

[Solutions](#) [Products](#) [Ordering](#) [Support](#) [Partners](#) [Training](#) [Corporate](#)

Tech Notes

The show processes Command

[TAC Notice: What's Changing on TAC Web](#)

Contents

[Introduction](#)[Prerequisites](#)[Requirements](#)[Components Used](#)[Conventions](#)[The show processes Command](#)[The show processes cpu Command](#)[The show processes cpu history Command](#)[The show processes memory Command](#)[The Processes](#)[Related Information](#)

Help us help you.

Please rate this document. Excellent Good Average Fair Poor
This document solved my problem. Yes No Just browsing
Suggestions for improvement:

(256 character limit)

Introduction

The **show processes** command displays information about the active processes. Issue the **show processes cpu** command to display detailed CPU utilization statistics on these processes and the **show processes memory** command to show the amount of memory used.

This document describes the fields in the output of these commands. To verify if the CPU or memory utilization level on your device indicates a possible problem, use the [Output Interpreter tool](#) ([registered](#) customers only) . For more information, you may also refer to [Troubleshooting High CPU Utilization](#).

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on the software version below:

- Cisco IOS® Software Release 12.2(10b)

The information presented in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If you are working in a live network, ensure that you understand the potential impact of any command before using it.

Conventions

For more information on document conventions, see the [Cisco Technical Tips Conventions](#).

The show processes Command

The following is a sample output of the **show processes** command:

```
router#show processes
CPU utilization for five seconds: 0%/0%; one minute: 0%; five minutes: 0%
  PID Q  Ty      PC  Runtime(uS)   Invoked   uSecs   Stacks  TTY Process
   1 C  sp 602F3AF0      0         1627      0 2600/3000  0 Load Meter
   2 L  we 60C5BE00      4          136     29 5572/6000  0 CEF Scanner
   3 L  st 602D90F8    1676         837    2002 5740/6000  0 Check heaps
   4 C  we 602D08F8      0          1      0 5568/6000  0 Chunk Manager
   5 C  we 602DF0E8      0          1      0 5592/6000  0 Pool Manager
   6 M  st 60251E38      0          2      0 5560/6000  0 Timers
   7 M  we 600D4940      0          2      0 5568/6000  0 Serial Backgr
   8 M  we 6034B718      0          1      0 2584/3000  0 OIR Handler
   9 M  we 603FA3C8      0          1      0 5612/6000  0 IPC Zone Mana
  10 M  we 603FA1A0      0        8124      0 5488/6000  0 IPC Periodic
  11 M  we 603FA220      0          9      0 4884/6000  0 IPC Seat Mana
  12 L  we 60406818    124        2003     61 5300/6000  0 ARP Input
  13 M  we 60581638      0          1      0 5760/6000  0 HC Counter Ti
  14 M  we 605E3D00      0          2      0 5564/6000  0 DDR Timers
  15 M  we 605FC6B8      0          2    011568/12000  0 Dialer event
```

The following table lists and describes the fields in the **show processes** command output:

Field	Description
CPU utilization for five seconds	CPU utilization for the last five seconds. The second number indicates the percent of CPU time spent at the interrupt level.
one minute	CPU utilization for the last minute
five minutes	CPU utilization for the last five minutes
PID	Process ID
Q	Process queue priority. Possible values: C (critical), H (high), M (medium), L (low).
	Scheduler test. Possible values: * (currently running), E (waiting for an event), S (ready to run, voluntarily relinquished processor), rd (ready to run, wakeup conditions have occurred), we (waiting for an event), sa

Ty	(sleeping until an absolute time), si (sleeping for a time interval), sp (sleeping for a time interval (alternate call)), st (sleeping until a timer expires), hg (hung; the process will never execute again), xx (dead: the process has terminated, but has not yet been deleted.).
PC	Current program counter
Runtime (uS)	CPU time the process has used, in microseconds
Invoked	Number of times the process has been invoked
uSecs	Microseconds of CPU time for each process invocation
Stacks	Low water mark or Total stack space available, shown in bytes
TTY	Terminal that controls the process
Process	Name of process. For more information, refer to The Processes section of this document.

Note: Because the network server has a 4000-microsecond clock resolution, runtimes are considered reliable only after a large number of invocations or a reasonable, measured runtime.

The show processes cpu Command

The **show processes cpu** command displays information about the active processes in the router and their corresponding CPU utilization statistics. The following is a sample output of the **show processes cpu** command:

```
router#show processes cpu
CPU utilization for five seconds: 8%/4%; one minute: 6%; five minutes: 5%
  PID Runtime(uS)   Invoked  uSecs   5Sec   1Min   5Min  TTY Process
    1      384      32789    11     0.00% 0.00% 0.00% 0 Load Meter
    2     2752      1179    2334     0.73% 1.06% 0.29% 0 Exec
    3    318592     5273   60419     0.00% 0.15% 0.17% 0 Check heaps
    4         4         1     4000     0.00% 0.00% 0.00% 0 Pool Manager
    5     6472     6568    985     0.00% 0.00% 0.00% 0 ARP Input
    6     10892    9461   1151     0.00% 0.00% 0.00% 0 IP Input
    7     67388    53244   1265     0.16% 0.04% 0.02% 0 CDP Protocol
    8    145520   166455    874     0.40% 0.29% 0.29% 0 IP Background
    9     3356     1568   2140     0.08% 0.00% 0.00% 0 BOOTP Server
   10        32     5469     5     0.00% 0.00% 0.00% 0 Net Backgroun
   11     42256   163623    258     0.16% 0.02% 0.00% 0 Per-Second Jo
   12    189936   163623   1160     0.00% 0.04% 0.05% 0 Net Periodic
   13     3248     6351    511     0.00% 0.00% 0.00% 0 Net Input
   14        168    32790     5     0.00% 0.00% 0.00% 0 Compute load
   15    152408    2731   55806     0.98% 0.12% 0.07% 0 Per-minute Jo
```

The following table lists and describes the fields in the **show processes cpu** output:

--	--

Field	Description
CPU utilization for five seconds	CPU utilization for the last five seconds. The first number indicates the total, the second number indicates the percent of CPU time spent at the interrupt level.
one minute	CPU utilization for the last minute
five minutes	CPU utilization for the last five minutes
PID	The process ID
Runtime (uS)	CPU time the process has used, expressed in microseconds
Invoked	The number of times the process has been invoked
uSecs	Microseconds of CPU time for each process invocation
5Sec	CPU utilization by task in the last five seconds
1Min	CPU utilization by task in the last minute
5Min	CPU utilization by task in the last five minutes
TTY	Terminal that controls the process
Process	Name of the process. For more information, refer to The Processes section of this document.

Note: Because the network server has a 4000-microsecond clock resolution, runtimes are considered reliable only after a large number of invocations, or a reasonable, measured runtime.

The show processes cpu history Command

The **show processes cpu history** command displays in ASCII graphical form the total CPU usage on the router over a period of time: one minute, one hour, and 72 hours, displayed in increments of one second, one minute, and one hour, respectively. Maximum usage is measured and recorded every second; average usage is calculated on periods over one second.

The following is a sample output of the one-hour portion of the output:

```
router#show processes cpu history
```

```
!--- One minute output omitted
```

```
6665776865756676676666667667677676766666766767767666566667
6378016198993513709771991443732358689932740858269643922613
```

```
100
```

```

90
80      * *                * *      * * * *
70 * * * * * * * * * * * * * * * * * * * * * * * *
60 #####
50 #####
40 #####
30 #####
20 #####
10 #####
0.....5.....1.....1.....2.....2.....3.....3.....4.....4.....5.....5.....
      0      5      0      5      0      5      0      5      0      5      0      5

      CPU% per minute (last 60 minutes)
      * = maximum CPU%   # = average CPU%

```

!--- 72-hour output omitted

- The Y-axis of the graph is the CPU utilization.
- The X-axis of the graph is the increment within the period displayed in the graph; in this instance, it is the individual minutes during the previous hour. The most recent measurement is on the left end of the X-axis.
- The top two rows, read vertically, display the highest percentage of CPU utilization recorded during the increment.
- In the above example, the CPU utilization for the last minute recorded is 66 percent. The router may have reached 66 percent only once during that minute, or it may have reached 66 percent multiple times; the router records only the peak reached during the increment and the average over the course of that increment.

The show processes memory Command

The **show processes memory** command displays information about the active processes in the router and the corresponding memory used. The following is a sample output of the **show processes memory** command:

```

router>show processes memory
Total: 106206400, Used: 7479116, Free: 98727284
  PID TTY   Allocated      Freed   Holding   Getbufs   Retbufs Process
   0  0      81648        1808   6577644      0         0 *Init*
   0  0         572       123196     572         0         0 *Sched*
   0  0    10750692   3442000     5812    2813524     0 *Dead*
   1  0         276         276     3804         0         0 Load Meter
   2  0         228          0     7032         0         0 CEF Scanner
   3  0          0          0     6804         0         0 Check heaps
   4  0     18444          0    25248         0         0 Chunk Manager
   5  0         96          0     6900         0         0 Pool Manager
   6  0         276         276     6804         0         0 Timers
   7  0         276         276     6804         0         0 Serial Backgrou
   8  0         96          0     3900         0         0 OIR Handler
   9  0         96          0     6900         0         0 IPC Zone Manage
  10  0          0          0     6804         0         0 IPC Periodic Ti

```

```

    11  0      17728      484      11156      0      0 IPC Seat Manage
    12  0        288      136      7092      0      0 ARP Input
    ....
    90  0          0          0      6804      0      0 DHCPD Timer
    91  0        152          0      6956      0      0 DHCPD Database
                                7478196 Total

```

Note: Due to the way in which **show processes memory sorted** is implemented in certain Cisco routers and switches, some devices (such as the Cisco 7304) show the total value as the sum of the processor memory and IO memory, rather than the total of the processor memory as shown by **show processes memory**.

The table below lists the fields and descriptions in the **show processes memory** command output:

Field	Description
Total	Total amount of memory held
Used	Total amount of used memory
Free	Total amount of free memory
PID	Process ID
TTY	Terminal that controls the process
Allocated	Bytes of memory allocated by the process
Freed	Bytes of memory freed by the process, regardless of who originally allocated it
Holding	Amount of memory being held by a process. This parameter is useful for troubleshooting when a memory leak is suspected. If a process is seen to be consuming an increasingly larger amount of memory over a period of time, it is likely that a memory leak is occurring. For more information, see Memory Leak Bug .
Getbufs	Number of times the process has requested a packet buffer
Retbufs	Number of times the process has relinquished a packet buffer
Process	Process name. For more information, refer to The Processes section of this document.
Total	Total amount of memory held by all processes

The Processes

The table below explains the individual processes in the **show processes**, **show processes cpu**, and **show processes memory** outputs. This is not an exhaustive list.

Process	Explanation
ARP Input	Handles incoming Address Resolution Protocol (ARP) requests
BGP I/O	Handles reading, writing, and executing Border Gateway Protocol (BGP) messages
BGP Scanner	Scans the BGP and main routing tables to ensure consistency (this is a separate process since it can be quite time-consuming)
BGP Router	Main BGP process which starts when the configuration is fully loaded
BOOTP Server	The gateway's Bootstrap Protocol (BOOTP) server process
CallMIB Background	Deletes the call history if the call history ages out and gathers call information
CDP Protocol	<ul style="list-style-type: none"> • Main Cisco Discovery Protocol (CDP) - handles the initialization of CDP for each interface • If incoming packet, monitors the CDP queue and timers, then processes it • If timer event, sends update
Check heaps	Checks the memory every minute. It forces a reload if it finds processor corruption.
Compute load avgs	<ul style="list-style-type: none"> • Computes the five minute, exponentially-decayed output bit rate of each network interface, and the loading factor of the entire system. The load average is computed using the following formula: $\text{average} = ((\text{average} - \text{interval}) * \exp(-t/C)) + \text{interval}$ <p>where $t = 5$ seconds and $C = 5$ minutes, $\exp(-5/60*5) = .983$</p> • Computes the load of each interface (one by one), and checks the back-up interface's load (enables them or shuts them down according to the load).
Dead	Processes as a group that is now dead. See Troubleshooting Memory Problems for more details.

Exec	Handles console exec sessions; has a high priority
Hybridge Input	Handles incoming transparent bridge packets that slip through the fast paths
Init	System initialization
IP Background	<ul style="list-style-type: none"> Called upon when you change the encapsulation (for example, when an interface moves to a new state, an IP address changes, when you add a new Data Exchange Interface (DXI) map, or when some dialer timers expire) Does the periodic aging of the Internet Control Message Protocol (ICMP) redirect cache Modifies the routing table according to the status of the interfaces
IP Cache Ager	Ages the routing cache and heals stale recursive routes. The ager runs once every time interval (once a minute by default) and checks to make sure that a recursive routing change has not made the entry invalid. Another function of this ager is to make sure that the entire cache gets refreshed approximately every 20 minutes.
IP Input	Process-switched IP packets
IP-RT Background	Periodically revises the gateway of last resort and IP static routes. This process is called on demand, right after the static routes (which the gateway of last resort may depend on) have been revised.
ISDNMIB Background	Sends ISDN trap service and deletes the call queue if it ages out
ISDN Timers	Handles ISDN carrier timer events
Load Meter	<p>Computes the load average for the different processes every five seconds, and the five minute exponentially-decayed busy time. The load average is computed using the following formula:</p> $\text{average} = ((\text{average} - \text{interval}) * \exp(-t/C)) + \text{interval}, \text{ where:}$

	<ul style="list-style-type: none"> • $t = 5$ seconds and $C = 5$ minutes, $\exp(-5/(60*5)) = .983 \approx 1007/1024$ • $t = 5$ seconds and $C = 1$ minute, $\exp(-5/60) = .920 \approx 942/1024$
Multilink PPP out	Processes multilink packets that have been queued from fast-switching (outbound half fast-switching)
Net Background	<ul style="list-style-type: none"> • Performs a variety of network-related background tasks. These tasks must be performed quickly and may not block for any reason. The tasks that are called in the net_background process (for example, interface dethrottling) are time critical. • Executes the "Compute load avgs", "Per-minute Jobs", and "Net Input" processes • Handles interface throttling
Net Input	<ul style="list-style-type: none"> • Handles otherwise unknown packets. This is done at process level so that input queuing comes into play. If you operate at interrupt level, you could very easily lock up the router. • Handles some known protocols which you may decide should be offered to bridging. In this case, net_input either sends the packet to NULL, or bridges it.
Net Periodic	<p>Performs interface periodic functions every second such as:</p> <ul style="list-style-type: none"> • resetting the periodic counter • clearing the input error rate counter • checking serial lines for restarting from glitches • performing any periodic keep-alive functions • checking protocol routing table consistency • doing bridge state consistency checking

	<ul style="list-style-type: none"> • announcing line protocol up or down events
Per-minute Jobs	<p>Performs the following tasks once a minute:</p> <ul style="list-style-type: none"> • analyzes stack usage • announces low stacks • executes registered one_minute jobs
Per-second Jobs	Performs a variety of tasks every second; executes registered one_second jobs
Pool Manager	Manager process for managing growth and discarding requests from dynamic pools at the interrupt level
PPP Manager	<ul style="list-style-type: none"> • Manages all PPP Finite State Machine (FSM) operations by processing PPP input packets and interface transitions • Monitors the PPP queue and the PPP timers (negotiation, authentication, idle, and others) <p>Note: By serializing events that might be detected which interrupt routines in other processes, many common bugs can be avoided.</p>
OSPF Router	Main Open Shortest Path First (OSPF) process
OSPF Hello	The OSPF process which receives hello
Sched	The Scheduler
Serial Background	Watches events and branches to the correct service routine for each expired event (mainly reset of interfaces)
Spanning Tree	<ul style="list-style-type: none"> • Executes the Spanning Tree Protocol (STP), a single process that handles the multiple spanning tree algorithm • Monitors the STP Queue: <ul style="list-style-type: none"> ○ Process incoming STP packets • Monitors the STP timers: <ul style="list-style-type: none"> ○ Hello timer

	<ul style="list-style-type: none"> ○ Topology change timers ○ Digital Equipment Corporation (DEC) short age out timer ○ Forward delay timer ○ Message age timer
Tbridge Monitor	<ul style="list-style-type: none"> • Dispatches "interesting packets" to the appropriate handler ("interesting traffic" is Cisco Group Management Protocol (CGMP), Internet Group Management Protocol (IGMP), OSPF packets [multicasts]) • Monitors multicast timers which check station entry age-outs and circuit group active circuits
TCP Driver	<p>Handles the sending of packet data over a Transmission Control Protocol (TCP) connection. It includes opening or closing connections, or dropping packets when queues are full.</p> <p>Remote Source-Route Bridging (RSRB), serial tunneling (STUN), X.25 switching, X.25 over TCP/IP (XOT), Data-link Switching (DLSW), translation, and all TCP connections starting or ending at the router currently use TCP Driver.</p>
TCP Timer	Handles retransmission of timeout packets
Virtual exec	Handles virtual type terminal (vty) lines (for example, Telnet sessions on the router).

It should be noted that high CPU utilization, by itself, does not indicate a problem with your device. For example, on your 7500 VIP, if the queueing strategy of the outbound interface is First In First Out (FIFO) and the outbound interface is congested, Rx-side buffering starts, that is, the inbound VIP starts buffering packets. Now, if Rx-side buffering is taking place, a [VIP CPU utilization of 99 percent](#) is seen. This is normal and by itself is not an indication of overloading. If the VIP receives something more important to do (for example, another packet to switch) the operation is not be affected by the high CPU. As a rough guideline, only consistently high CPU utilization over an extended period of time indicates a problem. Further, these commands are more relevant in the process of figuring out what went wrong rather than being indicators that all is not fine.

Related Information

- [Troubleshooting High CPU Utilization on Cisco Routers](#)
- [Troubleshooting Memory Problems](#)
- [Command Lookup Tool](#) ([registered](#) customers only)
- [Output Interpreter Tool](#) ([registered](#) customers only)
- [Technical Support - Cisco Systems](#)

Home	How to Buy	Login	Profile	Feedback	Site Map	Help
----------------------	----------------------------	-----------------------	-------------------------	--------------------------	--------------------------	----------------------

[Contacts & Feedback](#) | [Help](#) | [Site Map](#)

© 2008 - 2009 Cisco Systems, Inc. All rights reserved. [Terms & Conditions](#) | [Privacy Statement](#) | [Cookie Policy](#) | [Trademarks of Cisco Systems, Inc.](#)