



Buffer Overflow: Detection and Correction of Redzone Corruption

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In its default state, the Cisco IOS software forces a software reload when a memory block overflow is detected. The Buffer Overflow: Detection and Correction of Redzone Corruption feature allows you to configure a device to detect and correct the memory block overflow and continue operation.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the [“Feature Information for Buffer Overflow: Detection and Correction of Redzone Corruption”](#) section on page 13.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

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Restrictions for Buffer Overflow Detection and Correction

The device must have enough file system space to store the crashinfo data about memory overflow corrections.

A minimal performance impact occurs each time the software corrects a memory block overflow.

Information About Buffer Overflow Detection and Correction

Before configuring the Buffer Overflow: Detection and Correction of Redzone Corruption feature, be sure you understand the following concepts:

- [Detection of Memory Block Overflow Problems, page 2](#)
- [When to Enable Buffer Overflow Detection and Correction, page 2](#)

Detection of Memory Block Overflow Problems

A memory block overflow problem is detected in the Cisco IOS software when the value of an area in the memory block called the “redzone” is checked. A change in a redzone value indicates the occurrence of a memory block overflow. The memory block overflow can occur in either processor or packet memory.

Because processor memory is used for holding data referred to by the Cisco IOS software, the chances of device malfunction are higher when there are extensive overflows, even if software can correct it. The overflow detected in the processor memory is corrected only when the size of the overflow is less than or equal to the size of the redzone value, which is 4 bytes. If the memory block is allocated at the time of memory overflow detection, the correction will happen during freeing up of the memory block.

When a memory block overflow problem is detected in packet memory, software will change the memory block header data back to its correct value. The memory corruption caused by the memory overflow could extend over multiple contiguous blocks of memory. If so, the memory block header and redzone value of each such corrupted block would be rewritten. The correction would be done whenever the memory overflow was detected. In this case, the software assumes that the protocol stack will handle packet transmission when it becomes aware of data corruption. The protocol stack software could request that the packet be retransmitted or just drop the packet.

When to Enable Buffer Overflow Detection and Correction

The Buffer Overflow: Detection and Correction of Redzone Corruption feature corrects memory corruption to the Cisco IOS memory block headers and allows a router to continue its normal operation. This is an optional feature that you can configure through the use of the **exception memory ignore overflow** command. You would configure this feature when a device is known to have a memory block overflow problem.

If memory overflow correction is frequently required, for example, every 5 seconds and more than two times in a row, a severe problem is indicated and the device would be allowed to reload. Once an overflow is detected, details about the instance of the overflow are collected in a file and written to flash memory. You can display the details of this file using a Cisco IOS **show memory overflow** command.

How to Configure the Buffer Overflow Detection and Correction Feature

This section contains the following tasks for configuring and displaying details about the Buffer Overflow: Detection and Correction of Redzone Corruption feature:

- [Configuring Buffer Overflow Detection and Correction, page 3](#) (required)
- [Displaying Buffer Overflow Detection and Correction Details, page 4](#) (optional)

Configuring Buffer Overflow Detection and Correction

Perform the following task to configure buffer overflow detection and correction.

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `exception memory ignore overflow {io | processor} [frequency seconds] [maxcount corrections]`
4. `end`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><code>enable</code></p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<p><code>configure terminal</code></p> <p>Example: Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p><code>exception memory ignore overflow {io processor} [frequency seconds] [maxcount corrections]</code></p> <p>Example: Router(config)# exception memory ignore overflow processor frequency 30 maxcount 5</p>	<p>Configures the Cisco IOS software to correct corruption in memory block headers and allows a router to continue its normal operation.</p> <ul style="list-style-type: none"> • The io keyword selects packet memory. • The processor keyword selects processor memory. • The frequency seconds keyword and argument pair sets up the minimum time gap between two memory block header corrections, in a range from 1 to 600 seconds. The default is once every 10 seconds. • The maxcount corrections keyword and argument pair sets up the maximum number of memory block header corrections allowed, in a range from 1 to 1000. The default is 0, which sets an unlimited number of corrections.

	Command or Action	Purpose
Step 4	<code>end</code>	Exits to privileged EXEC mode.
	Example: <code>Router(config)# end</code>	

Displaying Buffer Overflow Detection and Correction Details

Perform the following task to display buffer overflow detection and correction details.

SUMMARY STEPS

1. `enable`
2. `show memory overflow`
3. `exit`

DETAILED STEPS

Step 1 `enable`

Use this command to enter privileged EXEC mode. Enter your password if prompted. For example:

```
Router> enable
Router#
```

Step 2 `show memory overflow`

Use this command to display the buffer overflow detection and correction details. For example:

```
Router# show memory overflow

Count   Buffer Count   Last corrected   Crashinfo files
-----
1       1              00:11:17        slot0:crashinfo_20030620-075755
Traceback 607D526C 608731A0 607172F8 607288E0 607A5688 607A566C
```

The report includes the amount of time from the boot up of the router at which the correction occurred, 11 minutes and 17 seconds (00:11:17), and the name of the file that logged the memory block overflow details, slot:crashinfo_20030620-075755.

Step 3 `exit`

Use this command to exit to user EXEC mode. For example:

```
Router# exit
Router>
```

Configuration Examples for Buffer Overflow Detection and Correction

This section provides the following configuration example:

- [Configuring Buffer Overflow Detection and Correction: Example, page 5](#)

Configuring Buffer Overflow Detection and Correction: Example

The following example sets a maximum of five processor memory block header corruption corrections to occur every 30 seconds:

```
Router(config)# exception memory ignore overflow processor frequency 30 maxcount 5
```

Additional References

The following sections provide references related to the Buffer Overflow: Detection and Correction of Redzone Corruption feature.

Related Documents

Related Topic	Document Title
Maintaining system memory	“ Maintaining System Memory ” chapter in the <i>Cisco IOS Configuration Fundamentals and Network Management Configuration Guide</i> , Release 12.3
System memory commands	<i>Cisco IOS Configuration Fundamentals and Network Management Command Reference</i> , Release 12.3T

Standards

Standards	Title
None	—

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
None	—

Technical Assistance

Description	Link
The Technical Support & Documentation website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Command Reference

This section documents modified commands only.

- [exception memory ignore overflow](#)
- [show memory](#)

exception memory ignore overflow

To configure the Cisco IOS software to correct corruption in memory block headers and allow a router to continue its normal operation, use the **exception memory ignore overflow** command in global configuration mode. To disable memory overflow correction, use the **no** form of this command.

exception memory ignore overflow {io | processor} [frequency seconds] [maxcount corrections]

no exception memory ignore overflow {io | processor} [frequency seconds] [maxcount corrections]

Syntax Description		
io	Selects input/output (also called packet) memory.	
processor	Selects processor memory.	
frequency seconds	(Optional) Specifies the minimum time gap between two memory block header corrections, in the range from 1 to 600 seconds. The default is once every 10 seconds.	
maxcount corrections	(Optional) Specifies the maximum number of memory block header corrections allowed, in the range from 1 to 1000. The default is 0, which sets an unlimited number of corrections.	

Command Default The default is to allow the memory overflow correction once every 10 seconds, and for memory overflow corrections to happen an unlimited number of times.

Command Modes Global configuration

Command History	Release	Modification
	12.3(7)T	This command was introduced.
	12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
	12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines Use this command to improve device availability when software faults are detected in the network. You can configure the frequency and the maximum number of memory overflow corrections. If overflow correction is required more often than the configured value, a software forced reload is triggered because a severe system problem is indicated.

Examples The following example shows how to set a maximum of five processor memory block header corruption corrections to occur every 30 seconds:

```
configure terminal
!
exception memory ignore overflow processor frequency 30 maxcount 5
end
```

■ exception memory ignore overflow

Related Commands	Command	Description
	show memory overflow	Displays the details of a memory block header corruption correction.

show memory

To display statistics about memory, including memory-free pool statistics, use the **show memory** command in user EXEC or privileged EXEC mode.

show memory [*memory-type*] [**free**] [**overflow**] [**summary**]

Syntax Description	
<i>memory-type</i>	(Optional) Memory type to display (processor , multibus , io , or sram). If <i>memory-type</i> is not specified, statistics for all memory types present are displayed.
free	(Optional) Displays free memory statistics.
overflow	(Optional) Displays details about memory block header corruption corrections when the exception memory ignore overflow global configuration command is configured.
summary	(Optional) Displays a summary of memory usage including the size and number of blocks allocated for each address of the system call that allocated the block.

Command Modes	
	User EXEC Privileged EXEC

Command History	Release	Modification
	10.0	This command was introduced.
	12.3(7)T	This command was enhanced with the overflow keyword to display details about memory block header corruption corrections.
	12.2(25)S	The command output was updated to display information about transient memory pools.
	12.3(14)T	The command output was updated to display information about transient memory pools.
	12.2(27)SBC	This command was integrated into Cisco IOS Release 12.2(27)SBC.
	12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines	
	The show memory command displays information about memory available after the system image decompresses and loads.

Examples The following is sample output from the **show memory** command:

```
Router# show memory

          Head  Total (b)  Used (b)  Free (b)  Lowest (b)  Largest (b)
Processor  B0EE38    5181896   2210036   2971860    2692456    2845368

          Processor memory
Address    Bytes Prev.   Next  Ref  PrevF  NextF  Alloc PC  What
B0EE38    1056  0       B0F280  1    PrevF  NextF    18F132  List Elements
```

show memory

```

B0F280      2656 B0EE38  B0FD08      1              18F132  List Headers
B0FD08      2520 B0F280  B10708      1              141384  TTY data
B10708      2000 B0FD08  B10F00      1              14353C  TTY Input Buf
B10F00       512 B10708  B11128      1              14356C  TTY Output Buf
B11128      2000 B10F00  B11920      1              1A110E  Interrupt Stack
B11920       44  B11128  B11974      1              970DE8  *Init*
B11974     1056 B11920  B11DBC      1              18F132  messages
B11DBC       84  B11974  B11E38      1              19ABCE  Watched Boolean
B11E38       84  B11DBC  B11EB4      1              19ABCE  Watched Boolean
B11EB4       84  B11E38  B11F30      1              19ABCE  Watched Boolean
B11F30       84  B11EB4  B11FAC      1              19ABCE  Watched Boolean

```

The following is sample output from the **show memory free** command:

```
Router# show memory free
```

```

Processor      Head  Total (b)  Used (b)  Free (b)  Lowest (b)  Largest (b)
Processor      B0EE38  5181896   2210076   2971820   2692456    2845368

Processor memory
Address  Bytes Prev.  Next  Ref  PrevF  NextF  Alloc PC  What
CEB844  24    Free list 1
CEB844  32  CEB7A4  CEB88C  0  0      0      96B894  SSE Manager
CEB844  52    Free list 2
CEB844  72    Free list 3
CEB844  76    Free list 4
CEB844  80    Free list 5
D35ED4  80  D35E30  D35F4C  0  0      D27AE8  96B894  SSE Manager
D27AE8  80  D27A48  D27B60  0  D35ED4  0      22585E  SSE Manager
D27AE8  88    Free list 6
D27AE8  100   Free list 7
D0A8F4  100  D0A8B0  D0A980  0  0      0      2258DA  SSE Manager
D0A8F4  104   Free list 8
B59EF0  108  B59E8C  B59F84  0  0      0      2258DA  (fragment)

```

The output of the **show memory free** command contains the same types of information as the **show memory** output, except that only free memory is displayed, and the information is displayed in order for each free list.

The first section of the display includes summary statistics about the activities of the system memory allocator. [Table 1](#) describes the significant fields shown in the first section of the display.

Table 1 *show memory Field Descriptions—First Section*

Field	Description
Head	Hexadecimal address of the head of the memory allocation chain.
Total(b)	Sum of used bytes plus free bytes.
Used(b)	Amount of memory in use.
Free(b)	Amount of memory not in use.
Lowest(b)	Smallest amount of free memory since last boot.
Largest(b)	Size of largest available free block.

The second section of the display is a block-by-block listing of memory use. [Table 2](#) describes the significant fields shown in the second section of the display.

Table 2 *Characteristics of Each Block of Memory—Second Section*

Field	Description
Address	Hexadecimal address of block.
Bytes	Size of block (in bytes).
Prev.	Address of previous block (should match the address on previous line).
Next	Address of next block (should match the address on next line).
Ref	Reference count for that memory block, indicating how many different processes are using that block of memory.
PrevF	Address of previous free block (if free).
NextF	Address of next free block (if free).
Alloc PC	Address of the system call that allocated the block.
What	Name of process that owns the block, or “(fragment)” if the block is a fragment, or “(coalesced)” if the block was coalesced from adjacent free blocks.

The **show memory io** command displays the free I/O memory blocks. On the Cisco 4000 router, this command quickly shows how much unused I/O memory is available.

The following is sample output from the **show memory io** command:

```
Router# show memory io

Address  Bytes Prev.  Next    Ref  PrevF  NextF  Alloc PC  What
6132DA0  59264 6132664 6141520  0    0      600DDEC 3FCF0    *Packet Buffer*
600DDEC    500 600DA4C 600DFE0  0    6132DA0 600FE68  0
600FE68    376 600FAC8 600FFE0  0    600DDEC 6011D54  0
6011D54    652 60119B4 6011FE0  0    600FE68 6013D54  0
614FCA0    832 614F564 614FFE0  0    601FD54 6177640  0
6177640 2657056 6172E90 0        0    614FCA0 0        0
Total: 2723244
```

The following example displays details of a memory block overflow correction when the **exception memory ignore overflow** global configuration command is configured:

```
Router# show memory overflow

Count  Buffer Count    Last corrected    Crashinfo files
1      1              00:11:17          slot0:crashinfo_20030620-075755
Traceback  607D526C 608731A0 607172F8 607288E0 607A5688 607A566C
```

The report includes the amount of time since the last correction was made and the name of the file that logged the memory block overflow details.

The **show memory sram** command displays the free SRAM memory blocks. For the Cisco 4000 router, this command supports the high-speed static RAM memory pool to make it easier for you to debug or diagnose problems with allocation or freeing of such memory.

The following is sample output from the **show memory sram** command:

```
Router# show memory sram

Address  Bytes Prev.  Next    Ref  PrevF  NextF  Alloc PC  What
7AE0    38178 72F0    0        0    0      0        0
Total    38178
```

The following example of the **show memory** command used on the Cisco 4000 router includes information about SRAM memory and I/O memory:

```
Router# show memory
```

	Head	Total (b)	Used (b)	Free (b)	Lowest (b)	Largest (b)
Processor	49C724	28719324	1510864	27208460	26511644	15513908
I/O	6000000	4194304	1297088	2897216	2869248	2896812
SRAM	1000	65536	63400	2136	2136	2136

Address	Bytes	Prev.	Next	Ref	PrevF	NextF	Alloc PC	What
1000	2032	0	17F0	1			3E73E	*Init*
17F0	2032	1000	1FE0	1			3E73E	*Init*
1FE0	544	17F0	2200	1			3276A	*Init*
2200	52	1FE0	2234	1			31D68	*Init*
2234	52	2200	2268	1			31DAA	*Init*
2268	52	2234	229C	1			31DF2	*Init*
72F0	2032	6E5C	7AE0	1			3E73E	Init
7AE0	38178	72F0	0	0	0	0	0	

The **show memory summary** command displays a summary of all memory pools and memory usage per Alloc PC (address of the system call that allocated the block).

The following is a partial sample output from the **show memory summary** command. This output shows the size, blocks, and bytes allocated. Bytes equal the size multiplied by the blocks. For a description of the other fields, see [Table 1](#) and [Table 2](#).

```
Router# show memory summary
```

Head	Total (b)	Used (b)	Free (b)	Lowest (b)	Largest (b)	
Processor	B0EE38	5181896	2210216	2971680	2692456	2845368

Processor memory					
Alloc PC	Size	Blocks	Bytes	What	
0x2AB2	192	1	192	IDB: Serial Info	
0x70EC	92	2	184	Init	
0xC916	128	50	6400	RIF Cache	
0x76ADE	4500	1	4500	XDI data	
0x76E84	4464	1	4464	XDI data	
0x76EAC	692	1	692	XDI data	
0x77764	408	1	408	Init	
0x77776	116	1	116	Init	
0x777A2	408	1	408	Init	
0x777B2	116	1	116	Init	
0xA4600	24	3	72	List	
0xD9B5C	52	1	52	SSE Manager	
.....					
0x0	0	3413	2072576	Pool Summary	
0x0	0	28	2971680	Pool Summary (Free Blocks)	
0x0	40	3441	137640	Pool Summary (All Block Headers)	
0x0	0	3413	2072576	Memory Summary	
0x0	0	28	2971680	Memory Summary (Free Blocks)	

Related Commands

Command	Description
exception memory ignore overflow	Configures the Cisco IOS software to correct corruptions in memory block headers and allow a router to continue its normal operation.
show processes memory	Displays memory used per process.

Feature Information for Buffer Overflow: Detection and Correction of Redzone Corruption

Table 3 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.



Note

Table 3 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release. Unless noted otherwise, subsequent releases of that Cisco IOS software release also support that feature.

Table 3 Feature Information for Buffer Overflow: Detection and Correction of Redzone Corruption

Feature Name	Releases	Feature Information
Buffer Overflow: Detection and Correction of Redzone Corruption	12.2(25)S, 12.2(27)SBC, 12.2(33)SRA, 12.3(7)T	<p>In its default state, the Cisco IOS software forces a software reload when a memory block overflow is detected. The Buffer Overflow: Detection and Correction of Redzone Corruption feature allows you to configure a device to detect and correct the memory block overflow and continue operation.</p> <p>In 12.3(7)T, this feature was introduced.</p> <p>In 12.2(25)S, this feature was integrated into a Cisco IOS 12.2S release.</p> <p>In 12.2(27)SBC, this feature was integrated into a Cisco IOS 12.2SB release.</p> <p>In 12.2(33)SRA, this feature was integrated into a Cisco IOS 12.2SR release.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> • When to Enable Buffer Overflow Detection and Correction, page 2 • Configuring Buffer Overflow Detection and Correction, page 3 • Displaying Buffer Overflow Detection and Correction Details, page 4 <p>The following commands were modified by this feature: exception memory ignore overflow and show memory.</p>

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