ACLs are applied on L2 physical interfaces to filter inbound traffic
- VLAN maps are directionless effecting packets that are routed into or out of a VLAN or that are bridged within a VLAN
- On the 2950 the only relevant monitoring commands are 'show access-lists', 'show mac-access group', 'show ip interface', 'show run'

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Catalyst 3550 TCAM: Interface Association

Switch	Number of TCAM Subsystems Per Switch	Notes
Catalyst 3550-24	1	All Interfaces Use TCAM Subsystem 1
Catalyst 3550-48	2	Fast Ethernet Interfaces 1–36 Use TCAM Subsystem 1 Fast Ethernet Interfaces 37–48 Plus Gigabit Ethernet Interfaces Use TCAM Subsystem 2
Catalyst 3550-12T	3	Interfaces 1–4 Use TCAM Subsystem 1, Interfaces 5–8 Use TCAM Subsystem 2, and Interfaces 9–12 Use TCAM Subsystem 3
Catalyst 3550-12G	3	Interfaces 1–4 Use TCAM Subsystem 1, Interfaces 5–8 Use TCAM Subsystem 2, and Interfaces 9–12 Use TCAM Subsystem 3

- Four port ASICs per TCAM
- One gig interface gets a dedicated port ASIC while 12 10/100 ports share a port ASIC

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Catalyst 3550 ACL Troubleshooting

Cisco.com

```
3550-2# show access-list
Extended IP access list 102
    permit tcp host 172.16.84.200 host 209.10.9.21 eq www
    deny ip any any
```

```
3550-2(config)# interface gig 0/10
3550-2(config-if)# ip access-group 102 in
```

```
3550-2# show fm interface gig0/10
Input Port Label: 1
```

3550-12T: TCAM #3 handles gig 0/10

```
3550-2# show tcam inacl 3 port-labels 1
Label Value :        4097(port label 1)
Number of entries : 9
Entry List
----------
<output omitted>
Mask Index : 5
F5 FF FF FF FF FF FF FF FF FF 00 80 00 C0 00 00 FF FF
Entry Index : 33  Timestamp: 4
94 AC 10 54 C8 D1 0A 09 15 81 00 00 00 80 00 00 00 50 As Data(hex) : 00000082
```

172.16.84.200 = AC.10.54.C8 (hex)
209.20.9.21 = D1.0A.09.15 (hex)
/32 host masks = FFFFFFFF (hex)
Src port any = 0
Dst port www(80) = 50 (hex)

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Catalyst 3550 ACL Troubleshooting

3550-12T: TCAM #3 handles gig 0/10

```
3550-2# show tcam inacl 3 size
Ingress ACL TCAM Size: 3328 Entries
```

```
3550-2# show tcam inacl 3 statistics
Ingress ACL TCAM#3: Number of active labels: 5
Ingress ACL TCAM#3: Number of masks   allocated:   17, available:  399
Ingress ACL TCAM#3: Number of entries allocated:   35, available: 3293
```

```
3550-2# show access-lists hardware counters
Input Drops:              127377 matches (10104503 bytes)
Output Drops:             0 matches (0 bytes)
Input Forwarded:          1383549 matches (116965172 bytes)
Output Forwarded:         11561 matches (768998 bytes)
Input Bridge Only:        0 matches (0 bytes)
Bridge and Route in CPU:  0 matches (0 bytes)
Route in CPU:             7890 matches (505774 bytes)
```


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Catalyst 3550: ACL Doesn't Fit in TCAM


```
switch(config)# int vlan 3
switch(config-if)# ip access-group 191 in
00:37:51: %FM-3-UNLOADING: Unloading input vlan label 1 feature from all TCAMs
```

```
switch# show tcam inacl 1 statistics
Ingress ACL TCAM#1: Number of active labels: 6
Ingress ACL TCAM#1: Number of masks allocated: 14, available: 402
Ingress ACL TCAM#1: Number of entries allocated: 43, available: 3285
```

```
switch# show fm vlan 3
Input VLAN Label: 1
Output VLAN Label: 0 (default)
Priority: normal
```

```
switch# show tcam inacl 1 vlan-labels 1
Label Value : 8193(vlan label 1)
Number of entries : 0
Entry List
 ----------
Default Entries
---------------
IP default entry
Mask Index : 412
F4 00 00 00 00 00 00 00 00 80 FF 00 00 00 00 00 00 00
Entry Index : 3302 Timestamp: 16
94 00 00 00 00 00 00 00 00 80 01 00 00 00 00 00 00 00 As Data(hex) : 00608085
non-IP default entry
Mask Index : 413
F4 00 00 00 00 00 00 00 00 80 FF 00 00 00 00 00 00 00
Entry Index : 3303 Timestamp: 64
90 00 00 00 00 00 00 00 00 80 01 00 00 00 00 00 00 00 As Data(hex) : 00608085
```


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Catalyst 2970/3750 Port ASIC: Interface Association


```
3750# show platform pm if-numbers

interface gid  gpn  lpn  port slot unit slun port-type lpn-idb gpn-
idb
-------------------------------------------------------------------
--
Gi1/0/1   1    1    1    1/3  1    1    1    local     Yes     Yes
Gi1/0/2   2    2    2    1/2  1    2    2    local     Yes     Yes
Gi1/0/3   3    3    3    1/0  1    3    3    local     Yes     Yes
Gi1/0/4   4    4    4    1/1  1    4    4    local     Yes     Yes
Gi1/0/5   5    5    5    2/3  1    5    5    local     Yes     Yes
Gi1/0/6   6    6    6    2/2  1    6    6    local     Yes     Yes
Gi1/0/7   7    7    7    2/0  1    7    7    local     Yes     Yes
Gi1/0/8   8    8    8    2/1  1    8    8    local     Yes     Yes
Gi1/0/9   9    9    9    0/3  1    9    9    local     Yes     Yes
Gi1/0/10  10   10   10   0/2  1    10   10   local     Yes     Yes
Gi1/0/11  11   11   11   0/0  1    11   11   local     Yes     Yes
Gi1/0/12  12   12   12   0/1  1    12   12   local     Yes     Yes
```

- **Each port ASIC will operate in one of two possible modes depending on the chassis:**
  - **Two gig ports + 24 10/100 ports**
  - **Four gig ports**
- **Each port ASIC has a corresponding TCAM (Note: Aggregator platforms (3750G-12S) have two TCAMs per port ASIC)**

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Catalyst 2970/3750 ACL Troubleshooting

Cisco.com

```
3750# show access-lists
Extended IP access list 101
    permit tcp host 172.1.3.2 host 172.1.1.2 eq www
    deny ip any any
```

```
3750(config)# int gig 2/0/1
3750(config-if)#ip access-group 101 in
```

Gig2/0/1 Belongs to the Stack Master So Check the HW Programming on That Switch Since It Is an Input ACL

```
3750# show platform tcam table acl
=================================================
ACL Cam Table (#entries: 8192, startIndex: 13696)
Index  ACL CAM Table                                    ACL
-------------------------------------------------------
<output omitted>
mask-> F8_FFFFFFFF_FFFFFFFF-FF_CC00FFFF_00000000
49     40_AC010102_AC010302-01_80000050_00000000   03000000 L3 Input
```

```
172.1.3.2          = AC.1.3.2
    (hex)
172.1.1.2          = AC.1.1.2
    (hex)
/32 host masks     = FFFFFFFF
    (hex)
Src port any       = 0
Dst port www(80) = 50 (hex)
```

```
3750# show platform acl interface gig 2/0/1
Input Label: 1
Output Label: 65535
Priority: normal
```

```
3750# show platform tcam table acl index 49 detail                <some output
omitted>
l3CamInputAclDescriptor       Value                Mask
-------------------------------------------------------------------------
  l3Destination:                AC.01.01.02          FF.FF.FF.FF
  l3Source:                     AC.01.03.02          FF.FF.FF.FF
  l4Destination:                50                   FFFF
  l4Source:                     0                    0
```


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Catalyst 2970/3750 ACL Troubleshooting

Port ASIC #

```
3750# show platform acl statistics 2
L2 ACL INPUT Statistics
     Drop:                    frame count: 1
     Drop:                    bytes count: 64
     Bridge Only:             frame count: 8701
     Bridge Only:             bytes count: 556864
     Forwarding To CPU:       frame count: 1452
     Forwarding To CPU:       bytes count: 550308

 L3 ACL INPUT Statistics
     Drop:                    frame count: 705901134
     Drop:                    bytes count: 1526497456
     Bridge Only:             frame count: 0
     Bridge Only:             bytes count: 0
     Forwarding To CPU:       frame count: 0
     Forwarding To CPU:       bytes count: 0
     Forwarded:               frame count: 39870408
     Forwarded:               bytes count: 1212780576
```

etc...

```
3750# show plat acl label 1
Input Op Select Index 255:
Output Op Select Index 255:
Input Features:
  Interfaces or VLANs:  Gi2/0/1
  Priority: normal
  Vlan Map: (none), 0 VMRs.
  Access Group: 101, 10 VMRs.
  Multicast Boundary: (none), 0 VMRs.
```

etc...

- Outbound ACLs are processed by the egress switch/port (unlike the 3550 where both inbound and outbound ACLs are processed by the ingress port ASIC)
- A copy of the outbound ACL deny traffic is sent to the CPU at 20 pps max (since no way to know whether ingress switch had "ip unreachables" set)

Port ASIC #

```
3750# show platform acl usage 2
ACL Type       Label       Entries Used
L2INPUT          0               1
                 1               1
L3INPUT          0               1
                 1               7

                Used          Available
Total
Mask             25             999
1024
Value            25             999
```


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Catalyst 2970/3750 ACL Troubleshooting (VLAN Map)


```
2970(config)#ip access-list extended http
2970(config-ext-nacl)#permit tcp host 10.1.1.32 host 10.1.1.34 eq www

2970(config)#vlan access-map map2 10
2970(config-access-map)#match ip address http
2970(config-access-map)#action drop

2970(config)#ip access-list extended match_all
2970(config-ext-nacl)#permit ip any any

2970(config)#vlan access-map map2 20
2970(config-access-map)#match ip address match_all
2970(config-access-map)#action forward

2970(config)# vlan filter map2 vlan 1
```

```
2970# show platform tcam table acl
=================================================================
mask-> F8_FFFFFFFF_FFFFFFFF-FF_CC00FFFF_00000000
49     40_0A010122_0A010120-01_80000050_00000000   00040000 L3 Input


mask-> F8_FFFFFFFF_FFFFFFFF-FF_CC00FFFF_00000000
96     50_0A010122_0A010120-01_80000050_00000000   00040000 L3 Output
```

```
2970# show platform acl interface gig
0/2
Input Label: 1
Output Label: 1
 Priority: normal
```

```
2970# show interface gig 0/2 switchport
Switchport: Enabled
Access Mode VLAN: 1 (default)
```


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Agenda

- Packet Forwarding
- Multicasting
- Access Control Lists
- QoS
- Miscellaneous

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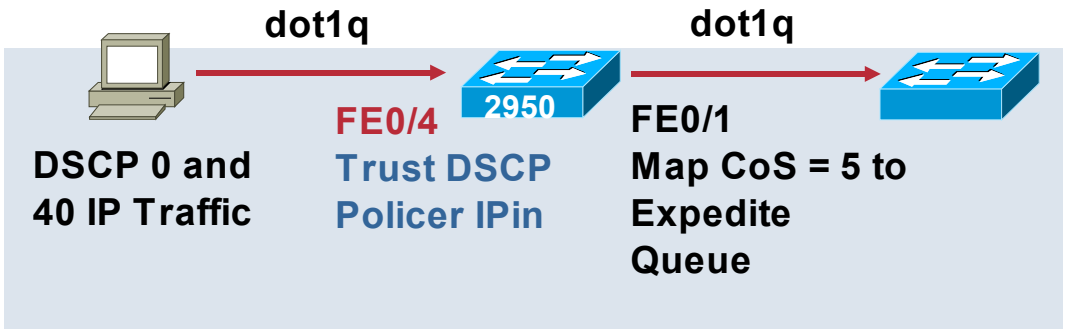
Catalyst 2950 QoS Troubleshooting Example (Ingress)


```
2950# show mls qos int fast 0/4
FastEthernet0/4
trust state: trust dscp
trust mode: trust dscp
COS override: dis
default COS: 0
pass-through: none
trust device: none
```




```
2950# show mls qos int fast 0/4 policers
FastEthernet0/4
policymap=IPin
```

```
2950# show policy-map
 Policy Map IPin
  class  ipclass1
   police 1000000 32768 exceed-action drop
```

```
2950# show class-map
 Class Map match-any class-default (id 0)
   Match any
 Class Map match-all ipclass1 (id 2)
   Match access-group  101
```

```
2950# show access-lists
Extended IP access list 101
    permit ip any any
```

```
2950# show running-config
!
class-map match-all ipclass1
  match access-group 101
!
!
policy-map IPin
  class ipclass1
    police 1000000 32768 exceed-
action drop
!
interface FastEthernet0/4
 switchport mode trunk
 service-policy input IPin
 mls qos trust dscp
!
access-list 101 permit ip any any
```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Catalyst 2950 QoS Troubleshooting Example (Egress)

Cisco.com

```
2950# show running-config
!
wrr-queue bandwidth 75 150 255 0
wrr-queue cos-map 1 0 1
wrr-queue cos-map 2 2 3
wrr-queue cos-map 3 4
```

Expedite Queue #4

Queue #


```
2950# show mls qos maps dscp-cos
   Dscp-cos map:
       dscp:   0  8 10 16 18 24 26 32 34 40 46 48 56
      ---------------------------------------------
         cos:   0  1  1  2  2  3  3  4  4  5  5  6  7
```

```
2950# show wrr-queue cos-map
CoS Value      :  0  1  2  3  4  5  6  7
Priority Queue :  1  1  2  2  3  4  4  4
```

```
2950# show wrr-queue bandwidth
WRR Queue   :   1   2   3   4
Bandwidth   :  75 150 255   0
```

Without the Policer:

```
2950# show interface counters
Port   InOctets   InUcastPkts   InMcastPkts   InBcastPkts
Fa0/4   1320000    20000            0             0
Port   OutOctets  OutUcastPkts  OutMcastPkts  OutBcastPkts
Fa0/1   1321992    20002            21            0
```

With the Policer:

```
2950# show interface counters
Port    InOctets   InUcastPkts   InMcastPkts  InBcastPkts
Fa0/4    1320000    20000            0            0
Port    OutOctets  OutUcastPkts  OutMcastPkts  OutBcastPkts
Fa0/1    50798      743              27           0
```


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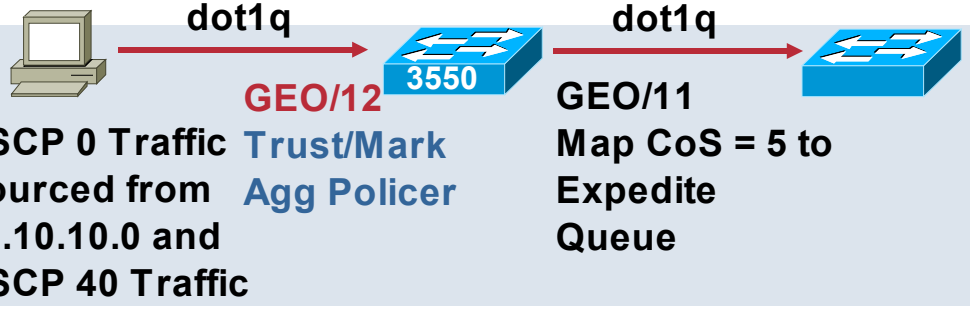
Catalyst 3550 QoS Troubleshooting Example (Ingress)


```
3550# show running-config
mls qos
access-list 1 permit 10.10.10.0 0.0.0.255
access-list 2 permit any

mls qos aggregate-police 48kpolicer 48000 8000
exceed-action policed-dscp-transmit
mls qos map policed-dscp 24 40 to 0

class-map ipclass1
    match access-group 1
class-map ipclass2
    match access-group 2

policy-map ingress1
    class ipclass1
        set ip dscp 24
        police aggregate 48kpolicer
    class ipclass2
        trust ip-precedence
        police aggregate 48kpolicer

interface GigabitEthernet0/12
 switchport trunk encapsulation dot1q
 switchport mode trunk
 [illegible]
mls qos monitor dscp 0 24 40
```

Note: A Policy-Map Trust State Supersedes an Interface Trust State




```
3550# show mls qos interface gig0/12 policers
GigabitEthernet0/12
policymap=ingress1
type=Shared, id=0 name=48kpolicer
```

```
3550# show mls qos interface gig 0/12 statistics
GigabitEthernet0/12
Ingress
  dscp: incoming    no_change  classified policed  dropped bytes
    0 : 960000      0          0          0        0
    24: 0           0          960000     959424   0
    40: 640000      640000     0          631552   0
Others: 0           0          0          0        0
<egress output omitted>
```

- Inbound traffic from 10.10.10.0 had a DSCP = 0 which was reclassified to DSCP 24 (CoS = 3)
- Both the trusted DSCP 40 (CoS = 5) traffic and the reclassified DSCP 24 traffic were then policed by the 48kbps policer

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Policing: Calculating Burst

EXAMPLE: To Configure the Minimum Burst for a 48Kbps Rate:

1) 1518 bytes (largest packet size)
2) 48,000bps (rate specified)/8000 (0.125ms policing interval) = 6bits

   6 bits/8 = approximately 1 byte

- Taking the bigger of the 2 values above gives a minimum burst of 1518 bytes
- The minimum sized burst value configurable on the 3550 however is 8000 bytes which can hold about 5 MTU sized ethernet frames

- For TCP traffic 1) above is changed to: 1518 bytes x (window size x2)
- This is so that the policer does not take effect until TCP flow control kicks in; This calculation sets the burst to twice the TCP window size

The policing rate does not include the 8 bytes of preamble and 12 byte Inter-Frame Gap (IFG) per ethernet frame; because of this, the policing rate may seem incorrect when in reality it is working correctly, particularly for smaller frame sizes; TCP windowing and burst size will also effect the policed rate

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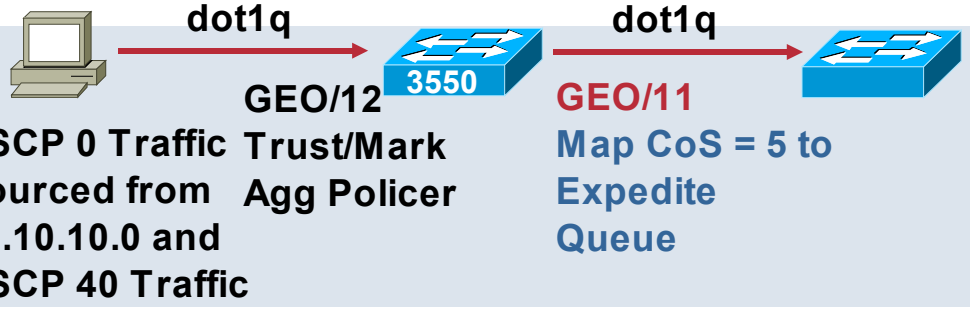
Catalyst 3550 QoS Troubleshooting Example (Egress)

Cisco.com

```
3550# show mls qos interface gig0/11 queueing
GigabitEthernet0/11
Egress expedite queue: ena   ← queue #4
wrr bandwidth weights:
qid-weights
 1 - 75        ← how often queues are
 2 - 150           serviced (wrr ratio)
 3 - 255
 4 - 500     when expedite queue is disabled
<output omitted>
Cos-queue map:
Cos-qid
   5-4     ← CoS 5 was mapped to expedite queue #4
```



Map CoS =5 to expedite queue ←

```
3550(config-if)# int gig 0/11
wrr-queue cos-map 4 5 6 7
wrr-queue bandwidth 75 150 255 500
priority-queue out
mls qos monitor dscp 0 24 40
```

```
3550# show mls qos interface gig 0/11 statistics
GigabitEthernet0/11
<ingress output omitted>
Egress
  dscp: incoming    no_change   classified policed    dropped (in bytes)
    0 : 1591728        n/a         n/a       0        0
   24: 576             n/a         n/a       0        0   ← Ingress Policed DSCP 24 and 40 marked
   40: 8448            n/a         n/a       0        0     down to DSCP 0
Others: 240            n/a         n/a       0        0   ← DSCP 24 and 40 traffic that did not
WRED drop counts:                                           exceed the ingress policed rate and
  qid  thresh1     thresh2    FreeQ                          so was not policed down to DSCP 0
   1 : 0           0          1844
   2 : 0           0          1229
   3 : 0           0          614
   4 : 0           0          409
```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Ingress Policer Results


```
3550# show mls qos interface gig 0/12 statistics
GigabitEthernet0/12
Ingress
  dscp: incoming   no_change  classified policed  dropped (in bytes)
    0 : 960000     0          0          0         0
    24: 0          0          960000     959424    0
    40: 640000     640000     0          631552    0
Others: 0          0          0          0         0
<egress output omitted>
```

← Ingress Policed Interface

- Total bytes in: 960,000 + 640,000 (from above) = 1,600,000 bytes
- Time required to receive bytes in: 1,600,000 bytes/64 bytes (packet size) = 25,000 packets/148,809.52 pps (in rate from source) = 0.168 seconds
- Portion of total in bytes conforming to policed rate (not policed): 48,000 bps (policer rate) x 0.168 seconds = 8064 bits/8 = 1008 bytes + 8000 bytes (burst specified) = 9008 bytes (1)
- Portion of total in bytes exceeding policed rate (policed): 959,424 + 631,552 (from

```
3550# show mls qos interface gig 0/11 statistics
GigabitEthernet0/11
<ingress output omitted>
Egress
  dscp: incoming   no_change  classified policed    dropped (in bytes)
    0 : 1591728      n/a         n/a       0           0
    24: 576          n/a         n/a       0           0
    40: 8448         n/a         n/a       0           0
Others: 240          n/a         n/a       0           0
```

← Egress Interface

- Traffic policed to DSCP 0 (1591728) is close to (2), DSCP 24 and 40 non-policed traffic (576 + 8448 = 9024) is close to (1)

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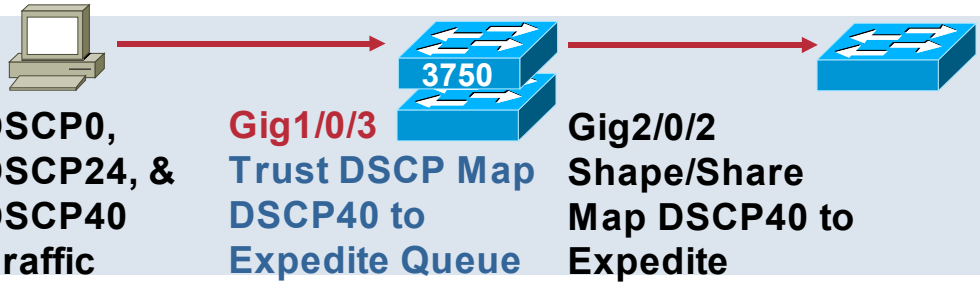
Catalyst 2970/3750 QoS Troubleshooting (Ingress)




```
3750(config)# mls qos
3750(config)# int gig 1/0/3
3750(config-if)# mls qos trust dscp
```

Queue 1

```
3750(config)#
mls qos srr-queue input threshold 1 50 100
mls qos srr-queue input dscp-map queue 1 threshold 2 24
```

```
3750# show mls qos input-queue
Queue     :       1       2
-------------------------------
buffers   :      90      10
bandwidth :       4       4
priority  :       0      10
threshold1:      50     100
threshold2:     100     100
```

← By default % size of priority Q buffer is less (less traffic, serviced more often)
← By default Q's are SRR serviced equally after 1st servicing the priority weight
← By default Q2 is the priority Q and so has a bigger priority bandwidth weight
← By default DSCP0 uses Q1/T1, DSCP40 uses Q2/T1. DSCP24 configured to use Q1/T2

- SRR services Q2 1st for its configured 10% priority bandwidth
- SRR then shares the remaining 90% bandwidth between Q1 and Q2 equally according to the 4:4 bandwidth ratio by allocating 45% to each queue

```
3750# show mls qos maps dscp-input-q
Dscp-inputq-threshold map:
d1 :d2    0     1     2     3     4     5     6     7     8     9
------------------------------------------------------------
0 :     01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01
1 :     01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01
2 :     01-01 01-01 01-01 01-01 01-02 01-01 01-01 01-01 01-01 01-01
3 :     01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01
4 :     02-01 02-01 02-01 02-01 02-01 02-01 02-01 02-01 01-01 01-01
5 :     01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01
6 :     01-01 01-01 01-01 01-01
```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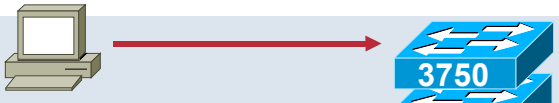
Catalyst 2970/3750 QoS Troubleshooting (Ingress)



DSCP0, DSCP24, & DSCP40 Traffic

Gig1/0/3 Trust DSCP Map DSCP40 to Expedite Queue

Gig2/0/2 Shape/Share Map DSCP40 to Expedite Queue

```
3750# clear mls qos int gig 1/0/3 statistics
3750# show mls qos int gig 1/0/3 statistics
GigabitEthernet1/0/3
  dscp: incoming
-------------------------------
  0 -  4 :         1000            0            0            0            0
 <output omitted
 20 - 24 :            0            0            0            0         3000
 <output omitted>
 35 - 39 :            0            0            0            0            0
 40 - 44 :         2000            0            0            0            0
dscp: outgoing
-------------------------------
 <output omitted>
cos: incoming
-------------------------------
  0 -  4 :         6002            0            0            0            0
  5 -  7 :            0            0            0
  cos: outgoing
-------------------------------
  0 -  4 :           13            0            0            0            0
  5 -  7 :            0            7            0
Policer: Inprofile:            0 OutofProfile:            0
```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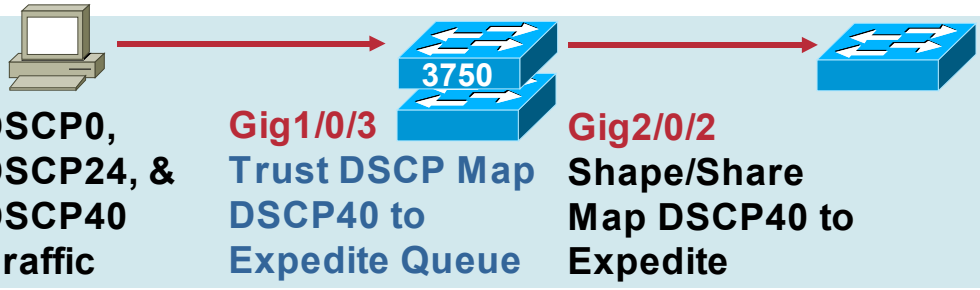
Catalyst 2970/3750 QoS Troubleshooting (Ingress)




```
3750# show platform pm if-numbers
interface gid  gpn  lpn  port slot unit slun port-type
-------------------------------------------------------
Gi1/0/3   3    3    3    1/0  1    3    3    remote
```

```
3750# session 1
3750-1# show plat port-asic stats enqueue port 0 asic 1
<output omitted>
RxQueue Enqueue Statistics
    Queue 0
      Weight 0 Frames 0
      Weight 1 Frames 8
      Weight 2 Frames 0
    Queue 1
      Weight 0 Frames 0
      Weight 1 Frames 0
      Weight 2 Frames 0
    Queue 2
      Weight 0 Frames 1000
      Weight 1 Frames 3000
      Weight 2 Frames 39
    Queue 3
      Weight 0 Frames 2000
      Weight 1 Frames 0
      Weight 2 Frames 0
```

1st Two Queues Are Internal System Queues

Q1

Q2 (Expedite)

```
3750-1# show plat port-asic stats drop port 0 asic 1
<output omitted>
 RxQueue Drop Statistics
    Queue 0
    Weight 0 Frames: 0
    Weight 1 Frames: 0
    Weight 2 Frames: 0
    Queue 1
    Weight 0 Frames: 0
    Weight 1 Frames: 0
    Weight 2 Frames: 0
    Queue 2
    Weight 0 Frames: 0
    Weight 1 Frames: 0
    Weight 2 Frames: 0
    Queue 3
    Weight 0 Frames: 0
    Weight 1 Frames: 0
    Weight 2 Frames: 0
```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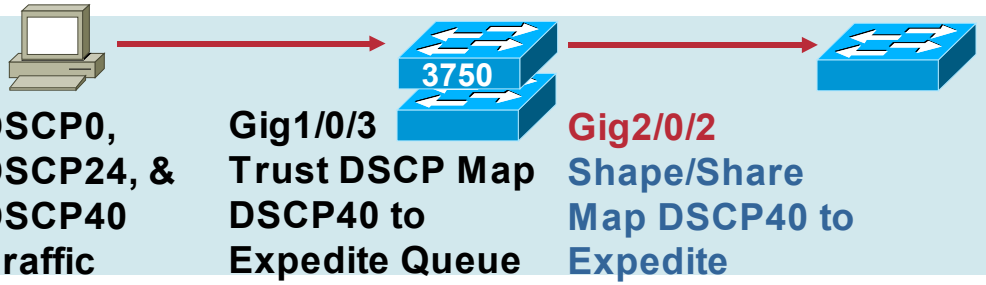
Catalyst 2970/3750 QoS Troubleshooting (Egress)


```
3750(config)# int gig 2/0/2
3750(config-if)# priority-queue out
```




```
3750# show mls qos int gig 2/0/2 queueing
GigabitEthernet2/0/2
Egress Priority Queue : enabled
Shaped queue weights (absolute) :  25 0 0 0
Shared queue weights  :  25 25 25 25
The port bandwidth limit : 100
The port is mapped to qset : 1
```

← Q1 is a priority Q: Shaped and shared settings for this Q are ignored
← Q1 is guaranteed 25% of the bandwidth and is rate limited to that
← By default all 4 Q's are serviced equally by SRR
← By default bandwidth limiting is disabled

- "PRIORITY-QUEUE OUT" If a queue is set for priority, the shaping or sharing command for that queue will not come into effect
- "SRR-QUEUE BANDWIDTH SHAPE" If a queue is not set for priority and if shaping is set for the queue, the queue uses the shape setting
- "SRR-QUEUE BANDWIDTH SHARE" If neither priority nor shaping is set then the queue is in sharing mode

```
3750# show mls qos maps dscp-output-q
   Dscp-outputq-threshold map:
     d1 :d2    0     1     2     3     4     5     6     7     8     9
     ------------------------------------------------------------
      0 :    02-01 02-01 02-01 02-01 02-01 02-01 02-01 02-01 02-01 02-01
      1 :    02-01 02-01 02-01 02-01 02-01 02-01 03-01 03-01 03-01 03-01
      2 :    03-01 03-01 03-01 03-01 03-01 03-01 03-01 03-01 03-01 03-01
      3 :    03-01 03-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01
      4 :    01-01 01-01 01-01 01-01 01-01 01-01 01-01 01-01 04-01 04-01
      5 :    04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01 04-01
      6 :    04-01 04-01 04-01 04-01
```

← DSCP40 = Q1/T1, DSCP0 = Q2/T1,
← DSCP24 = Q3/T1 (these are defaults)

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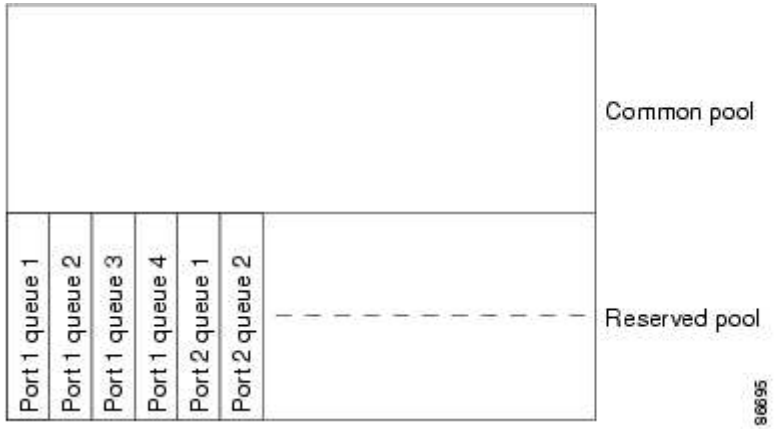
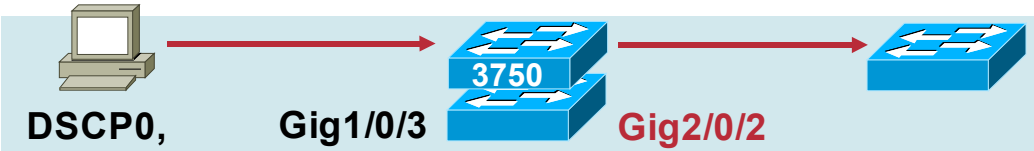
Catalyst 2970/3750 QoS Troubleshooting (Egress)


```
3750# show mls qos int gig 2/0/2 queueing
GigabitEthernet2/0/2
Egress Priority Queue : enabled
Shaped queue weights (absolute) :  25 0 0 0
Shared queue weights  :  25 25 25 25
The port bandwidth limit : 100
The port is mapped to qset : 1
```

```
3750# show mls qos queue-set 1
Queueset: 1
Queue     :       1       2       3       4
----------------------------------------------
buffers   :      25      25      25      25
threshold1:     100     200     100     100
threshold2:     100     200     100     100
reserved  :      50      50      50      50
maximum   :     400     400     400     400
```





Default Egress Queue Settings:

- Each of the 4 queues is allocated 25% of the interface's buffers
- The queues have reserved only 50% of their allocated buffer and gave the other 50% back to the common pool
- The common pool is shared by all interfaces on the switch
- Queues can borrow up to a maximum of 400% of their reserved buffer amount from the common pool if required and if available
- Drop thresholds restrict this borrowing

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Catalyst 2970/3750 Default QoS Egress Buffer Change

Transferring/Opening a File Becomes Slow After QoS Is Enabled

12.2(25)SEB Changed the 2970/3750 Default QOS Egress Buffer Allocation

```
3750# show mls qos queue-set 1
Queueset: 1
Queue     :       1       2       3       4
----------------------------------------------
buffers   :      25      25      25      25
threshold1:     100      50     100     100
threshold2:     100      50     100     100
reserved  :      50     100      50      50
maximum   :     400     400     400     400
```

```
3750# show mls qos queue-set 1
Queueset: 1
Queue     :       1       2       3       4
----------------------------------------------
buffers   :      25      25      25      25
threshold1:     100     200     100     100
threshold2:     100     200     100     100
reserved  :      50      50      50      50
maximum   :     400     400     400     400
```

```
3750(config)#mls qos queue-set output 1 threshold 2 200 200 50
400
```


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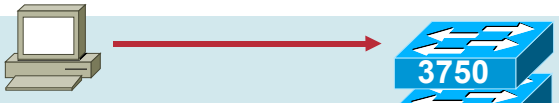
Catalyst 2970/3750 QoS Troubleshooting (Egress)



DSCP0, DSCP24, & DSCP40 Traffic

Gig1/0/3 Trust DSCP Map DSCP40 to Expedite Queue

Gig2/0/2 Shape/Share Map DSCP40 to Expedite Queue

```
3750# clear mls qos int gig 2/0/2 statistics
3750# show mls qos int gig 2/0/2 statistics
GigabitEthernet2/0/2
  dscp: incoming
-------------------------------
 <output omitted>
  dscp: outgoing
-------------------------------
  0 -  4 :        1003            0            0            0            0
  5 -  9 :           0            0            0            0            0
 <output omitted>
 20 - 24 :           0            0            0            0         3000
 <output omited>
 40 - 44 :        2000            0            0            0            0
 cos: incoming
-------------------------------
 <output omitted>
 cos: outgoing
-------------------------------
  0 -  4 :        1003            0            0         3000            0
  5 -  7 :        2000            0            0
Policer: Inprofile:          0 OutofProfile:          0
```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Catalyst 2970/3750 QoS Troubleshooting (Egress)

Cisco.com


```
3750# show platform pm if-numbers
interface gid  gpn  lpn  port slot unit slun port-type
-------------------------------------------------------
Gi2/0/2   54   54   2    2/3  2    2    2    local
```

```
3750# sho plat port-asic stats enqueue port 3 asic 2
<output omitted>
  Port 3 TxQueue Enqueue Statistics
    Queue 0
Weight 0 Frames 2000
Weight 1 Frames 0
Weight 2 Frames 0
    Queue 1
Weight 0 Frames 1003
Weight 1 Frames 110
Weight 2 Frames 59
    Queue 2
Weight 0 Frames 3000
Weight 1 Frames 0
Weight 2 Frames 0
    Queue 3
Weight 0 Frames 0
Weight 1 Frames 0
Weight 2 Frames 0
```

Q1 (Expedite)

Q2

Q3

Q4

```
3750# show plat port-asic stats drop port 3 asic 2
<output omitted>
Port 3 TxQueue Drop Statistics
    Queue 0
      Weight 0 Frames 0
      Weight 1 Frames 0
      Weight 2 Frames 0
    Queue 1
      Weight 0 Frames 0
      Weight 1 Frames 0
      Weight 2 Frames 0
    Queue 2
      Weight 0 Frames 0
      Weight 1 Frames 0
      Weight 2 Frames 0
    Queue 3
      Weight 0 Frames 0
      Weight 1 Frames 0
      Weight 2 Frames 0
```


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Agenda

- Packet Forwarding
- Multicasting
- Access Control Lists
- QoS
- Miscellaneous

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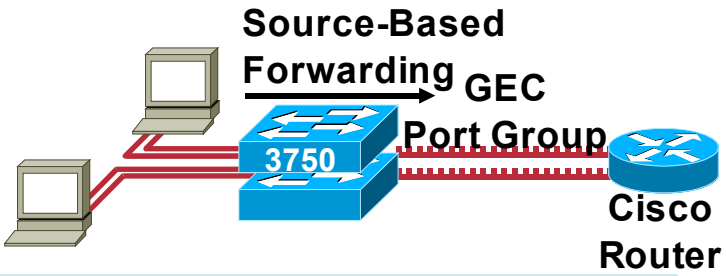
Cross Stack EtherChannel (Catalyst 3750)




```
3750# show etherchannel summary
Group  Port-channel  Protocol    Ports
------+-------------+-----------
+----------------------
1      Po1(SU)           -        Gi1/0/1(P)  Gi2/0/1
3750# show etherchannel load-balance
Source MAC address                                        SA mac         DA mac
                                                            |              |
3750# test etherchannel load-balance int port-channel 1 mac 0002.1234.5678
0009.8765.2565
Would select Gi1/0/1 of Po1
3750# session 1
3750-1# show platform pm group-masks

================================================================
                    Etherchannel members and group masks table
Group #ports group frame-dist slot port mask interface index
----------------------------------------------------------------
 1    2      1     src-mac
                              2    1    5555 Gi2/0/1   0
                              1    1    AAAA Gi1/0/1   1
<output omited>
================================================================
                    Etherchannel members info
 group agport #ports members
----------------------------------------------------------------
 1     Po1    2       Gi1/0/1 Gi2/0/1
```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Switchports and Trunking


```
2950# show interfaces fastEthernet 0/1 trunk

Port        Mode         Encapsulation  Status        Native
vlan
Fa0/1       desirable    802.1q         trunking      1

Port      Vlans allowed on trunk
Fa0/1       1-4094

Port      Vlans allowed and active in management domain
Fa0/1       1-2

Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1       1-2
```

```
2970# show int gig 0/3 switchport
Name: Gi0/3
Switchport: Enabled
Administrative Mode: dynamic auto
Operational Mode: static access
Administrative Trunking Encapsulation: negotiate
Operational Trunking Encapsulation: native
Negotiation of Trunking: On
Access Mode VLAN: 1 (default)
Trunking Native Mode VLAN: 1 (default)
Administrative Native VLAN tagging: enabled
Voice VLAN: none
Administrative private-vlan host-association: none
Administrative private-vlan mapping: none
Administrative private-vlan trunk native VLAN: none
Administrative private-vlan trunk Native VLAN tagging: enabled
Administrative private-vlan trunk encapsulation: dot1q
Administrative private-vlan trunk normal VLANs: none
Administrative private-vlan trunk private VLANs: none
Operational private-vlan: none
Trunking VLANs Enabled: ALL
Pruning VLANs Enabled: 2-1001
Capture Mode Disabled
Capture VLANs Allowed: ALL
Protected: false
Unknown unicast blocked: disabled
Unknown multicast blocked: disabled
Appliance trust: none
```

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High CPU (Catalyst 2950)

A CPU Utilization Value of 20% to 50% is Normal, Even Under Minimal Load

Total - Interrupt = Process Switched

```
2950# show proc cpu
CPU utilization for five seconds: 20%/4%; one minute: 20%; five minutes: 20%
PID Runtime(ms)     Invoked  uSecs   5Sec   1Min   5Min TTY  Process
1          17224      118347    145  0.00%  0.00%  0.00%    0  Load Meter
2             28          19   1473  0.16%  0.02%  0.00%    0  Exec
3         125504       60098   2088  0.00%  0.02%  0.00%    0  Check heaps
4              0           1      0  0.00%  0.00%  0.00%    0  Chunk Manager
5              0           1      0  0.00%  0.00%  0.00%    0  Pool Manager
6              4           2   2000  0.00%  0.00%  0.00%    0  Timers
7              0           1      0  0.00%  0.00%  0.00%    0  Entity MIB API
8           3424       10582    323  0.00%  0.00%  0.00%    0  ARP Input
.
.
.
15      32376304    30554579   1059  4.75%  4.38%  4.35%    0  LED Control Proc
16      77842720    69172017   1125  9.66% 11.39% 11.59%    0  Port Status Proc
17             0           1      0  0.00%  0.00%  0.00%    0  Address Learning
```


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High CPU: When Do I Get Concerned?

- If the CPU utilization is extremely high (around 90%–99%) this will not directly affect the switching of data; however, it may start to affect protocols such as STP, etc.; possibly resulting in switch instability

WHAT TO DO ABOUT IT?

- Ensure the management VLAN is not carrying regular user traffic
- Note which processes are generating the most load via "show proc cpu"
- Check for consistent MAC address clearing or spanning-tree instability (show mac address-table dynamic, show spanning-tree summary)
- Check for a network broadcast storm or excessive SNMP traffic directed at the management VLAN of the switch
- For L3 interfaces use "show interface stats" to see which interfaces are process or fast switching traffic

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High CPU Caused by L3 (Catalyst 3750, 3550)

- SDM templates - traffic for entries that do not fit in hardware are sent to the CPU
- Follow the recommended max # of routed ports and SVIs for each platform…route/interface flap can increase CPU usage, etc.
- A deny ACL applied to an interface with “ip unreachable” set
- Outbound deny ACL (Catalyst 3750 only)
- An ACL entry with the log option
- The hardware TCAM is not programmed properly
- Time to Live (TTL) <= 1 in the incoming packet
- Excessive arping
- IP options are set in the incoming traffic

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High CPU Troubleshooting (Catalyst 3750, 3550, 2970)

- **Retrieval and notify queues**: Programmed to give priority to different control plane traffic

```
3550# show controllers cpu-interface
stp packets : 38099 retrieved, 0 dropped
ram access packets : 159684 retrieved, 0 dropped
routing protocol packets : 632 retrieved, 0 dropped
forwarding packets : 0 retrieved, 0 dropped
routing packets : 734 retrieved, 0 dropped
L2 protocol packets : 1350 retrieved, 0 dropped
igmp snooping protocol packets : 6349 retrieved, 0 dropped
addr learning packets : 0 retrieved, 0 dropped
icmp redirect packets : 0 retrieved, 0 dropped
icmp unreachable packets : 0 retrieved, 0 dropped
logging packets : 0 retrieved, 0 dropped
addr learning packets : 0 retrieved, 0 dropped
rpffail packets : 0 retrieved, 0 dropped
```

- **3750:** L2 and port centric features are handled by local CPU's on each switch in the stack; Bandwidth reservations on the rings ensure the CPU communication is not affected by data traffic

```
3750# remote command [switch# | all] show proc cpu
3750# remote command [switch# | all] show controllers cpu-interface
```


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High CPU Due to IP unicast Routing Example (Catalyst 3750)


```
3750# show proc cpu
CPU utilization for five seconds: 27%/22%; one minute: 22%; five minutes: 12%
```

```
3750# show controllers cpu-interface
cpu-queue-frames  retrieved  dropped    invalid    hol-block  stray
----------------- ---------- ---------- ---------- ---------- ----------
sw forwarding     1696415    0          0          0          0
```

```
3750# sho platform ip unicast failed adjacency
Dumping Fibs with Adj fails info(0 entries:0)

3750# remote command all show platform ip unicast failed route
```

```
3750# show int gig 2/0/1 stats
GigabitEthernet2/0/1
          Switching path     Pkts In   Chars In   Pkts Out  Chars Out
               Processor         559     501894        249      25281
            Route cache     3525303 3511201788          0          0
                  Total     3525862 3511703682        249      25281
```

```
3750# debug platform cpu-queues software-fwd-q                    (use caution when running debugs!)

4d05h: SW-FWD-Q:Pak FastSW'ed: Local Port Blocked L3If: L2If:GigabitEthernet2/0/1
DI:0x2C1, LT:7, Vlan:0   SrcGPN:53, SrcGID:53, ACLLogIdx:0x0, MacDA:000d.bd5c.
16c6, MacSA: 000b.462e.6f80   IP_SA:172.1.3.2 IP_DA:172.1.1.10 IP_Proto:6
   TPFFD:D8000035_000003F1_00B003E8-000002C1_1D140000_00000000
```

```
3750# show ip arp 172.1.1.10                                    (incomplete arp was the culprit!)
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  172.1.1.10             0   Incomplete      ARPA
```


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Stack Partitioning (Catalyst 3750)
How NOT to Remove Switches From a Stack!

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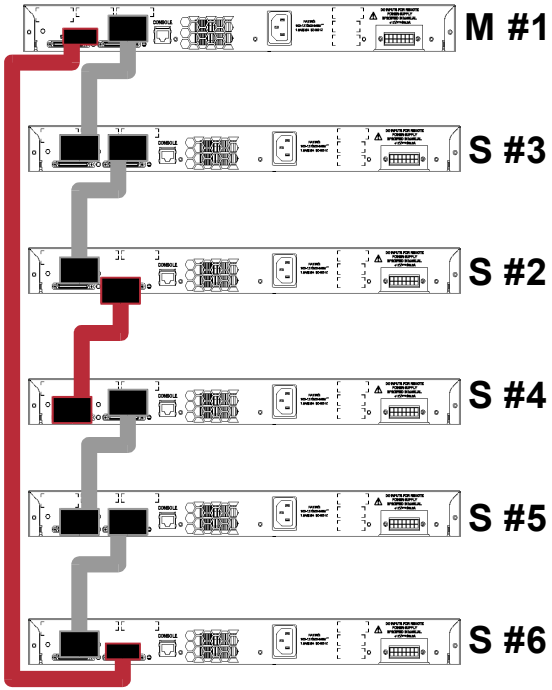

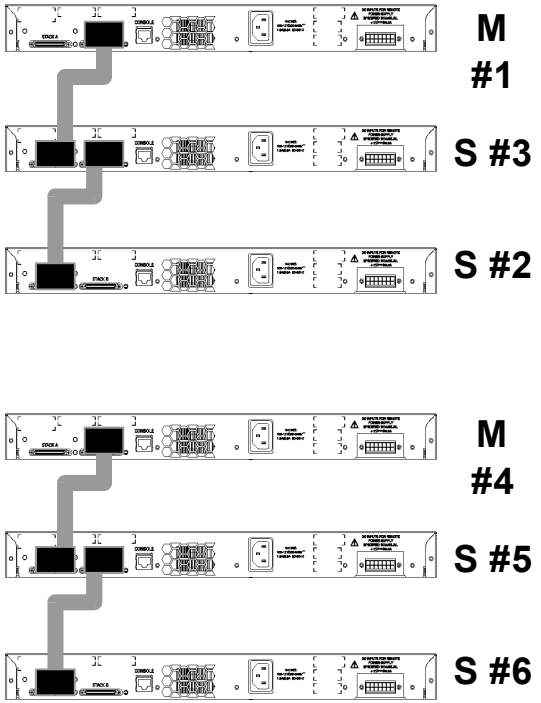

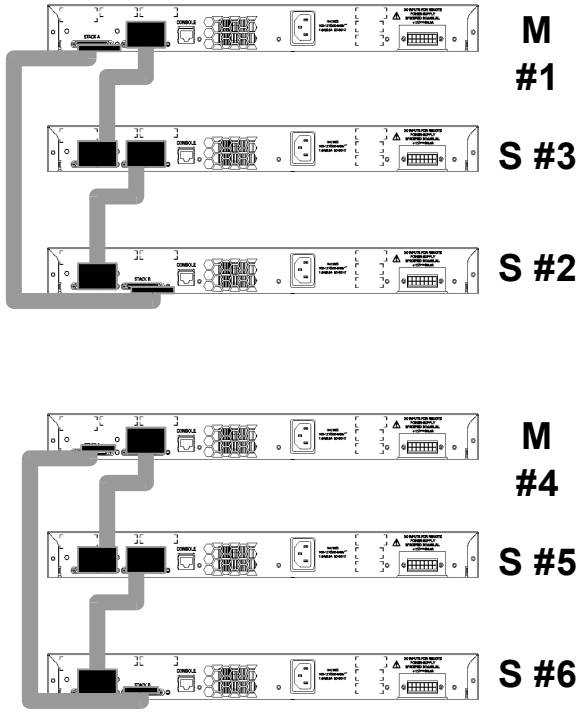

- Both fragments have same config file
- IP address is same on both stacks—IP routing problem!
- Power down switches before you remove them from a stack AND give the new switches/stack a new IP address before re-connecting to the network

M = Master Switch
S = Slave Switch

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Catalyst 3750 Stack Commands


```
3750# show switch detail
                                                    Current
Switch#  Role       Mac Address     Priority      State
-----------------------------------------------------------
 1       Slave      000c.30ae.4f00     9          Ready
*2       Master     000d.bd5c.1680     15         Ready


         Stack Port Status              Neighbors
Switch#  Port 1     Port 2            Port 1    Port 2
-----------------------------------------------------------
  1        Ok          Ok                 2         2
  2        Ok          Ok                 1         1
```

```
3750# show switch stack-ring activity
Switch   Frames sent to stack ring (approximate)
-----------------------------------------------
1              5781
2              4928
Total frames sent to stack ring : 10709
Note: these counts do not include frames sent to the ring
by certain output features such as output SPAN and output
ACLs.
```

You Can Also Use the Mode Button on the Front of the Switch to Determine It's Stack Switch Number; the LED on the Port with the Corresponding Switch Number Will Illuminate; (for Example, if the Switch Is Switch# 4 in the Stack, Port 4's LED Will Light Up)

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Common GigaStack Issue (Catalyst 3550, 2950)

Link Flaps and Never Stabilizes:

- Duplex Must Always Be Auto-Negotiated When a GigaStack GBIC Is Inserted
- Configure the GigaStack Ports to Auto-Negotiate Duplex: "duplex auto"
- Configure the GigaStack Ports to Negotiate the Link: "negotiation auto"
- Once Complete, Remove And Reinsert the GigaStack GBIC

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Stack Auto Upgrade (Catalyst 3750)

- After a version mismatch slave joins the stack it takes about one minute before auto upgrade takes place

```
3750(config)# boot auto-copy-sw
3750(config)#^Z
3750# show boot
BOOT path-list      : flash:/c3750-i5k2-mz.121-
19.EA1a.bin
Config file         : flash:/config.text
Private Config file : flash:/private-config.text
Enable Break        : no
Manual Boot         : no
HELPER path-list    :
Auto upgrade        : yes
```

Situations where auto upgrade does not work:

- Not enough flash space on the version mismatch slave to store another image; (need to delete some files manually and then use "archive copy-sw")
- We cannot find a donor in the stack with a compatible image of the same type (i.e. EMI vs. SMI) as the one running on the version mismatch slave
- We cannot find a donor in the stack with a compatible image which supports the hardware of the version mismatch slave; (use "archive copy-sw" to copy the image from the new switch to the rest of the stack)
- When loading in a bin image only using "copy tftp flash:"; auto upgrade requires loading the tar file via "archive download-sw"; if you want the bin image only use the tar file and "archive download-sw/image only"

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Stack Auto Upgrade (Catalyst 3750)

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```
3750# show version
<output omitted>
Switch   Ports  Model              SW Version            SW Image
------   -----  -----              ----------            ----------
*    1   28     WS-C3750G-24TS     12.1(19)EA1d          C3750-I5-M
     2   0      WS-C3750G-12S      12.1(14)EA1           C3750-I5-M
```

```
3750# show switch
                                                 Current
Switch#  Role      Mac Address     Priority      State
-----------------------------------------------------------
*1       Master    000c.30ae.4f00     9          Ready
 2       Slave     000d.bd5c.1680     1          Version Mismatch
```

```
3750# show platform stack-manager all
<output omitted>
Switch   Master/   Mac Address          Version    Uptime    Current
Number   Slave                         (maj.min)             State
-----------------------------------------------------------------------
1        Master    000c.30ae.4f00          1.5        2       Ready
2        Slave     000d.bd5c.1680          1.1        2       Version Mimatch
```

Software images downloaded to the Stack Master are automatically downloaded to the rest of the Stack Members assuming the major (‘maj’) version is the same and you avoid the caveats on the previous slide

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TDR-Time Domain Reflector (Catalyst 2970/3750)

- Detects open, broken, or shorted twisted-pair
- If one of the twisted-pair wires is open, TDR can find the length at which the wire is open
- Supported only on copper Ethernet 10/100/1000 ports

```
3750# test cable-diagnostics tdr interface gigabitEthernet 2/0/3

TDR test started on interface Gi2/0/3

A TDR test can take a few seconds to run on an interface

Use 'show cable-diagnostics tdr' to read the TDR results.


3750# show cable-diagnostics tdr interface gigabitEthernet 2/0/3
TDR test last run on: April 02 05:55:20

Interface Speed Local pair Pair length        Remote pair Pair
status
--------- ----- ---------- ------------------ -----------
-----------
Gi2/0/3   1000M Pair A     4    +/- 10 meters Pair A      Normal
```


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Catalyst 3560 POE (Power Over Ethernet)

- 3750 troubleshooting commands discussed throughout this presentation apply to the 3560 POE (power over Ethernet) switch as well
- Note the 3560 does not support stacking at this time
- When the mode button is in “Power” mode, the port LEDs describe the power delivery status and identifies status of Power over Ethernet for each port
- “Logging event power-inline-status” interface command can be used to enable logging of PoE events on specific PoE-capable interfaces
- “debug ilpower event” can be used to monitor the inline power state and events

```
3560# show power inline
Available:370.0(w)  Used:0.0(w)  Remaining:370.0(w)

Interface Admin     Oper          Power     Device             Class Max
                                  (Watts)

--------- ------ ---------- ------- ------------------ ----- ----

Gi0/1     auto      off            0.0       n/a                n/a   15.4

Gi0/2     auto      off            0.0       n/a                n/a   15.4
```


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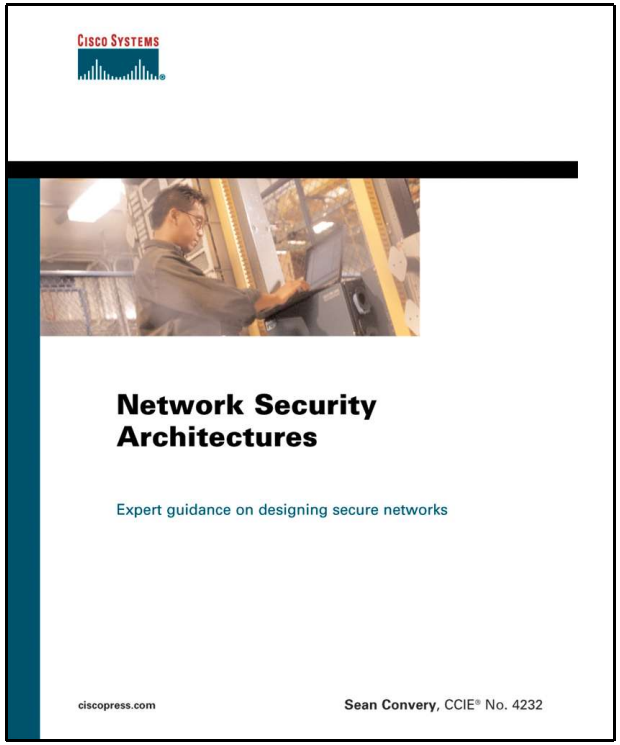
Recommended Reading

- Continue your Networkers learning experience with further reading for this session from Cisco Press
- Check the Recommended Reading flyer for suggested books



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