

Cisco 12000 Series Internet Router Architecture: Maintenance Bus, Power Supplies and Blowers, and Alarm Cards

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Introduction

This document provides an overview of the maintenance bus, power supplies and blowers, and alarm cards of the Cisco 12000 Series Internet Router.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on the software and hardware versions:

- Cisco 12000 Series Internet Routers

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

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Maintenance Bus

The Maintenance Bus (MBUS) is a 1 Mbps redundant Controller Area Network (CAN) serial bus that connects the route processor (RP), the line cards (LCs), the switch fabric cards (SFCs), the power supplies, and the fans (except for the 12008). Due to its high fault-tolerant design, the CAN bus is commonly used in the industrial control area.

Each line card supports an MBUS module, which provides an interface to the master GRP. Use the **show diag** command to view the MBUS Agent Software version running on your switch fabric card or line card.

```
SLOT 17 (CSC 1): Clock Scheduler Card
  MAIN: type 17, 800-2353-02 rev A0 dev 16777215
        HW config: 0xFF SW key: FF-FF-FF
  PCA: 73-2148-02 rev C0 ver 2
        HW version 1.0 S/N CAB03191T45
  MBUS: MBUS Agent (1) 73-2146-07 rev B0 dev 0
        HW version 1.2 S/N CAB03181N2S
        Test hist: 0xFF RMA#: FF-FF-FF RMA hist: 0xFF
  DIAG: Test count: 0xFFFFFFFF Test results: 0xFFFFFFFF
  EEPROM contents (hex):
00: 01 00 01 00 49 00 08 62 07 58 00 00 00 FF FF FF
10: 43 41 42 30 33 31 38 31 4E 32 53 00 00 00 00 00
20: 01 02 00 00 00 00 00 FF FF FF FF FF FF FF FF
30: A5 A5 A5 A5 A5 A5 FF A5 A5 A5 A5 A5 A5 A5 A5
40: 00 11 01 00 00 49 00 08 64 02 60 02 00 03 FF FF
50: 03 20 00 09 31 02 50 FF FF FF FF FF FF FF FF
60: 43 41 42 30 33 31 39 31 54 34 35 00 00 00 00 00
70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
80: 01 02 04 08 10 20 40 80 01 02 04 08 10 20 40 80
90: 01 02 04 08 10 20 40 80 01 02 04 08 10 20 40 80
A0: 01
MBUS Agent Software version 01.43 (RAM) (ROM version is 01.33)
Using CAN Bus A
ROM Monitor version 0
Primary clock is CSC 1
```

The MBUS is mainly used for the following purposes:

- Initial bootup – On initial load, the primary GRP uses the MBUS to instruct the MBUS modules on the line cards and switch cards to power on their cards. A bootstrap image is then downloaded to the line cards across the MBUS. The MBUS is also used to gather revision numbers, environmental information, and general maintenance information. In addition, the GRPs exchange redundancy messages over the MBUS, which report the results of GRP arbitration, as illustrated in the following log messages:

```
00:00:14: %MBUS-6-GRP_STATUS: GRP in Slot 0 Mode = MBUS Primary
00:00:20: %MBUS-6-GRP_STATUS: GRP in Slot 11 Mode = MBUS Secondary
```

The primary GRP periodically restates its mastership through the MBUS. The secondary GRP re-enters the arbitration phase after failing to detect the primary's ownership claims for a configurable period.

- Environmental statistic monitoring
- Out-of-band console access to the LCs using the **attach <slot#>** command
- Download of the field diagnostics image.

Note: Data traffic never goes through the MBUS, but across the switch fabric. The MBUS is used exclusively to manage components within the Cisco 12000 series router.

The MBUS also transports log and debug messages from LCs to the GRP. Access control list (ACL) logging can produce a large number of messages that overwhelm the MBUS and can result in LCLOG-3-INVSTATE and MBUS_SYS-3-SEQUENCE errors. A similar problem may occur when logging Border Gateway Protocol (BGP) neighbor changes. Cisco IOS® Software Release 12.0(20)S resolves this problem by allowing log messages to be transferred through the switch fabric using Inter-Process Communication (IPC) messages (CSCdu00535). It introduces the following new commands:

- **logging method mbus <severity>** – Selects the severity of the message sent through the MBUS. Cisco IOS Software Release 12.0(20)S changes the default logging configuration of the GSR. Log messages with severity 0–4 are sent through the MBUS and log messages with severity 5–7 are sent through IPC, so ACL and BGP neighbor logs are sent through IPC. The **logging method mbus 7** command sends all logs through the MBUS.
- **show logging method** – Displays the current severity settings of which log messages are sent through IPC/MBUS.
- **logging sequence-nums** – Configures LCs to add a sequence number to transmitted log messages to ensure that the GRP process messages sent by either IPC or the MBUS are in sequential order. When this command is enabled, logs are sent to the GRP in the format: "SLOT <slot num>:<seq num>:<HH:MM:SS:MM>: <message text>".

In rare cases, the GSR reports the following MBUS–related error message:

```
%MBUS_SYS-3-NOCHANNEL: Failed to allocate MBUS channel for over 10 secs
```

This message has been seen when the router has a faulty power supply and when LCs are upgraded incorrectly. In the latter case, you should remove all LCs from the chassis and reboot the Cisco 12000 router. Once the GRP is up, introduce the LCs one at a time. As each LC boots up successfully, issue the **upgrade all** command on the slot with the LC from enable mode. When all the LCs are upgraded, it is extremely unlikely that you will run into this issue again since, on subsequent reboots, you can download the LC image over the switch fabric rather than the MBUS.

Power Supplies and Blowers

The Cisco 12000 Series Router is available in either an AC or a DC configuration. All power supplies are load–sharing and hot–swappable.

Both the 12008 and 12012 need at least one AC or one DC power supply to function.

The 12016 and the 12416 power modules do not have MBUS modules. They are monitored through the Busboard. The 12016 and the 12416 are divided into two load zones for power. There are two AC power supply configurations, one with three power supply modules, the other with four power supply modules. When using a DC power supply system, there are four DC power supply modules (A1, A2, B1, B2).

To completely power the system, you need to power both load zones. The second load zone covers the switch fabric card cage, the lower card cage, and the lower blower module, while the first load zone covers the top card cage and the top blower module. In an AC system, this is done by connecting any two power modules to a source. For the DC system, A1 and B1 power the upper load zone while A2 and B2 power the lower load zone. To fully power a 12016/12416 with DC power supplies, the minimum that must be connected is A1&A2, B1&B2, A1&B2, or A2&B1.

The links below provide information, per chassis, about the power supply location and how to replace it.

- **Cisco 12008 Internet Router**

Product Overview

Installing a Cisco 12008

Field Replaceable Unit (FRU) Replacement Instructions

- **Cisco 12012 Internet Router**

Product Overview

Installing a Cisco 12012

Field Replaceable Unit (FRU) Replacement Instructions

- **Cisco 12016 Internet Router**

Product Overview

Installing a Cisco 12016/12416

Field Replaceable Unit (FRU) Replacement Instructions

- **Cisco 12404 Internet Router**

Product Overview

Installing a Cisco 12404

Field Replaceable Unit (FRU) Replacement Instructions

- **Cisco 12406 Internet Router**

Product Overview

Installing a Cisco 12006

Field Replaceable Unit (FRU) Replacement Instructions

- **Cisco 12410 Internet Router**

Product Overview

Installing a Cisco 12410

Field Replaceable Unit (FRU) Replacement Instructions

- **Cisco 12416 Internet Router**

Product Overview

Installing a Cisco 12016/12416

Field Replaceable Unit (FRU) Replacement Instructions

Alarm Cards

There are different types of alarm cards depending on the type of 12000 chassis. On the Cisco 12008 and the 12016/12416, alarm cards power the LCs, so make sure that at least one alarm card is present. The 12008 needs an alarm card because that alarm card is integrated with the Card Scheduler and Clock (CSC). The 12016 and 12416 have slots for two alarm cards (for redundancy). The two alarm cards do not have segmented service zones like the DC power supply on a 12016.

The Cisco 12404 supports a Consolidated Switch Fabric Card that includes the switch fabric, alarm, and clock and schedule functions on one board.

The links below provide information related to alarm cards and replacement instructions for each alarm card.

- **Cisco 12008 Internet Router**

The CSC serves as an alarm monitoring facility for the router – Housekeeping and Alarm Monitoring Functions of the CSC

- **Cisco 12012 Internet Router**

Alarm Card Overview

Cisco 12012 Gigabit Switch Router Alarm Card Replacement Instructions

- **Cisco 12016 Internet Router**

Alarm Card Overview

Cisco 12016 Gigabit Switch Router Alarm Card Replacement Instructions

- **Cisco 12404 Internet Router**

Consolidated Switch Fabric Overview

Cisco 12404 Consolidated Switch Fabric Replacement Instructions

- **Cisco 12406 Internet Router**

Alarm Card Overview

Cisco 12406 Internet Router Alarm Card Replacement Instructions

- **Cisco 12410 Internet Router**

Alarm Card Overview

Cisco 12410 Gigabit Switch Router Alarm Card and Alarm Display Panel Replacement Instructions

- **Cisco 12416 Internet Router** (same as the Cisco 12016 Internet Router)

Alarm Card Overview

Cisco 12016 Gigabit Switch Router Alarm Card Replacement Instructions

Related Information

- **Cisco 12000 Series Internet Router Architecture – Chassis**
- **Cisco 12000 Series Internet Router Architecture – Switch Fabric**
- **Cisco 12000 Series Internet Router Architecture – Route Processor**
- **Cisco 12000 Series Internet Router Architecture – Line Card Design**
- **Cisco 12000 Series Internet Router Architecture – Memory Details**
- **Cisco 12000 Series Internet Router Architecture – Software Overview**
- **Cisco 12000 Series Internet Router Architecture – Packet Switching**
- **Understanding Cisco Express Forwarding**
- **Technical Support – Cisco Systems**

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