



## **Maintaining System Memory Configuration Guide, Cisco IOS Release 12.2SY**

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**Last Updated: July 21, 2011**

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# Memory Leak Detector

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The Memory Leak Detector feature is a tool that can be used to detect memory leaks on a router that is running Cisco IOS software. The Memory Leak Detector feature is capable of finding leaks in all memory pools, packet buffers, and chunks.

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information for Memory Leak Detector.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. 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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## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

## Prerequisites for Memory Leak Detector

- You should have at least a basic familiarity with the Cisco IOS environment and the command-line interface.
- You should have at least a minimal configuration running on your system.

## Restrictions for Memory Leak Detector

- You must have your network up and running, with Cisco IOS Release 12.2 or a later release installed.
- Some of the Cisco IOS configuration commands are only available on certain router platforms, and the command syntax may vary on different platforms.

## Information About Memory Leak Detector

- [Memory Leaks, page 2](#)
- [Memory Leak Detection, page 2](#)

## Memory Leaks

Memory leaks are static or dynamic allocations of memory that do not serve any useful purpose. Although technology is available for detection of leaks among statically allocated memory, in this document the focus is on memory allocations that are made dynamically.

## Memory Leak Detection

From the detection point of view, leaks among the dynamically allocated memory blocks can be classified into the following three types:

- Type 1 leaks have no references. These blocks of memory can not be accessed.
- Type 2 leaks are part of one or more cycles of allocations but none of the blocks in these cycles is accessible from outside of the cycles. Blocks within each cycle have references to other elements in the cycle(s). An example of a Type 2 leak is a circular list that is not needed anymore. Though individual elements are reachable, the circular list is not reachable.
- Type 3 leaks are accessible or reachable but are not needed, for example, elements in data structures that are not needed anymore. A subclass of Type 3 leaks are those where allocations are made but never written to. You can look for these subclass leaks using the **showmemorydebugreferenceunused** command.

The Memory Leak Detector feature provides the technology to detect Type 1 and Type 2 memory leaks.

The Memory Leak Detector feature works in the following two modes:

- Normal mode--Where memory leak detector uses memory to speed up its operations.
- Low memory mode--Where memory leak detector runs without attempting to allocate memory.

Low memory mode is considerably slower than the normal mode and can handle only blocks. There is no support for chunks in low memory mode. Low memory mode is useful when there is little or no memory available on the router.

The memory leak detector has a simple interface and can be invoked by the command line interface (CLI) at any time to get a report of memory leaks. For testing purposes, you can perform all tests, then invoke memory leak detector to get a report on leaks. If you are interested only in leaks generated by your test cases alone, memory leak detector has an incremental option, which can be enabled at the start of testing. After testing completes, you can get a report on only the leaks that occurred after the incremental option was enabled.

To reduce false alarms, it is mandatory that memory leak detector be invoked multiple times and that only leaks that consistently appear in all reports be interpreted as leaks. This is especially true for packet buffer leaks.

**Note**

When submitting defects based on the reports of memory leak detector, please add “memleak-detection” to the attribute field of the defect report.

**Danger**

Executing memory leak detection commands on a device with a serious memory leak issue may cause loss of connectivity.

## How to Use Memory Leak Detector

- [Displaying Memory Leak Information](#), page 3
- [Setting the Memory Debug Incremental Starting Time](#), page 4
- [Displaying Memory Leak Information Incrementally](#), page 4

## Displaying Memory Leak Information

To display detected memory leak information, complete the task in this section:

### SUMMARY STEPS

1. enable
2. show memory debug leaks [chunks | largest | lowmem | summary]

### DETAILED STEPS

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.
	<b>Example:</b>  Router> enable	<ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>



Command or Action	Purpose
<b>Step 2</b> <b>show memory debug leaks</b> [ <b>chunks</b>   <b>largest</b>   <b>lowmem</b>   <b>summary</b> ]  <b>Example:</b>  Router# show memory debug leaks chunks	Invokes normal mode memory leak detection and displays detected memory leaks. Optional keywords are as follows: <ul style="list-style-type: none"> <li>• <b>chunks</b> --Invokes normal mode memory leak detection and displays detected memory leaks in chunks.</li> <li>• <b>largest</b> --Invokes memory leak detection and displays the top ten leaking allocator_pcs and total amount of memory that they have leaked. Additionally, each time this command is invoked it remembers the previous invocation's report and compares it to the current invocation's report.</li> <li>• <b>lowmem</b> --Invokes low memory mode memory leak detection and displays detected memory leaks. The amount of time taken for analysis is considerably greater than that of normal mode. The output for this command is similar to the <b>showmemorydebugleaks</b> command.</li> <li>• <b>summary</b> --Invokes normal mode memory leak detection and displays detected memory leaks based on allocator_pc and then on the size of the block.</li> </ul>

## Setting the Memory Debug Incremental Starting Time

To set the starting time for incremental analysis of memory leaks, complete the task in this section:

### SUMMARY STEPS

1. **enable**
2. **set memory debug incremental starting-time**

### DETAILED STEPS

Command or Action	Purpose
<b>Step 1</b> <b>enable</b>  <b>Example:</b>  Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b> <b>set memory debug incremental starting-time</b>  <b>Example:</b>  Router# set memory debug incremental starting-time	Sets the starting time for incremental analysis to the time when the command is issued. When the starting time is set, only memory allocated after the starting time will be considered for reporting as leaks.

## Displaying Memory Leak Information Incrementally

To display memory leak information after a starting time has been established, complete the tasks in this section:

**SUMMARY STEPS**

1. enable
2. set memory debug incremental starting-time
3. show memory debug incremental { allocations | leaks [lowmem] | status }

**DETAILED STEPS**

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> <pre>Router&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>set memory debug incremental starting-time</b>  <b>Example:</b> <pre>Router# set memory debug incremental starting-time</pre>	Sets the starting time for incremental analysis to the time when the command is issued.
Step 3	<b>show memory debug incremental { allocations   leaks [lowmem]   status }</b>  <b>Example:</b> <pre>Router# show memory debug incremental allocations</pre> <b>Example:</b>	<ul style="list-style-type: none"> <li>• <b>allocations</b> --Displays all the memory blocks that were allocated after the issue of a <b>setmemorydebugincrementalstarting-time</b> command. The displayed memory blocks are just memory allocations, they are not necessarily leaks.</li> <li>• <b>leaks</b> --Displays output similar to the <b>showmemorydebugleaks</b> command, except that it displays only memory that was leaked after the issue of a <b>setmemorydebugincrementalstarting-time</b> command.</li> <li>• <b>lowmem</b> --Forces memory leak detection to work in low memory mode. The output for this command is similar to the <b>showmemorydebugleaks</b> command, except that it displays only memory that was leaked after the issue of a <b>setmemorydebugincrementalstarting-time</b> command.               <ul style="list-style-type: none"> <li>◦ In low memory mode, the analysis time is considerably greater than it is in normal mode.</li> <li>◦ You can use this command when you already know that normal mode memory leak detection will fail (perhaps by an unsuccessful previous attempt to invoke normal mode memory leak detection).</li> </ul> </li> <li>• <b>status</b> --Displays whether a starting point for incremental analysis has been set and the elapsed time since then.</li> </ul>

**Examples for Memory Leak Detector**

- [Example show memory debug leaks, page 6](#)
- [Example show memory debug leaks chunks, page 6](#)
- [Example show memory debug leaks largest, page 7](#)

- [Example show memory debug leaks summary, page 8](#)
- [Example show memory debug incremental allocations, page 9](#)
- [Example show memory debug incremental status, page 9](#)

## Example show memory debug leaks

The following example shows output from the **showmemorydebugleaks** command with no optional keywords specified:

```
Router# show memory debug leaks
Adding blocks for GD...
      PCI memory
Address      Size  Alloc_pc  PID  Name
      I/O memory
Address      Size  Alloc_pc  PID  Name
      Processor memory
Address      Size  Alloc_pc  PID  Name
62DABD28      80 60616750  -2  Init
62DABD78      80 606167A0  -2  Init
62DCF240      88 605B7E70  -2  Init
62DCF298      96 605B7E98  -2  Init
62DCF2F8      88 605B7EB4  -2  Init
62DCF350      96 605B7EDC  -2  Init
63336C28     104 60C67D74  -2  Init
63370D58      96 60C656AC  -2  Init
633710A0     304 60C656AC  -2  Init
63B2BF68      96 60C659D4  -2  Init
63BA3FE0    32832 608D2848  104  Audit Process
63BB4020    32832 608D2FD8  104  Audit Process
```

The table below describes the significant fields shown in the display.

**Table 1** *show memory debug leaks Field Descriptions*

Field	Description
Address	Hexadecimal address of the leaked block.
Size	Size of the leaked block (in bytes).
Alloc_pc	Address of the system call that allocated the block.
PID	The process identifier of the process that allocated the block.
Name	The name of the process that allocated the block.

## Example show memory debug leaks chunks

The following example shows output from the **showmemorydebugleakschunks** command:

```
Router# show memory debug leaks chunks
Adding blocks for GD...
      PCI memory
Address      Size  Alloc_pc  PID  Name
Chunk Elements:
Address      Size  Parent    Name
      I/O memory
Address      Size  Alloc_pc  PID  Name
Chunk Elements:
```

```

Address  Size  Parent  Name
Processor memory
Address  Size  Alloc_pc  PID  Name
62DABD28      80  60616750   -2  Init
62DABD78      80  606167A0   -2  Init
62DCF240      88  605B7E70   -2  Init
62DCF298      96  605B7E98   -2  Init
62DCF2F8      88  605B7EB4   -2  Init
62DCF350      96  605B7EDC   -2  Init
63336C28     104  60C67D74   -2  Init
63370D58      96  60C656AC   -2  Init
633710A0     304  60C656AC   -2  Init
63B2BF68      96  60C659D4   -2  Init
63BA3FE0    32832  608D2848  104  Audit Process
63BB4020    32832  608D2FD8  104  Audit Process
Chunk Elements:
Address  Size  Parent  Name
62D80DA8     16  62D7BFD0 (Managed Chunk )
62D80DB8     16  62D7BFD0 (Managed Chunk )
62D80DC8     16  62D7BFD0 (Managed Chunk )
62D80DD8     16  62D7BFD0 (Managed Chunk )
62D80DE8     16  62D7BFD0 (Managed Chunk )
62E8FD60    216  62E8F888 (IPC Message He)

```

The table below describes the significant fields shown in the display.

**Table 2** *show memory debug leaks chunks Field Descriptions*

Field	Description
Address	Hexadecimal address of the leaked block.
Size	Size of the leaked block (in bytes).
Alloc_pc	Address of the system call that allocated the block.
PID	The process identifier of the process that allocated the block.
Name	The name of the process that allocated the block.
Size	(Chunk Elements) Size of the leaked element (bytes).
Parent	(Chunk Elements) Parent chunk of the leaked chunk.
Name	(Chunk Elements) The name of the leaked chunk.

## Example show memory debug leaks largest

The following example shows output from the **showmemorydebugleakslargest** command:

```

Router# show memory debug leaks largest
Adding blocks for GD...
          PCI memory
Alloc_pc  total leak size
          I/O memory
Alloc_pc  total leak size
          Processor memory
Alloc_pc  total leak size
608D2848  32776      inconclusive
608D2FD8  32776      inconclusive

```

```

60C656AC    288    inconclusive
60C67D74    48    inconclusive
605B7E98    40    inconclusive
605B7EDC    40    inconclusive
60C659D4    40    inconclusive
605B7E70    32    inconclusive
605B7EB4    32    inconclusive
60616750    24    inconclusive

```

The following example shows output from the second invocation of the **showmemorydebugleakslargest** command:

```

Router# show memory debug leaks largest
Adding blocks for GD...
      PCI memory
Alloc_pc    total leak size
      I/O memory
Alloc_pc    total leak size
      Processor memory
Alloc_pc    total leak size
608D2848    32776
608D2FD8    32776
60C656AC    288
60C67D74    48
605B7E98    40
605B7EDC    40
60C659D4    40
605B7E70    32
605B7EB4    32
60616750    24

```

## Example show memory debug leaks summary

The following example shows output from the **showmemorydebugleakssummary** command:

```

Router# show memory debug leaks summary
Adding blocks for GD...
      PCI memory
Alloc PC    Size    Blocks    Bytes    What
      I/O memory
Alloc PC    Size    Blocks    Bytes    What
      Processor memory
Alloc PC    Size    Blocks    Bytes    What
0x605B7E70  0000000032  0000000001  0000000032  Init
0x605B7E98  0000000040  0000000001  0000000040  Init
0x605B7EB4  0000000032  0000000001  0000000032  Init
0x605B7EDC  0000000040  0000000001  0000000040  Init
0x60616750  0000000024  0000000001  0000000024  Init
0x606167A0  0000000024  0000000001  0000000024  Init
0x608D2848  0000032776  0000000001  0000032776  Audit Process
0x608D2FD8  0000032776  0000000001  0000032776  Audit Process
0x60C656AC  0000000040  0000000001  0000000040  Init
0x60C656AC  0000000248  0000000001  0000000248  Init
0x60C659D4  0000000040  0000000001  0000000040  Init
0x60C67D74  0000000048  0000000001  0000000048  Init

```

The table below describes the significant fields shown in the display.

**Table 3** *show memory debug leaks summary Field Descriptions*

Field	Description
Alloc PC	Address of the system call that allocated the block.
Size	Size of the leaked block.

Field	Description
Blocks	Number of blocks leaked.
Bytes	Total amount of memory leaked.
What	Name of the process that owns the block.

## Example show memory debug incremental allocations

The following example shows output from the **showmemorydebugincremental** command when entered with the **allocations** keyword:

```
Router# show memory debug incremental allocations
Address      Size  Alloc_pc  PID  Name
62DA4E98     176  608CDC7C  44   CDP Protocol
62DA4F48      88  608CCCC8  44   CDP Protocol
62DA4FA0      88  606224A0  3     Exec
62DA4FF8      96  606224A0  3     Exec
635BF040      96  606224A0  3     Exec
63905E50     200  606A4DA4  69   Process Events
```

## Example show memory debug incremental status

The following example shows output from the **showmemorydebugincremental** command entered with the **status** keyword:

```
Router# show memory debug incremental status
Incremental debugging is enabled
Time elapsed since start of incremental debugging: 00:00:10
```

## Additional References

The following sections provide references related to Memory Leak Detector.

### Related Documents

Related Topic	Document Title
Cisco IOS commands	<a href="#">Cisco IOS Master Commands List, All Releases</a>
Cisco IOS configuration commands	<i>Cisco IOS Configuration Fundamentals Command Reference</i>

### Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	--

**MIBs**

<b>MIBs</b>	<b>MIBs Link</b>
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:  <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**RFCs**

<b>RFCs</b>	<b>Title</b>
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	--

**Technical Assistance**

<b>Description</b>	<b>Link</b>
Technical Assistance Center (TAC) home page, containing 30,000 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.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

## Feature Information for Memory Leak Detector

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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**Table 4** *Feature Information for Memory Leak Detector*

<b>Feature Name</b>	<b>Releases</b>	<b>Feature Information</b>
Memory Leak Detector	12.3(8)T1 12.2(25)S	The Memory Leak Detector feature is a tool that can be used to detect memory leaks on a router that is running Cisco IOS software. The Memory Leak Detector feature is capable of finding leaks in all memory pools, packet buffers, and chunks.

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