

# Process Health Monitoring

This chapter describes how to manage and monitor the health of various components of your router. It contains the following sections:


- Monitoring Control Plane Resources, on page 1
- Monitoring Hardware Using Alarms, on page 10
- Network Management System Alerts a Network Administrator when an Alarm is Reported Through SNMP, on page 11


# Monitoring Control Plane Resources

The following sections explain the details of memory and CPU monitoring from the perspective of the Cisco IOS process and the overall control plane:

## Avoiding Problems Through Regular Monitoring

Processes should provide monitoring and notification of their status/health to ensure correct operation. When a process fails, a syslog error message is displayed and either the process is restarted or the router is rebooted. A syslog error message is displayed when a monitor detects that a process is stuck or has crashed. If the process can be restarted, it is restarted; else, the router is restarted.

Monitoring system resources enables you to detect potential problems before they occur, thus avoiding outages. It also establishes a baseline for a normal system load. You can use this information as a basis for comparison, when you upgrade hardware or software to see if the upgrade has affected resource usage.

## Cisco IOS Process Resources

You can view CPU utilization statistics on active processes and see the amount of memory being used in these processes using the **show memory** command and the **show process cpu** command. These commands provide a representation of memory and CPU utilization from the perspective of only the Cisco IOS process; they do not include information for resources on the entire platform. When the **show memory** command is used in a system with 4 GB RAM running a single Cisco IOS process, the following memory usage is displayed:

```
Router# show memory
Tracekey : 1#b93c0f1c0d5d16ddc3ab8e54342a8dd5

               Head    Total(b)     Used(b)     Free(b)   Lowest(b)  Largest(b)
Processor  7F5F358048   1997625144   290200588   1707424556   487419128   1509949348
```

```
reserve P  7F5F3580A0      102404          92      102312      102312      102312
lsmpi_io  7F5D9901A8     6295128     6294304         824         824         412
Dynamic heap limit(MB) 1440      Use(MB) 0

          Processor memory

Address      Bytes      Prev       Next    Ref   PrevF     NextF          what
   Alloc PC
7F5F358048 0000102408 00000000 7F5F3710A8 001  -------- -------- *Init*
:555F22A000+5E5691C
7F5F3710A8 0000000056 7F5F358048 7F5F371138 001  -------- -------- *Init*
:555F22A000+5E56938
7F5F371138 0000008224 7F5F3710A8 7F5F3731B0 001  -------- -------- *Init*
:555F22A000+5E56958
7F5F3731B0 0000000296 7F5F371138 7F5F373330 001  -------- -------- *Init*
:555F22A000+86B9178
7F5F373330 0000000568 7F5F3731B0 7F5F3735C0 001  -------- -------- *Init*
:555F22A000+86BEE5C
7F5F3735C0 0000032776 7F5F373330 7F5F37B620 001  -------- -------- Managed Chunk Q
:555F22A000+86AAC38
7F5F37B620 0000000056 7F5F3735C0 7F5F37B6B0 001  -------- -------- *Init*
:555F22A000+5EA29DC
7F5F37B6B0 0000032776 7F5F37B620 7F5F383710 001  -------- -------- Queue Pair - Q
:555F22A000+86D3A28
7F5F383710 0000012808 7F5F37B6B0 7F5F386970 001  -------- -------- *Init*
:555F22A000+11EFF930
7F5F386970 0000032776 7F5F383710 7F5F38E9D0 001  -------- -------- List Elements
:555F22A000+86798AC
7F5F38E9D0 0000032776 7F5F386970 7F5F396A30 001  -------- -------- List Headers
:555F22A000+86798EC
7F5F396A30 0000032776 7F5F38E9D0 7F5F39EA90 001  -------- -------- IOSXE Process S
:555F22A000+984FEE0
7F5F39EA90 0000032776 7F5F396A30 7F5F3A6AF0 001  -------- -------- IOSXE Queue Pro
:555F22A000+984FF24
7F5F3A6AF0 0000065544 7F5F39EA90 7F5F3B6B50 001  -------- -------- IOSXE Queue Bal
:555F22A000+984FF68
7F5F3B6B50 0000000328 7F5F3A6AF0 7F5F3B6CF0 001  -------- -------- *Init*
:555F22A000+11EF88AC
7F5F3B6CF0 0000000328 7F5F3B6B50 7F5F3B6E90 001  -------- -------- *Init*
:555F22A000+11EF88AC
7F5F3B6E90 0000000192 7F5F3B6CF0 7F5F3B6FA8 001  -------- -------- SDB String
:555F22A000+8629F60
7F5F3B6FA8 0000036872 7F5F3B6E90 7F5F3C0008 001  -------- -------- *Init*
:555F22A000+98482F4
7F5F3C0008 0000010008 7F5F3B6FA8 7F5F3C2778 001  -------- -------- Platform VM Pag
:555F22A000+986FC68
7F5F3C2778 0000002008 7F5F3C0008 7F5F3C2FA8 001  -------- -------- *Init*
iosd_crb_crankshaft_unix:7F83050000+6D850
7F5F3C2FA8 0000200712 7F5F3C2778 7F5F3F4008 001  -------- -------- Interrupt Stack
:555F22A000+98482F4
7F5F3F4008 0000000328 7F5F3C2FA8 7F5F3F41A8 001  -------- -------- *Init*
:555F22A000+11EF88AC
7F5F3F41A8 0000002008 7F5F3F4008 7F5F3F49D8 001  -------- -------- Watcher Message
:555F22A000+86DE21C
7F5F3F49D8 0000000360 7F5F3F41A8 7F5F3F4B98 001  -------- -------- Process Events
:555F22A000+86D94A4
7F5F3F4B98 0000000328 7F5F3F49D8 7F5F3F4D38 001  -------- -------- *Init*
:555F22A000+11EF88AC
7F5F3F4D38 0000000184 7F5F3F4B98 7F5F3F4E48 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F3F4E48 0000000264 7F5F3F4D38 7F5F3F4FA8 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F3F4FA8 0000036872 7F5F3F4E48 7F5F3FE008 001  -------- -------- *Init*
:555F22A000+98482F4
```

```
7F5F3FE008 0000000328 7F5F3F4FA8 7F5F3FE1A8 001  -------- -------- *Init*
:555F22A000+11EF88AC
7F5F3FE1A8 0000001504 7F5F3FE008 7F5F3FE7E0 001  -------- -------- Reg Function Se
:555F22A000+868AE50
7F5F3FE7E0 0000001504 7F5F3FE1A8 7F5F3FEE18 001  -------- -------- Reg Function Se
:555F22A000+868AEE0
7F5F3FEE18 0000000064 7F5F3FE7E0 7F5F3FEEB0 001  -------- -------- Parser Linkage
:555F22A000+5D98838
7F5F3FEEB0 0000000160 7F5F3FEE18 7F5F3FEFA8 001  -------- -------- *Init*
:555F22A000+530A17C
7F5F3FEFA8 0000036872 7F5F3FEEB0 7F5F408008 001  -------- -------- *Init*
:555F22A000+98482F4
7F5F408008 0000000328 7F5F3FEFA8 7F5F4081A8 001  -------- -------- *Init*
:555F22A000+11EF88AC
7F5F4081A8 0000000760 7F5F408008 7F5F4084F8 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F4084F8 0000000576 7F5F4081A8 7F5F408790 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F408790 0000000400 7F5F4084F8 7F5F408978 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F408978 0000000488 7F5F408790 7F5F408BB8 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F408BB8 0000000920 7F5F408978 7F5F408FA8 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F408FA8 0000200712 7F5F408BB8 7F5F43A008 001  -------- -------- Interrupt Stack
:555F22A000+98482F4
7F5F43A008 0000000968 7F5F408FA8 7F5F43A428 001  -------- -------- *Init*
iosd_crb_crankshaft_unix:7F83050000+378C0
7F5F43A428 0000000280 7F5F43A008 7F5F43A598 001  -------- -------- *Init*
:555F22A000+A3CE294
7F5F43A598 0000000896 7F5F43A428 7F5F43A970 001  -------- -------- Watched Message
:555F22A000+86DE1E8
7F5F43A970 0000001320 7F5F43A598 7F5F43AEF0 001  -------- -------- Process
:555F22A000+86E50BC
7F5F43AEF0 0000000096 7F5F43A970 7F5F43AFA8 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F43AFA8 0000036872 7F5F43AEF0 7F5F444008 001  -------- -------- *Init*
:555F22A000+98482F4
7F5F444008 0000003008 7F5F43AFA8 7F5F444C20 001  -------- -------- Watched Semapho
:555F22A000+86DE180
7F5F444C20 0000000360 7F5F444008 7F5F444DE0 001  -------- -------- Process Events
:555F22A000+86D94A4
7F5F444DE0 0000000368 7F5F444C20 7F5F444FA8 001  -------- -------- *Init*
:555F22A000+11EF88AC
7F5F444FA8 0000200712 7F5F444DE0 7F5F476008 001  -------- -------- Interrupt Stack
:555F22A000+98482F4
7F5F476008 0000002336 7F5F444FA8 7F5F476980 001  -------- -------- Process Array
:555F22A000+86E4F94
7F5F476980 0000000184 7F5F476008 7F5F476A90 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F476A90 0000000184 7F5F476980 7F5F476BA0 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F476BA0 0000000184 7F5F476A90 7F5F476CB0 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F476CB0 0000000184 7F5F476BA0 7F5F476DC0 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F476DC0 0000000184 7F5F476CB0 7F5F476ED0 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F476ED0 0000000128 7F5F476DC0 7F5F476FA8 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F476FA8 0000036872 7F5F476ED0 7F5F480008 001  -------- -------- *Init*
:555F22A000+98482F4
7F5F480008 0000001320 7F5F476FA8 7F5F480588 001  -------- -------- Process
:555F22A000+86E50BC
```

```
7F5F480588 0000000184 7F5F480008 7F5F480698 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F480698 0000000184 7F5F480588 7F5F4807A8 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F4807A8 0000000184 7F5F480698 7F5F4808B8 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F4808B8 0000000184 7F5F4807A8 7F5F4809C8 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F4809C8 0000000184 7F5F4808B8 7F5F480AD8 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F480AD8 0000000184 7F5F4809C8 7F5F480BE8 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F480BE8 0000000184 7F5F480AD8 7F5F480CF8 001  -------- -------- *Init*
:555F22A000+86C945C
7F5F480CF8 0000000096 7F5F480BE8 7F5F480DB0 001  -------- -------- *Init*
:555F22A000+86C940C
7F5F480DB0 0000000096 7F5F480CF8 7F5F480E68 001  -------- -------- Init
:555F22A000+862A110
7F5F480E68 0000000232 7F5F480DB0 7F5F480FA8 001  -------- -------- *Init*
:555F22A000+60E2660
7F5F480FA8 0000200712 7F5F480E68 7F5F4B2008 001  -------- -------- Interrupt Stack
:555F22A000+98482F4
7F5F4B2008 0000003008 7F5F480FA8 7F5F4B2C20 001  -------- -------- Reg Function Li
:555F22A000+868AE80
7F5F4B2C20 0000000064 7F5F4B2008 7F5F4B2CB8 001  -------- -------- Parser Linkage
:555F22A000+5D98838
7F5F4B2CB8 0000000064 7F5F4B2C20 7F5F4B2D50 001  -------- -------- Parser Linkage
:555F22A000+5D98A78
7F5F4B2D50 0000000080 7F5F4B2CB8 7F5F4B2DF8 001  -------- -------- Init
:555F22A000+5E87AC0
7F5F4B2DF8 0000000200 7F5F4B2D50 7F5F4B2F18 001  -------- -------- Init
:555F22A000+5E87AC0
7F5F4B2F18 0000000056 7F5F4B2DF8 7F5F4B2FA8 001  -------- -------- Init
:555F22A000+54DD60C
7F5F4B2FA8 0000036872 7F5F4B2F18 7F5F4BC008 001  -------- -------- *Init*
:555F22A000+98482F4
7F5F4BC008 0000001504 7F5F4B2FA8 7F5F4BC640 001  -------- -------- Reg Function Ca
:555F22A000+868AF10
7F5F4BC640 0000000224 7F5F4BC008 7F5F4BC778 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F4BC778 0000000224 7F5F4BC640 7F5F4BC8B0 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F4BC8B0 0000000328 7F5F4BC778 7F5F4BCA50 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F4BCA50 0000000328 7F5F4BC8B0 7F5F4BCBF0 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F4BCBF0 0000000328 7F5F4BCA50 7F5F4BCD90 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F4BCD90 0000000216 7F5F4BCBF0 7F5F4BCEC0 001  -------- -------- Init
:555F22A000+5E87AC0
7F5F4BCEC0 0000000144 7F5F4BCD90 7F5F4BCFA8 001  -------- -------- Init
:555F22A000+530F7A4
7F5F4BCFA8 0000200712 7F5F4BCEC0 7F5F4EE008 001  -------- -------- Interrupt Stack
:555F22A000+98482F4
7F5F4EE008 0000006888 7F5F4BCFA8 7F5F4EFB48 001  -------- -------- TTY data
:555F22A000+85C9E44
7F5F4EFB48 0000004104 7F5F4EE008 7F5F4F0BA8 001  -------- -------- TTY Input Buf
:555F22A000+85CBD60
7F5F4F0BA8 0000004104 7F5F4EFB48 7F5F4F1C08 001  -------- -------- TTY Output Buf
:555F22A000+85CBDB0
7F5F4F1C08 0000024584 7F5F4F0BA8 7F5F4F7C68 001  -------- -------- proc_hist_lmt_v
:555F22A000+BA3B718
7F5F4F7C68 0000008200 7F5F4F1C08 7F5F4F9CC8 001  -------- -------- proc_hist_lmt_v
:555F22A000+BA3B74C
```

```
7F5F4F9CC8 0000008200 7F5F4F7C68 7F5F4FBD28 001  -------- -------- proc_hist_lmt_v
:555F22A000+BA3B784
7F5F4FBD28 0000005008 7F5F4F9CC8 7F5F4FD110 001  -------- -------- messages
:555F22A000+86DE040
7F5F4FD110 0000005008 7F5F4FBD28 7F5F4FE4F8 001  -------- -------- Watched message
:555F22A000+86DE078
7F5F4FE4F8 0000020008 7F5F4FD110 7F5F503378 001  -------- -------- Watched Queue
:555F22A000+86DE0AC
7F5F503378 0000065544 7F5F4FE4F8 7F5F5133D8 001  -------- -------- Watched Queue I
:555F22A000+86DE0E4
7F5F5133D8 0000020008 7F5F503378 7F5F518258 001  -------- -------- Watched Boolean
:555F22A000+86DE118
7F5F518258 0000020008 7F5F5133D8 7F5F51D0D8 001  -------- -------- Watched Bitfiel
:555F22A000+86DE14C
7F5F51D0D8 0000010008 7F5F518258 7F5F51F848 001  -------- -------- Watcher Info
:555F22A000+86DE1B4
7F5F51F848 0000010008 7F5F51D0D8 7F5F521FB8 001  -------- -------- Read/Write Lock
:555F22A000+86DE250
7F5F521FB8 0000001232 7F5F51F848 7F5F5224E0 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F5224E0 0000000064 7F5F521FB8 7F5F522578 001  -------- -------- Init
:555F22A000+8D8F3A0
7F5F522578 0000002008 7F5F5224E0 7F5F522DA8 001  -------- -------- Injected msg CB
:555F22A000+ACBBF08
7F5F522DA8 0000000064 7F5F522578 7F5F522E40 001  -------- -------- SDB String
:555F22A000+8629F60
7F5F522E40 0000000056 7F5F522DA8 7F5F522ED0 001  -------- -------- *Init*
:555F22A000+5EA29DC
7F5F522ED0 0000000128 7F5F522E40 7F5F522FA8 001  -------- -------- XOS_MEM_XDT
:555F22A000+894FE1C
7F5F522FA8 0000028104 7F5F522ED0 7F5F529DC8 001  -------- -------- Process Stack
:555F22A000+98482F4
7F5F529DC8 0000000096 7F5F522FA8 7F5F529E80 001  -------- -------- Init
:555F22A000+862A110
7F5F529E80 0000000208 7F5F529DC8 7F5F529FA8 001  -------- -------- *Init*
:555F22A000+86C8D58
7F5F529FA8 0000016104 7F5F529E80 7F5F52DEE8 001  -------- -------- Process Stack
:555F22A000+98482F4
7F5F52DEE8 0000032776 7F5F529FA8 7F5F535F48 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F535F48 0000032776 7F5F52DEE8 7F5F53DFA8 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F53DFA8 0000032776 7F5F535F48 7F5F546008 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F546008 0000032776 7F5F53DFA8 7F5F54E068 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F54E068 0000032776 7F5F546008 7F5F5560C8 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F5560C8 0000032776 7F5F54E068 7F5F55E128 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F55E128 0000032776 7F5F5560C8 7F5F566188 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F566188 0000032776 7F5F55E128 7F5F56E1E8 001  -------- -------- List Elements
:555F22A000+8679DCC
7F5F56E1E8 0000005008 7F5F566188 7F5F56F5D0 001  -------- -------- Reg Function 12
:555F22A000+868AE1C
7F5F56F5D0 0000020008 7F5F56E1E8 7F5F574450 001  -------- -------- Subsys Malloc I
:555F22A000+86875C8
7F5F574450 0000001176 7F5F56F5D0 7F5F574940 001  -------- -------- SPA variable ms
:555F22A000+B9B3700
7F5F574940 0000000920 7F5F574450 7F5F574D30 001  -------- -------- SAMsgThread
:555F22A000+54E49DC
7F5F574D30 0000000064 7F5F574940 7F5F574DC8 001  -------- -------- Parser Linkage
:555F22A000+5D98A78
```

```
7F5F574DC8 0000000064 7F5F574D30 7F5F574E60 001  -------- -------- Parser Linkage
:555F22A000+5D98838
7F5F574E60 0000000064 7F5F574DC8 7F5F574EF8 001  -------- -------- Parser Linkage
:555F22A000+5D98A78
7F5F574EF8 0000000088 7F5F574E60 7F5F574FA8 001  -------- -------- Init
:555F22A000+54DD60C
7F5F574FA8 0000000968 7F5F574EF8 7F5F5753C8 001  -------- -------- Crypto CA
:555F22A000+8DC26C0
7F5F5753C8 0000000216 7F5F574FA8 7F5F5754F8 001  -------- -------- Crypto CA
:555F22A000+8DC2588
7F5F5754F8 0000002648 7F5F5753C8 7F5F575FA8 000  7F609C3C28 7F69C82D38 (coalesced)
:555F22A000+52BC2B8
7F5F575FA8 0000028104 7F5F5754F8 7F5F57CDC8 001  -------- -------- Process Stack
:555F22A000+98482F4
7F5F57CDC8 0000013112 7F5F575FA8 7F5F580158 001  -------- -------- SAMsgThread
:555F22A000+5360944
7F5F580158 0000004728 7F5F57CDC8 7F5F581428 001  -------- -------- *Packet Data*
:555F22A000+AF448CC
7F5F581428 0000000968 7F5F580158 7F5F581848 001  -------- -------- Exec
:555F22A000+5D9C004
7F5F581848 0000000600 7F5F581428 7F5F581AF8 001  -------- -------- Ether OAM subbl
:555F22A000+962A100
7F5F581AF8 0000000056 7F5F581848 7F5F581B88 000  7F69F8B620 7F6A906D40 (fragment)
:555F22A000+962A100
7F5F581B88 0000005008 7F5F581AF8 7F5F582F70 001  -------- -------- Reg Function iL
:555F22A000+868AEB0
7F5F582F70 0000065544 7F5F581B88 7F5F592FD0 001  -------- -------- Registry Call S
:555F22A000+8690EFC
7F5F592FD0 0000002584 7F5F582F70 7F5F593A40 001  -------- -------- *Init*
:555F22A000+868BC18
7F5F593A40 0000002080 7F5F592FD0 7F5F5942B8 001  -------- -------- *Init*
:555F22A000+ACB41D8
7F5F5942B8 0000002600 7F5F593A40 7F5F594D38 001  -------- -------- *Init*
:555F22A000+ACB41D8
7F5F594D38 0000020008 7F5F5942B8 7F5F599BB8 001  -------- -------- Peer uid cb chu
:555F22A000+ACBBE98
```

The **show process cpu** command displays Cisco IOS CPU utilization average:

```
Router# show process cpu
CPU utilization for five seconds: 0%/0%; one minute: 0%; five minutes: 0%
PID Runtime(ms)     Invoked      uSecs   5Sec   1Min   5Min TTY Process
   1           8          31        258  0.00%  0.00%  0.00%   0 Chunk Manager
   2           8       10141          0  0.00%  0.00%  0.00%   0 Load Meter
   3           0           1          0  0.00%  0.00%  0.00%   0 PKI Trustpool
   4           0           1          0  0.00%  0.00%  0.00%   0 Retransmission o
   5           0           1          0  0.00%  0.00%  0.00%   0 IPC ISSU Dispatc
   6          28          13       2153  0.00%  0.00%  0.00%   0 RF Slave Main Th
   7           0           1          0  0.00%  0.00%  0.00%   0 EDDRI_MAIN
   8           0           1          0  0.00%  0.00%  0.00%   0 RO Notify Timers
   9       40648        7844       5182  0.00%  0.06%  0.05%   0 Check heaps
  10          16         845         18  0.00%  0.00%  0.00%   0 Pool Manager
  11           0           1          0  0.00%  0.00%  0.00%   0 DiscardQ Backgro
  12           0           2          0  0.00%  0.00%  0.00%   0 Timers
  13           0         176          0  0.00%  0.00%  0.00%   0 WATCH_AFS
  14           0           1          0  0.00%  0.00%  0.00%   0 MEMLEAK PROCESS
  15           0           1          0  0.00%  0.00%  0.00%   0 ARP Input
  16           4       52892          0  0.00%  0.00%  0.00%   0 ARP Background
  17           0           2          0  0.00%  0.00%  0.00%   0 ATM Idle Timer
  18           0           1          0  0.00%  0.00%  0.00%   0 ATM ASYNC PROC
  19           0           1          0  0.00%  0.00%  0.00%   0 CEF MIB API
```

```
  20           0           1           0  0.00%  0.00%  0.00%   0 AAA_SERVER_DEADT
  21           0           1           0  0.00%  0.00%  0.00%   0 Policy Manager
  22           0           2           0  0.00%  0.00%  0.00%   0 DDR Timers
  23          16          10        1600  0.00%  0.00%  0.00%   0 Entity MIB API
  24         120          27        4444  0.00%  0.00%  0.00%   0 PrstVbl
  25           0           2           0  0.00%  0.00%  0.00%   0 Serial Backgroun
  26           0           1           0  0.00%  0.00%  0.00%   0 RMI RM Notify Wa
  27           0           2           0  0.00%  0.00%  0.00%   0 ATM AutoVC Perio
  28           0           2           0  0.00%  0.00%  0.00%   0 ATM VC Auto Crea
  29           4       25354           0  0.00%  0.00%  0.00%   0 IOSXE heartbeat
  30           0          86           0  0.00%  0.00%  0.00%   0 Btrace time base
  31           0          10           0  0.00%  0.00%  0.00%   0 DB Lock Manager
  32           4       50697           0  0.00%  0.00%  0.00%   0 GraphIt
  33           0           1           0  0.00%  0.00%  0.00%   0 DB Notification
  34           0           1           0  0.00%  0.00%  0.00%   0 IPC Apps Task
  35           0           1           0  0.00%  0.00%  0.00%   0 ifIndex Receive
  36           0       10142           0  0.00%  0.00%  0.00%   0 IPC Event Notifi
  37           0       49518           0  0.00%  0.00%  0.00%   0 IPC Mcast Pendin
  38           0           1           0  0.00%  0.00%  0.00%   0 Platform appsess
  39           0         846           0  0.00%  0.00%  0.00%   0 IPC Dynamic Cach
  40           0       10142           0  0.00%  0.00%  0.00%   0 IPC Service NonC
  41           0           1           0  0.00%  0.00%  0.00%   0 IPC Zone Manager
  42           8       49518           0  0.00%  0.00%  0.00%   0 IPC Periodic Tim
  43           0       49518           0  0.00%  0.00%  0.00%   0 IPC Deferred Por
  44           0           1           0  0.00%  0.00%  0.00%   0 IPC Process leve
  45           0           1           0  0.00%  0.00%  0.00%   0 IPC Seat Manager
```

**show process cpu platform sorted**

```
CPU utilization for five seconds:  9%, one minute: 10%, five minutes: 10%
Core 0: CPU utilization for five seconds:  3%, one minute:  4%, five minutes:  4%
Core 1: CPU utilization for five seconds:  4%, one minute:  4%, five minutes:  4%
Core 2: CPU utilization for five seconds:  2%, one minute:  2%, five minutes:  2%
Core 3: CPU utilization for five seconds: 38%, one minute: 38%, five minutes: 38%
   Pid    PPid    5Sec    1Min    5Min  Status        Size  Name
--------------------------------------------------------------------------------
18700   18679     44%     44%     44%  S           235192  qfp-ucode-avent
  5226    5216      2%      3%      3%  S           697124  linux_iosd-imag
24238   24231      1%      1%      1%  S             8288  ngiolite
18412   18398      1%      1%      1%  S           135696  fman_fp_image
30574       2      0%      0%      0%  S                0  kworker/0:3
24231   16366      0%      0%      0%  S             2460  pman
24025   23998      0%      0%      0%  S             3392  nginx
24024   23998      0%      0%      0%  S             4300  nginx
23998   23990      0%      0%      0%  S             7944  nginx
23990    4251      0%      0%      0%  S             2460  pman
23605   23599      0%      0%      0%  S             7988  ngiolite
23599   16366      0%      0%      0%  S             2464  pman
23330   23309      0%      0%      0%  S            39600  iomd
23309   16366      0%      0%      0%  S             2460  pman
21981   15002      0%      0%      0%  S              416  sleep
21935   21906      0%      0%      0%  S            38680  iomd
21906   16366      0%      0%      0%  S             2460  pman
21830   13884      0%      0%      0%  S              416  sleep
21694       2      0%      0%      0%  S                0  kworker/0:0
21042       2      0%      0%      0%  S                0  kworker/u8:4
21041       2      0%      0%      0%  S                0  kworker/u8:3
21040       2      0%      0%      0%  S                0  kworker/u8:0
20737       2      0%      0%      0%  S                0  kworker/1:3
20731       2      0%      0%      0%  S                0  SarIosdMond
20574   20548      0%      0%      0%  S            12004  btman
20548   16921      0%      0%      0%  S             2432  pman
20180   20146      0%      0%      0%  S            17428  cman_fp
20146   16921      0%      0%      0%  S             2432  pman
20135   20105      0%      0%      0%  S            12228  btman
```

```
20105   16366      0%      0%      0%  S             2432  pman
20093       2      0%      0%      0%  S                0  kworker/0:1
19819   19796      0%      0%      0%  S           107992  cpp_cp_svr
19796   16921      0%      0%      0%  S             2436  pman
19549   19528      0%      0%      0%  S            18948  cmcc
19541   19512      0%      0%      0%  S            35124  cpp_driver
19528   16366      0%      0%      0%  S             2432  pman
19512   16921      0%      0%      0%  S             2432  pman
19280   19243      0%      0%      0%  S            38708  cpp_ha_top_leve
19243   16921      0%      0%      0%  S             2436  pman
18966   18959      0%      0%      0%  S            49916  cpp_sp_svr
18959   16921      0%      0%      0%  S             2436  pman
18877   18862      0%      0%      0%  S             5780  pttcd
18862    4251      0%      0%      0%  S             2432  pman
18856       2      0%      0%      0%  S                0  kworker/1:1
18711   18691      0%      0%      0%  S            10352  hman
18691   16366      0%      0%      0%  S             2432  pman
18679   16921      0%      0%      0%  S             2436  pman
18517   18495      0%      0%      0%  S            60720  pubd
18495    4251      0%      0%      0%  S             2432  pman
18398   16921      0%      0%      0%  S             2432  pman
18211       2      0%      0%      0%  S                0  kworker/0:2
18140   18120      0%      0%      0%  S            10352  hman
18120   16921      0%      0%      0%  S             2436  pman
17448   16921      0%      0%      0%  S              428  inotifywait
17253       2      0%      0%      0%  S                0  kworker/1:0
17204       1      0%      0%      0%  S             2064  rotee
16921       1      0%      0%      0%  S             5512  pvp.sh
16744   16366      0%      0%      0%  S              428  inotifywait
16582       1      0%      0%      0%  S             2060  rotee
16366       1      0%      0%      0%  S             5512  pvp.sh
15627       2      0%      0%      0%  S                0  bioset
15626       2      0%      0%      0%  S                0  dmcrypt_write
15625       2      0%      0%      0%  S                0  kcryptd
15624       2      0%      0%      0%  S                0  kcryptd_io
15623       2      0%      0%      0%  S                0  bioset
15621       2      0%      0%      0%  S                0  kdmflush
15618       2      0%      0%      0%  S                0  loop1
15563       2      0%      0%      0%  S                0  ext4-rsv-conver
15562       2      0%      0%      0%  S                0  jbd2/mmcblk0p1-
15023       2      0%      0%      0%  S                0  kworker/u8:1
15002   14992      0%      0%      0%  S             1440  sort_files_by_i
14992    4251      0%      0%      0%  S             2416  pman
13884   13874      0%      0%      0%  S             2816  flash_check.sh
```

# Overall Control Plane Resources

Control plane memory and CPU utilization on each control processor allows you to keep a tab on the overall control plane resources. You can use the **show platform software status control-processor brief** command (summary view) or the **show platform software status control-processor command** (detailed view) to view control plane memory and CPU utilization information.

All control processors should show status, Healthy. Other possible status values are Warning and Critical. Warning indicates that the router is operational, but that the operating level should be reviewed. Critical implies that the router is nearing failure.

If you see a Warning or Critical status, take the following actions:

- Reduce the static and dynamic loads on the system by reducing the number of elements in the configuration or by limiting the capacity for dynamic services.

- Reduce the number of routes and adjacencies, limit the number of ACLs and other rules, reduce the number of VLANs, and so on.

The following sections describe the fields in the **show platform software status control-processor** command output.

### Load Average

Load average represents the process queue or process contention for CPU resources. For example, on a single-core processor, an instantaneous load of 7 would mean that seven processes are ready to run, one of which is currently running. On a dual-core processor, a load of 7 would mean that seven processes are ready to run, two of which are currently running.

### Memory Utilization

Memory utilization is represented by the following fields:

- Total—Total system memory
- Used—Consumed memory
- Free—Available memory
- Committed—Virtual memory committed to processes

### CPU Utilization

CPU utilization is an indication of the percentage of time the CPU is busy, and is represented by the following fields:

- CPU—Allocated processor
- User—Non-Linux kernel processes
- System—Linux kernel process
- Nice—Low-priority processes
- Idle—Percentage of time the CPU was inactive
- IRQ—Interrupts
- SIRQ—System Interrupts
- IOwait—Percentage of time CPU was waiting for I/O

### Example: show platform software status control-processor Command

The following are some examples of using the **show platform software status control-processor** command:

```
Router# show platform software status control-processor
RP0: online, statistics updated 10 seconds ago
Load Average: healthy
  1-Min: 1.28, status: healthy, under 5.00
  5-Min: 0.74, status: healthy, under 5.00
  15-Min: 0.78, status: healthy, under 5.00
```

```
Memory (kb): healthy
  Total: 8154204
  Used: 2282364 (28%), status: healthy
  Free: 5871840 (72%)
  Committed: 2025108 (25%), under 90%
Per-core Statistics
CPU0: CPU Utilization (percentage of time spent)
  User:  2.46, System:  5.53, Nice:  0.00, Idle: 90.87
  IRQ:  0.82, SIRQ:  0.20, IOwait:  0.10
CPU1: CPU Utilization (percentage of time spent)
  User:  2.24, System:  5.91, Nice:  0.00, Idle: 90.91
  IRQ:  0.71, SIRQ:  0.20, IOwait:  0.00
CPU2: CPU Utilization (percentage of time spent)
  User:  0.50, System:  1.82, Nice:  0.00, Idle: 97.16
  IRQ:  0.50, SIRQ:  0.00, IOwait:  0.00
CPU3: CPU Utilization (percentage of time spent)
  User: 13.03, System: 12.88, Nice:  0.00, Idle: 62.51
  IRQ: 11.55, SIRQ:  0.00, IOwait:  0.00


Router# show platform software status control-processor brief
Load Average
Slot  Status  1-Min  5-Min 15-Min
  RP0 Healthy   0.99   0.72   0.77

Memory (kB)
Slot  Status    Total     Used (Pct)     Free (Pct) Committed (Pct)
  RP0 Healthy  8154204  2281012 (28%)  5873192 (72%)   2032232 (25%)

CPU Utilization
Slot  CPU   User System   Nice   Idle    IRQ   SIRQ IOwait
  RP0    0   1.02   1.84   0.00  96.30   0.61   0.10   0.10
         1   0.72   1.85   0.00  96.60   0.61   0.20   0.00
         2   0.50   1.62   0.00  97.25   0.60   0.00   0.00
         3  11.78  14.28   0.00  62.44  11.34   0.14   0.00


Boot Flash Disk Monitoring

*Aug 24 07:48:31.088 GMT: %FLASH_CHECK-3-DISK_QUOTA: R0/0: flash_check: Flash disk quota
exceeded
[free space is 83820 kB] - Please clean up files on flash1.
```

# Monitoring Hardware Using Alarms

This section contains the following:

## Router Design and Monitoring Hardware

The router sends alarm notifications when problems are detected, allowing you to monitor the network remotely. You do not need to use **show** commands to poll devices on a routine basis; however, you can perform onsite monitoring if you choose.

# BootFlash Disk Monitoring

The bootflash disk must have enough free space to store two core dumps. This condition is monitored, and if the bootflash disk is too small to store two core dumps, a syslog alarm is generated, as shown in the following example:

```
Oct  6 14:10:56.292: %FLASH_CHECK-3-DISK_QUOTA: R0/0: flash_check: Flash disk quota exceeded

[free space is 1429020 kB] - Please clean up files on bootflash.
```

# Approaches for Monitoring Hardware Alarms

This section contains the following:

## Viewing the Console or Syslog for Alarm Messages

The network administrator can monitor alarm messages by reviewing alarm messages sent to the system console or to a system message log (syslog).

## Enabling the logging alarm Command

The **logging alarm** command must be enabled for the system to send alarm messages to a logging device, such as the console or a syslog. This command is not enabled by default.

You can specify the severity level of the alarms to be logged. All the alarms at and above the specified threshold generate alarm messages. For example, the following command sends only critical alarm messages to logging devices:

```
Router(config)# logging alarm critical
```

If alarm severity is not specified, alarm messages for all severity levels are sent to logging devices.

# Network Management System Alerts a Network Administrator when an Alarm is Reported Through SNMP

The SNMP is an application-layer protocol that provides a standardized framework and a common language used for monitoring and managing devices in a network.

SNMP provides notification of faults, alarms, and conditions that might affect services. It allows a network administrator to access router information through a network management system (NMS) instead of reviewing logs, polling devices, or reviewing log reports.

To use SNMP to get alarm notification, use the following MIBs:

- ENTITY-MIB, RFC4133 (required for the CISCO-ENTITY-ALARM-MIB, ENTITY-STATE-MIB and CISCO-ENTITY-SENSOR-MIB to work)
- CISCO-ENTITY-ALARM-MIB
- ENTITY-STATE-MIB
- CISCO-ENTITY-SENSOR-MIB (for transceiver environmental alarm information, which is not provided through the CISCO-ENTITY-ALARM-MIB)