ASR 9900 Series Fabric Explanation and Troubleshoot Examples

Document ID: 117718

Contributed by Sam Milstead, Cisco TAC Engineer.
Mar 19, 2015

Contents

Introduction
Fabric Overview
- Fabric Details
- Typhoon
- Tomahawk
- Fabric Card Requirements

Check the Fabric Card
- Crossbar Link Status
- Crossbar Statistics

Check the Linecard
- Crossbar Link Status
- Crossbar Statistics

Troubleshoot
- Crossbar Port Down
- Spine Unavailable Syslog
- FC Inactive Syslog

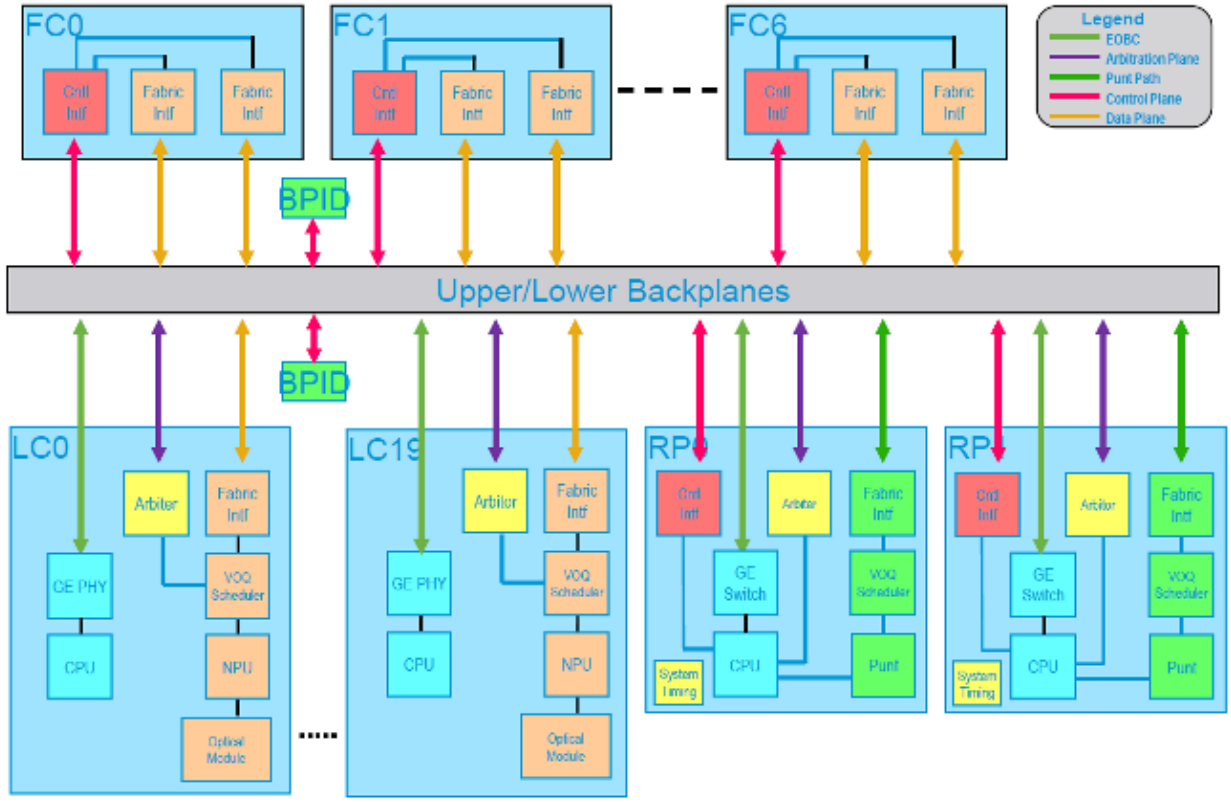
Related Information
Appendix
- Logical to Physical Slot Mappings
  - 9922
  - 9912
- Multicast

Introduction

This document describes the use of separate fabric cards with the ASR 9922 and ASR 9912, similar to the fabric architecture implemented with the Cisco Carrier Routing System (CRS).

Cisco's ASR 9000 (ASR9K) uses a three−stage fabric system. In other chassis types (for example, 9006 and 9010) the three−stage fabric is divided into stage one and stage three on the linecards (LCs), and stage two on the Route Switch Processor (RSP). With the advent of the 9922 and 9912, stage two of the fabric has been moved from the RSP to dedicated fabric cards and a Route Processor (RP) card is used instead of the RSP.

Each Fabric Card (FC) is its own spine. These terms can be used interchangeably as well as the term 'plane' which is used in CRS terminology. Below is a high level view of the system with the crossbar being labeled as 'Fabric Intf'.



Fabric Overview

Each FC has two switch fabric ASICs, commonly referred to as crossbar ASICs, which are mapped as instance 0 and 1 while each LC and RP have one crossbar interface, instance 0.

On each LC there are two Serializer/Deserializer (SerDes) interfaces that connect to every FC, one SerDes interface per FC crossbar (0 and 1). These FC crossbars act as our stage two in the three−stage fabric, while stage one and stage three exist as the LC's crossbar. In addition, every RP has one SerDes interface per FC with this connection always on the FCs crossbar instance 0.

Fabric Details

Network Processors (NPs) and Fabric Interface ASICs (FIAs) are agnostic of scheduling over crossbar links, traffic is load−balanced on all eight links that make up the SerDes interface. If a single link within the SerDes interface has an issue then the entire interface will be shut down. Upon detection of this failure, the fabric drivers issue a retrain in order to try and fix the link.

Typhoon

With the current Typhoon architecture, five FCs are supported. These cards provide 8x7.5 G links per SerDes interface which equates to 55 G of available bandwidth after encoding is accounted for. With all five FCs each LC will have 2x55x5 = 550 Gbps of bandwidth available. When accounting for 4+1 fabric redundancy 440 Gbps are available per LC.

Note: In a 9000 Series chassis with RSP−440 and Typhoon LCs, there are 4x8x7.5 G links to each RSP plus two additional links. The four links from each RSP provide the full 440 Gbps available per LC.

Tomahawk

Next generation cards support 115 Gbps SerDes connections. With the added support of seven fabric cards, this provides 2x115x7 = 1.61 Tbps of bandwidth per slot. Accounting for 6+1 fabric redundancy, this provides 1.38 Tbps per slot.

Fabric Card Requirements

Since the bandwidth on the crossbar is shared among all FIAs and NPs, a few calculations are needed in order to determine the true bandwidth and fabric redundancy.

In order to calculate the minimum number of FCs needed for a particular LC, use this formula:

(num_ports_used*port_bandwidth)/(FC_bandwidth)

In the case of the 36x10 GigE card with 30 ports this is (30*10)/(110)=2.72 FCs, or three FCs rounded up.

In order to calculate n+1 redundnacy, use this formula:

(num_ports_used*port_bandwidth)/(FC_bandwidth) + 1

In the case of the 36x10 GigE card this would be five if all 36 ports were used.

This table outlines the number of needed FCs for full line rate.

LC Type	***Min. FC Required in Chassis***	***Number FC Required for n+1 Redundancy***
A9K−MOD80	1	2
A9K−MOD160	2	3
A9K−2x100GE	2	3
A9K−24x10GE	3	4
A9K−36x10GE	4	5

Check the Fabric Card

Crossbar Link Status

The first thing to check is if all SerDes links on all planes, FCs, are up. In order to check this, enter the ***show controller fabric plane [all | [0−6]]*** command. In this example, because there are two RPs and three LCs, there are (1x2)+(2x3) = 8 links and all links are up to all planes.

Note: In Release 4.3.0 and later the status of all planes can be checked at once. Previously, each one had to be specified individually.

```
RP/0/RP1/CPU0:ASR9922−B#show platform
Tue Apr 15 14:24:00.935 UTC
Node            Type                       State            Config State
−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−−
0/RP0/CPU0      ASR−9922−RP−SE(Standby)   IOS XR RUN       PWR,NSHUT,MON
0/RP1/CPU0      ASR−9922−RP−SE(Active)    IOS XR RUN       PWR,NSHUT,MON
0/0/CPU0        A9K−2x100GE−SE            IOS XR RUN       PWR,NSHUT,MON
0/2/CPU0        A9K−36x10GE−SE            IOS XR RUN       PWR,NSHUT,MON
0/3/CPU0        A9K−MOD160−TR             IOS XR RUN       PWR,NSHUT,MON
```

```
0/3/1           A9K-MPA-4X10GE            OK                PWR,NSHUT,MON
```

```
RP/0/RP1/CPU0:ASR9922-B#show controller fabric plane all
Mon Apr 14 14:37:00.116 UTC
Flags: Admin State: 1-Up 2-Down 12-UnPowered 16-Shutdown
       Oper  State: 1-Up 2-Down 3-Admin Down
Summary for All Fabric Planes:
Plane Id  Admin State  Oper State  Links Up Links Down  In Pkt Count  Out Pkt count
=============================================================================
0             01            01       08          00       346770          431250
1             01            01       08          00       44397            44397
2             01            01       08          00       44459            44459
3             01            01       08          00       94005            94005
4             01            01       08          00       73814            73814
```

If a link shows as down the command ***show controller fabric crossbar link-status instance <0-1> spine <FC_num>*** can be used to identify exactly which one. In this example there are five crossbar links up to FC4 instance 0 and three links up to FC4 instance 1 (5+3=8 from before). There are two more on instance 0 because of the RPs.

Note: See the Appendix for details on logical to physical slot mappings.

```
RP/0/RP1/CPU0:ASR9922-B#show controllers fabric crossbar link-status instance 0 spine 4
Fri Apr 18 18:08:31.953 UTC
PORT    Remote Slot  Remote Inst    Logical ID  Status
=====================================================
01        05               00             0        Up
04        04               00             0        Up
05        02               00             0        Up
08        00               00             0        Up
09        01               00             0        Up
```

```
RP/0/RP1/CPU0:ASR9922-B#show controllers fabric crossbar link-status instance 1 spine 4
Fri Apr 18 18:09:13.637 UTC
PORT    Remote Slot  Remote Inst    Logical ID  Status
=====================================================
00        05               00             0        Up
04        04               00             0        Up
05        02               00             0        Up
```

Crossbar Statistics

With the link-status collected in the previous output as a mapping and these statistics, it is easy to narrow down any component that has a traffic issue. For every crossbar port, SerDes interface, there will be ingress (from LC) and egress (towards LC) statistics. These are collected per FC crossbar instance.

```
RP/0/RP1/CPU0:ASR9922-B#show controller fabric crossbar statistics instance 0 spine 4
Tue Apr 22 16:52:23.162 UTC
Port statistics for xbar:0 port:0
============================
Hi priority stats (unicast)
==========================

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:1
============================
Hi priority stats (unicast)
==========================
    Ingress Packet Count Since Last Read       : 14016
```

```
    Egress Packet Count Since Last Read        : 24971

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:2
==============================
Hi priority stats (unicast)
==========================

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:4
==============================
Hi priority stats (unicast)
==========================
    Ingress Packet Count Since Last Read       : 21056
    Egress Packet Count Since Last Read        : 32195

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:5
==============================
Hi priority stats (unicast)
==========================
    Ingress Packet Count Since Last Read       : 7024
    Egress Packet Count Since Last Read        : 10477

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:6
==============================
Hi priority stats (unicast)
==========================

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:7
==============================
Hi priority stats (unicast)
==========================

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:8
==============================
Hi priority stats (unicast)
==========================

Low priority stats (multicast)
==========================
    Ingress Packet Count Since Last Read       : 37388
    Egress Packet Count Since Last Read        : 37388

Port statistics for xbar:0 port:9
==============================
Hi priority stats (unicast)
==========================
    Ingress Packet Count Since Last Read       : 72882
    Egress Packet Count Since Last Read        : 47335
```

```
Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 37386
    Egress Packet Count Since Last Read        : 37386

Port statistics for xbar:0 port:10
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:11
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:12
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:13
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:14
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:15
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:16
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:17
==============================
Hi priority stats (unicast)
============================
```

```
Low priority stats (multicast)
============================

Port statistics for xbar:0 port:18
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:19
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:20
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:22
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:24
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================


Total Unicast In:    114978
Total Unicast Out:   114978
Total Multicast In:  74774
Total Multicast Out: 74774
```

Check the Linecard

On the LC itself, between the crossbar and each FIA, there are 2x8x6.25 links which provide 100 G of raw bandwidth per FIA. Between each NP and FIA there is a single 8x6.25 link that gives 50 G of raw bandwidth per NP.

Note: The bandwidth referenced is the raw bandwidth. Actual bandwidth is slightly less after overhead is considered.

Crossbar Link Status

The collection of the crossbar link status for a LC is similar to that of a FC, but in this case the links from the FC crossbar to the LC crossbar will be seen as well as the LC crossbar to FIA links. As previously mentioned,

each FIA connects to the crossbar via two links. In this example, port 00 and 24 both connect to FIA 2. As with the previous examples, remote slots 22−26 are the FCs and 0/2/CPU0 corresponds to slot 4 itself.

```
RP/0/RP1/CPU0:ASR9922−B#show controller fabric crossbar link−status inst 0 loc 0/2/CPU0
Wed Apr 23 14:22:42.250 UTC
PORT    Remote Slot  Remote Inst    Logical ID  Status
=====================================================
00        04               02             1        Up
01        04               01             1        Up
02        04               01             0        Up
03        04               00             0        Up
04        04               00             1        Up
05        04               03             1        Up
06        04               05             1        Up
07        25               01             0        Up
08        04               03             0        Up
09        25               00             0        Up
10        04               05             0        Up
11        26               01             0        Up
12        26               00             0        Up
14        24               00             0        Up
15        24               01             0        Up
16        23               00             0        Up
17        23               01             0        Up
20        22               00             0        Up
22        22               01             0        Up
23        04               04             1        Up
24        04               02             0        Up
25        04               04             0        Up
```

Crossbar Statistics

Using the link−status collected in the previous output as a reference mapping, the below statistics output can be used as an easy way to narrow down any components that exhibit traffic loss.

```
RP/0/RP1/CPU0:ASR9922−B#show controller fabric crossbar statistics instance 0 loc 0/2/CPU0
Wed Apr 23 15:53:41.955 UTC
Port statistics for xbar:0 port:0
============================
Hi priority stats (unicast)
==========================
    Ingress Packet Count Since Last Read       : 15578
    Egress Packet Count Since Last Read        : 11957

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:1
============================
Hi priority stats (unicast)
==========================
    Ingress Packet Count Since Last Read       : 15775
    Egress Packet Count Since Last Read        : 11647

Low priority stats (multicast)
==========================

Port statistics for xbar:0 port:2
============================
Hi priority stats (unicast)
==========================
    Ingress Packet Count Since Last Read       : 15646
    Egress Packet Count Since Last Read        : 19774
```

```
Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 31424
    Egress Packet Count Since Last Read        : 188544

Port statistics for xbar:0 port:3
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15663
    Egress Packet Count Since Last Read        : 15613

Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 31424
    Egress Packet Count Since Last Read        : 188547

Port statistics for xbar:0 port:4
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15758
    Egress Packet Count Since Last Read        : 15813

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:5
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15742
    Egress Packet Count Since Last Read        : 15628

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:6
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15773
    Egress Packet Count Since Last Read        : 13687

Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 78666

Port statistics for xbar:0 port:7
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:8
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15679
    Egress Packet Count Since Last Read        : 15793

Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 31424
```

```
    Egress Packet Count Since Last Read        : 188544

Port statistics for xbar:0 port:9
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 72826
    Egress Packet Count Since Last Read        : 58810

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:10
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15653
    Egress Packet Count Since Last Read        : 23041

Low priority stats (multicast)
============================
    Egress Packet Count Since Last Read        : 188544

Port statistics for xbar:0 port:11
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:12
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 54172
    Egress Packet Count Since Last Read        : 35440

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:14
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15161
    Egress Packet Count Since Last Read        : 17790

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:15
==============================
Hi priority stats (unicast)
============================

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:16
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15220
    Egress Packet Count Since Last Read        : 17790
```

```
Low priority stats (multicast)
============================

Port statistics for xbar:0 port:17
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 1
    Egress Packet Count Since Last Read        : 1

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:20
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 36457
    Egress Packet Count Since Last Read        : 58699

Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 188549
    NULL FPOE Drop Count                       : 2
    Egress Packet Count Since Last Read        : 235786

Port statistics for xbar:0 port:22
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 1
    Egress Packet Count Since Last Read        : 1

Low priority stats (multicast)
============================

Port statistics for xbar:0 port:23
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15775
    Egress Packet Count Since Last Read        : 15835

Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 31424

Port statistics for xbar:0 port:24
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15843
    Egress Packet Count Since Last Read        : 19464

Low priority stats (multicast)
============================
    Ingress Packet Count Since Last Read       : 31424
    Egress Packet Count Since Last Read        : 188544

Port statistics for xbar:0 port:25
==============================
Hi priority stats (unicast)
============================
    Ingress Packet Count Since Last Read       : 15646
    Egress Packet Count Since Last Read        : 15586
```

```
Low priority stats (multicast)
==========================
    Egress Packet Count Since Last Read        : 188544


Total Unicast In:    382369
Total Unicast Out:   382369
Total Multicast In:  424335
Total Multicast Out: 1367053
```

Troubleshoot

Crossbar Port Down

The first output indicates that there are two RPs and two LCs. The second output indicates that the link from FC4 to remote slot 0 (RP0) is down.

```
RP/0/RP0/CPU0:ASR9k-1#show controllers fabric plane all

Plane Id Admin State  Oper State    Links Up  Links Down  In Pkt Count   Out Pkt count
=============================================================================================
0          01           01            06        00         62266063301    62266209776
1          01           01            06        00         18730254608    18730254616
2          01           01            06        00         18730354183    18730354187
3          01           01            06        00         62257126982    62257127007
4          01           01            05        01         37448788006    37448788023


RP/0/RP0/CPU0:ASR9k-1#show controllers fabric crossbar link-status instance 0 spine 4
PORT    Remote Slot  Remote Inst    Logical ID  Status
=====================================================
04        04               00             0        Up
08        00               00             0        Down
09        01               00             0        Up
10        03               00             0        Up
```

Since the bandwidth from the FCs is shared among all FIA's and NPs on the LC when a crossbar link is down, the net bandwidth for the LC will be reduced 55 G in a Typhoon system. The system can run with a link down given the redundancy of the system, but should be immediately investigated.

When a crossbar link goes down, a brief traffic drop might be seen and the fabric driver retrains the link in order to attempt automatic recovery. If this fails then an Online Insertion and Removal (OIR) might recover the issue as well. For any further issue please contact the Technical Assistance Center (TAC).

Spine Unavailable Syslog

These messages indicate that the system runs below the recommended five FCs. While it is recommended to always run five FCs, this does not necessarily mean any bandwidth loss for the LCs in the system. See the section Fabric Card Requirements for more information.

```
RP/0/RP1/CPU0:May 13 14:42:22.810 : pfm_node_rp[353]:
 %PLATFORM-FABMGR-1-SPINE_UNAVAILABLE : Set|fabmgr[303204]|Fabric Manager(0x1032000)|
Number of active spines has dropped below the recommended number 5

RP/0/RP1/CPU0:May 13 14:53:18.897 : pfm_node_rp[353]:
%PLATFORM-FABMGR-1-SPINE_UNAVAILABLE : Clear|fabmgr[303204]|Fabric Manager(0x1032000)|
Number of active spines has dropped below the recommended number 5
```

FC Inactive Syslog

When performing an OIR of a FC there are two mechanical buttons that must be pushed before the card is partially unseated which requires an OIR to recover. The reason for these buttons is to allow a graceful shutdown of the FC.

On the 9922 router the top button is purely mechanical, while the lower button sends a signal to the system to gracefully shutdown the card. A syslog in this format is seen. If the buttons were not pushed and an OIR does not recover the issue, contact the TAC.

```
RP/0/RP0/CPU0:Dec 24 10:45:27.108 MST: fab_xbar_sp3[220]: FC3 Inactive due to
 Front Panel Switch Press. Please OIR to recover.
```

Related Information

- ***ASR9000/XR Understanding and troubleshooting Fabric issues in the A9K***
- ***Technical Support & Documentation − Cisco Systems***

Appendix

Logical to Physical Slot Mappings

These outputs are the logical to physical slot mappings for the 9922 and 9912 routers. This information is needed when looking at fabric show commands.

9922

```
slot 00 -> 0/RP0/CPU0 (0x1)
slot 01 -> 0/RP1/CPU0 (0x11)
slot 02 -> 0/0/CPU0 (0x821)
slot 03 -> 0/1/CPU0 (0x831)
slot 04 -> 0/2/CPU0 (0x841)
slot 05 -> 0/3/CPU0 (0x851)
slot 06 -> 0/4/CPU0 (0x861)
slot 07 -> 0/5/CPU0 (0x871)
slot 08 -> 0/6/CPU0 (0x881)
slot 09 -> 0/7/CPU0 (0x891)
slot 10 -> 0/8/CPU0 (0x8a1)
slot 11 -> 0/9/CPU0 (0x8b1)
slot 12 -> 0/10/CPU0 (0x8c1)
slot 13 -> 0/11/CPU0 (0x8d1)
slot 14 -> 0/12/CPU0 (0x8e1)
slot 15 -> 0/13/CPU0 (0x8f1)
slot 16 -> 0/14/CPU0 (0x901)
slot 17 -> 0/15/CPU0 (0x911)
slot 18 -> 0/16/CPU0 (0x921)
slot 19 -> 0/17/CPU0 (0x931)
slot 20 -> 0/18/CPU0 (0x941)
slot 21 -> 0/19/CPU0 (0x951)
slot 22 -> 0/FC0/SP (0x1960)
slot 23 -> 0/FC1/SP (0x1970)
slot 24 -> 0/FC2/SP (0x1980)
slot 25 -> 0/FC3/SP (0x1990)
slot 26 -> 0/FC4/SP (0x19a0)
slot 27 -> 0/FC5/SP (0x19b0)
slot 28 -> 0/FC6/SP (0x19c0)
slot 34 -> 0/BPID0/SP (0x1220)
slot 35 -> 0/BPID1/SP (0x1230)
slot 36 -> 0/FT0/SP (0x640)
```

```
slot 37 -> 0/FT1/SP (0x650)
slot 38 -> 0/FT2/SP (0x660)
slot 39 -> 0/FT3/SP (0x670)
slot 40 -> 0/PM0/SP (0xe80)
slot 41 -> 0/PM1/SP (0xe90)
slot 42 -> 0/PM2/SP (0xea0)
slot 43 -> 0/PM3/SP (0xeb0)
slot 44 -> 0/PM4/SP (0xec0)
slot 45 -> 0/PM5/SP (0xed0)
slot 46 -> 0/PM6/SP (0xee0)
slot 47 -> 0/PM7/SP (0xef0)
slot 48 -> 0/PM8/SP (0xf00)
slot 49 -> 0/PM9/SP (0xf10)
slot 50 -> 0/PM10/SP (0xf20)
slot 51 -> 0/PM11/SP (0xf30)
slot 52 -> 0/PM12/SP (0xf40)
slot 53 -> 0/PM13/SP (0xf50)
slot 54 -> 0/PM14/SP (0xf60)
slot 55 -> 0/PM15/SP (0xf70)
```

9912

```
slot 00 -> 0/RP0/CPU0 (0x1)
slot 01 -> 0/RP1/CPU0 (0x11)
slot 02 -> 0/0/CPU0 (0x821)
slot 03 -> 0/1/CPU0 (0x831)
slot 04 -> 0/2/CPU0 (0x841)
slot 05 -> 0/3/CPU0 (0x851)
slot 06 -> 0/4/CPU0 (0x861)
slot 07 -> 0/5/CPU0 (0x871)
slot 08 -> 0/6/CPU0 (0x881)
slot 09 -> 0/7/CPU0 (0x891)
slot 10 -> 0/8/CPU0 (0x8a1)
slot 11 -> 0/9/CPU0 (0x8b1)
slot 12 -> 0/FC0/SP (0x18c0)
slot 13 -> 0/FC1/SP (0x18d0)
slot 14 -> 0/FC2/SP (0x18e0)
slot 15 -> 0/FC3/SP (0x18f0)
slot 16 -> 0/FC4/SP (0x1900)
slot 17 -> 0/FC5/SP (0x1910)
slot 18 -> 0/FC6/SP (0x1920)
slot 25 -> 0/BPID0/SP (0x1190)
slot 26 -> 0/FT0/SP (0x5a0)
slot 27 -> 0/FT1/SP (0x5b0)
slot 40 -> 0/PM0/SP (0xe80)
slot 41 -> 0/PM1/SP (0xe90)
slot 42 -> 0/PM2/SP (0xea0)
slot 43 -> 0/PM3/SP (0xeb0)
slot 44 -> 0/PM4/SP (0xec0)
slot 45 -> 0/PM5/SP (0xed0)
slot 46 -> 0/PM6/SP (0xee0)
slot 47 -> 0/PM7/SP (0xef0)
slot 48 -> 0/PM8/SP (0xf00)
slot 49 -> 0/PM9/SP (0xf10)
slot 50 -> 0/PM10/SP (0xf20)
slot 51 -> 0/PM11/SP (0xf30)
```

Multicast

LCs use a fixed path over the fabric based on a hash calculated over source and group (S, G) of the multicast flow. Hence, for higher multicast throughput over an LC, it is important to have a higher number of flows with source and group that varies in order to evenly spread traffic over all active fabric planes. If the selected FC is removed or disabled, the link selection algorithm selects a different link among the available active

fabric planes.

Multicast forwarding uses a 12−bit fabric header field called Fabric Group ID (FGID). Bit 0 and 1 are reserved for RP0/1. The 10 bits that remain, from 2 to 11, are used to address 20 LCs. Since 1 bit is available to address 2 LCs, there is redundant multicast packet replication (supercast) between paired LC [(LC0, LC10), (LC1, LC11), (LC2, LC12), and so on]. Local crossbar on the paired LC drops redundant multicast traffic if no interface on that LC has joined that multicast group.

FGID Bit	***0***	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***
Slot	RP0	RP1	LC0	LC1	LC2	LC3	LC4	LC5	LC6	LC7	LC8	LC9
Paired Slot	X	X	LC10	LC11	LC12	LC13	LC14	LC15	LC16	LC17	LC18	LC19

Updated: Mar 19, 2015 Document ID: 117718