

Troubleshooting Line Card Crashes on the Cisco 12000 Series Internet Router

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Introduction

This document provides information on how to troubleshoot line card crashes on 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 these software and hardware versions:

- All Cisco 12000 Series Internet Routers, including the 12008, 12012, 12016, 12404, 12406, 12410, and the 12416.
- All Cisco IOS® Software versions that support the Cisco 12000 Series Internet Router.

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

Refer to [Cisco Technical Tips Conventions](#) for more information on document conventions.

Background Information

This section provides a background on how to identify a line card crash.

Identify a Line Card Crash

In order to quickly identify a line card crash, use the **show context summary** command:

```
Router#show context summary
CRASH INFO SUMMARY
  Slot 0 : 0 crashes
  Slot 1 : 0 crashes
  Slot 2 : 0 crashes
  Slot 3 : 0 crashes
  Slot 4 : 1 crashes
    1 - crash at 04:28:56 EDT Tue Apr 20 1999
  Slot 5 : 0 crashes
  Slot 6 : 0 crashes
  Slot 7 : 0 crashes
  Slot 8 : 0 crashes
  Slot 9 : 0 crashes
  Slot 10: 0 crashes
  Slot 11: 0 crashes
```

If the crash affects the router itself (and not the line card only), refer to [Troubleshooting Router Crashes](#).

Gather Information About the Crash

In order to collect the relevant data about the crash, use the commands shown in [Table 1](#).

Table 1 – Commands to Use to Collect Data About the Crash

Command	Description
show version	Provides general information about the system's hardware and software configurations.
show logging	Displays the general logs of the router.
show diag	Provides specific information about a particular slot: type of engine, hardware revisions, memory

[slot #]	configuration, and so on.
show context slot [slot #]	Provides context information about the recent crash(es). This is often the most useful command for troubleshooting line card crashes.
core dump	A core dump of a line card is the full content of its memory at the time of the crash. This data is normally not needed for an initial troubleshooting. It may be required later if the problem turns out to be a new software bug. In that case, refer to Configuring a Core Dump on a GSR Line Card .

If you have the output of a **show tech-support** (from enable mode) command from your Cisco device, you can use to display potential issues and fixes. In order to use , you must be a [registered](#) customer, be logged in, and have JavaScript enabled.

[registered](#)

Analyze the Collected Data

Check the value of the sig= field in the **show context slot [slot#]** output:

```
Router#show context slot 4
CRASH INFO: Slot 4, Index 1, Crash at 04:28:56 EDT Tue Apr 20 1999

VERSION:
GS Software (GLC1-LC-M), Version 11.2(15)GS1a, EARLY DEPLOYMENT RELEASE
SOFTWARE (fc1)
Compiled Mon 28-Dec-98 14:53 by tamb
Card Type: 1 Port Packet Over SONET OC-12c/STM-4c, S/N CAB020500AL
System exception: SIG=20, code=0xA414EF5A, context=0x40337424

Traceback Using RA
STACK TRACE:
    traceback 4014CFC0 40141AB8 40143944 4014607C 4014A7EC 401499D4 40149BB4
40149FD4 40080118 40080104
CONTEXT:
$0 : 00000000, AT : 40330000, v0 : 00000000, v1 : 00000038
a0 : 4094EF58, a1 : 00000120, a2 : 00000002, a3 : 00000001
t0 : 00000010, t1 : 3400BF01, t2 : 34008D00, t3 : FFFF00FF
t4 : 400A1410, t5 : 00000002, t6 : 00000000, t7 : 4041783C
s0 : 4093F980, s1 : 4093F980, s2 : 4094EEF0, s3 : 4094EF00
s4 : 00000000, s5 : 00000001, s6 : 00000000, s7 : 00000000
t8 : 34008000, t9 : 00000000, k0 : 404D1860, k1 : 400A2F68
gp : 402F3070, sp : 4082BFB0, s8 : 00000000, ra : 400826FC
EPC : 0x40098824, SREG : 0x3400BF04, Cause : 0x00000000
ErrorEPC : 0x4015B7E4
```

See [Table 2](#) to find out what error reason matches the SIG value you recorded.

Table 2 – Find the Error That Matches the SIG Value

SIG	SIG Name	Error Reason
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Value		
2	SIGINT	Unexpected hardware interrupt.
3	SIGQUIT	Abort due to break key.
4	SIGILL	Illegal opcode exception.
5	SIGTRAP	Abort due to Break Point or an arithmetic exception.
8	SIGFPE	Floating point unit (FPU) exception.
9	SIGKILL	Reserved exception.
10	SIGBUS	Bus error exception.
11	SIGSEGV	SegV exception.
20	SIGCACHE	Cache parity exception.
21	SIGWBERR	Write bus error interrupt.
22	SIGERROR	Fatal hardware error.
23	SIGRELOAD	Software-forced crash.

Note: Cache Parity Exception (SIG=20), Bus Error Exception (SIG=10), and Software-forced Crashes (SIG=23) account for more than 95% of line card crashes.

The diag Exec Command

The Cisco 12000 Series supports the **diag [slot#]** command for testing the different board components. This command is useful for troubleshooting hardware-related crashes, and to identify the faulty board.

The **verbose** option causes the router to display the list of tests as they are being performed. Otherwise, it simply displays a "PASSED" or "FAILURE" message.

Note: Performing this diagnostic stops all activities of the line card for the duration of the tests (usually around five minutes).

Starting with Cisco IOS Software Release 12.0(22)S, Cisco has unbundled the Cisco 12000 Series Internet Router field diagnostics line card image from the Cisco IOS software image. In earlier versions, diagnostics could be launched from the command line and the imbedded image would be launched. In order to accommodate customers with 20 MB Flash memory cards, line card field diagnostics are now stored and maintained as a separate image that must be available on a Flash memory card or a Trivial File Transfer Protocol (TFTP) boot server before the field diagnostics commands can be used. Router processor and switch fabric field diagnostics continue

to be bundled and need not be launched from a separate image. You can find more information at [Field Diagnostics for the Cisco 12000 Series Internet Router](#).

Here is an example of a **diag [slot#]** command output:

```
Router#diag 3 verbose
Running DIAG config check
Running Diags will halt ALL activity on the requested slot.
[confirm]
CR1.LND10#
Launching a Field Diagnostic for slot 3
Downloading diagnostic tests to slot 3 (timeout set to 400 sec.)
Field Diag download COMPLETE for slot 3
FD 3> *****
FD 3> GSR Field Diagnostics V3.0
FD 3> Compiled by award on Tue Aug 3 15:58:13 PDT 1999
FD 3> view: award-bfr_112.FieldDiagRelease
FD 3> *****
FD 3> BFR_CARD_TYPE_OC48_1P_POS testing...
FD 3> running in slot 3 (128 tests)

Executing all diagnostic tests in slot 3
(total/indiv. timeout set to 600/200 sec.)
FD 3> Verbosity now (0x00000001) TESTSDISP

FDIAG_STAT_IN_PROGRESS: test #1 R5K Internal Cache
FDIAG_STAT_IN_PROGRESS: test #2 Burst Operations
FDIAG_STAT_IN_PROGRESS: test #3 Subblock Ordering
FDIAG_STAT_IN_PROGRESS: test #4 Dram Marching Pattern
FDIAG_STAT_DONE_FAIL test_num 4, error_code 6
Field Diagnostic: *****TEST FAILURE***** slot 3: last test run 4,
Dram Marching Pattern, error 6
Field Diag eeprom values: run 2 fail mode 1 (TEST FAILURE) slot 3
last test failed was 4, error code 6
Shutting down diags in slot 3

slot 3 done, will not reload automatically
```

Depending on the error encountered, the slot might or might not be automatically reloaded. If it is not, it might be in a stuck or inconsistent state (check with the **show diag [slot #]** command) until manually reloaded. This is normal. In order to manually reload the card, use the **hw-module slot [slot#] reload** command.

Cache Parity Exceptions

You can identify cache parity exceptions by the **SIG=20** in the **show context [slot #]** output.

If you have the output of a **show tech-support** (from enable mode) command from your Cisco device, you can use to display potential issues and fixes. In order to use , you must be a [registered](#) customer, be logged in, and have JavaScript enabled.

[registered](#)

There are two different kinds of parity errors:

- Soft parity errors—These occur when an energy level within the chip (for example, a one or a

zero) changes. In case of a soft parity error, there is no need to swap the board or any of the components.

- Hard parity errors— These occur when there is a chip or board failure that causes data to be corrupted. In this case, you should re-seat or replace the affected component, usually a memory chip swap or a board swap. There is a hard parity error when multiple parity errors are seen at the same address. There are more complicated cases which are harder to identify but, in general, if more than one parity error is seen in a particular memory region in a relatively short period of time (several weeks to months), this can be considered a hard parity error.

Studies have shown that soft parity errors are 10 to 100 times more frequent than hard parity errors.

In order to troubleshoot these errors, find a maintenance window to run the **diag** command for that slot.

- If the diagnosis results in a failure, replace the line card.
- If there is no failure, it is likely to be a soft parity error, and the line card does not have to be replaced (unless it crashes a second time with parity error after a short period of time).

Bus Error Exceptions

You can identify bus error exceptions by the **SIG=10** in the **show context [slot #]** output.

If you have the output of a **show tech-support** (from enable mode) command from your Cisco device, you can use to display potential issues and fixes. In order to use , you must be a [registered](#) customer, be logged in, and have JavaScript enabled.

[registered](#)

This type of crash is normally software-related, but if for some reason (for example, it is a brand new card, or the crashes start after a power outage) you think the problem could be hardware-related, run the **diag** command for that slot.

Note: Some software bugs have been known to cause the **diag** command to report errors, even though there is no problem with the hardware. If a card has already been replaced, but still fails at the same test in the diagnostic, you might be affected by this issue. In that case, treat the crash as a software problem.

Upgrading to the latest version of your Cisco IOS software release train eliminates all fixed bugs causing line card bus errors. If the crash is still present after the upgrade, collect the relevant information (see [Gather Information about the Crash](#)), along with a **show tech-support**, and any information that you think might be useful (such as recent topology change, or a new feature recently implemented) and contact your Cisco support representative.

Software-forced Crashes

You can identify software-forced crashes by the **SIG=23** in the **show context [slot #]** output. Despite the name, these crashes are not always software-related.

If you have the output of a **show tech-support** (from enable mode) command from your Cisco device, you can use to display potential issues and fixes. In order to use , you must be a [registered](#) customer, be logged in, and have JavaScript enabled.

[registered](#)

The most common reason for software-forced crashes is the "Fabric Ping Timeout". During normal router operation, the Route Processor (RP) continually pings the line cards. If a line card doesn't answer, the route processor decides to reset it. This results in a software-forced crash (SIG=23) of the affected line card, and you should see these errors in the router's logs:

```
Mar 12 00:42:48: %GRP-3-FABRIC_UNI:
Unicast send timed out (4)
Mar 12 00:42:50: %GRP-3-COREDUMP: Core dump incident on slot 4, error: Fabric ping
failure
```

In order to troubleshoot fabric ping timeouts, you need to find out why the line card didn't respond to the ping. There can be multiple causes:

- The line card is experiencing high CPU utilization—This can be verified using the **execute-on slot [slot #] show proc cpu** command. If the CPU is really high (above 95%), refer to [Troubleshooting High CPU Utilization on Cisco Routers](#).
- There are software bugs in Inter Process Communication (IPC) or the line card is running out of IPC buffers. Most of the time these software-forced reloads are caused by software bugs. Upgrading to the latest version of your Cisco IOS software release train eliminates all fixed bugs causing fabric ping timeouts. If the crash is still present after the upgrade, collect the relevant information (see [Getting Information about the Crash](#)), along with a **show tech-support**, a **show ipc status**, and any information that you think may be useful (such as recent topology change, or a new feature recently implemented) and contact your Cisco support representative.
- Hardware failure—If the card has been running fine for a long time and no recent topology, software, or feature changes have taken place, or if the problems started after a move or a power outage, defective hardware may be the cause. Run the **diag** command on the affected line card. Replace the line card, if faulty. If multiple line cards are affected or the diag is fine, replace the fabric.

%GSRSPA-6-ERRORRECOVER: A Hardware or Software error occurred on Subslot 0.Reason Marvel: TXECCERR Automatic Error recovery initiate

TXECCERR/RXECCERR error occurs when Rx FIFO or Tx FIFO unrecoverable ECC error interrupt occurs in MAC more than the threshold value within the time interval. Unrecoverable ECC errors can not be corrected by the ECC logic. When an unrecoverable error occurs during Rx FIFO read, the packet to which the data belongs is marked with EOP/Abort on the SPI4 receive interface and is discarded by upper layers.

This is due to the hardware and is corrected once we reload the SIP/SPA. The permanent solution is to replace the SIP/SPA in order to avoid the errors.

Other Crashes

Other crash types are, by far, less common than the two mentioned above. In most cases, the **diag** command should indicate whether the card needs to be replaced or not. If the card passes the diagnostic test correctly, consider upgrading the software.

Information to Collect if You Open a TAC Service Request

If you still need assistance after following the troubleshooting steps above and want to [open a service request](#) ([registered](#) customers only) with the Cisco TAC, be sure to include the following information:

- Troubleshooting performed before opening the service request.
- **show technical-support** output (in enable mode if possible).
- **show log** output or console captures, if available.
- **execute-on slot [slot #] show tech** for the slot which experienced the line card crash.

Attach the collected data to your service request in non-zipped, plain text format (.txt). You can attach information to your service request by uploading it using the [TAC Service Request tool](#) ([registered](#) customers only) . If you cannot access the Service Request tool, you can send the information in an email attachment to attach@cisco.com with your service request number in the subject line of your message.

Note: Do not manually reload or power-cycle the router before collecting the above information unless required to troubleshoot a line card crash on the Cisco 12000 Series Internet Router, as this can cause important information to be lost that is needed for determining the root cause of the problem.

Related Information

- [Troubleshooting Router Crashes](#)
- [Configuring a Core Dump on a GSR Line Card](#)
- [Troubleshooting High CPU Utilization on Cisco Routers](#)
- [Technical Support & Documentation - Cisco Systems](#)