



# Process Health Monitoring

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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 13](#)

## 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, on page 1](#)
- [Cisco IOS Process Resources, on page 1](#)
- [Overall Control Plane Resources, on page 11](#)

## 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#ac03ca5b9748c51baa2971d7a417e55e

```
Head Total(b) Used(b) Free(b) Lowest(b) Largest(b)
Processor 7F74107C4048 3807080396 239658308 3567422088 661095820 3145727908
reserve P 7F74107C40A0 102404 92 102312 102312 102312
lsmpi_io 7F740259B1A8 6295128 6294304 824 824 412
Dynamic heap limit(MB) 3000 Use(MB) 0
```

Processor memory

```
Address Bytes Prev Next Ref PrevF NextF what Alloc PC
7F74107C4048 0000102408 00000000 7F74107DD0A8 001 ----- *Init*
:559FB88BD000+5E73061
7F74107DD0A8 0000000056 7F74107C4048 7F74107DD138 001 ----- *Init*
:559FB88BD000+5E7307F
7F74107DD138 0000008224 7F74107DD0A8 7F74107DF1B0 001 ----- *Init*
:559FB88BD000+5E7309A
7F74107DF1B0 0000000296 7F74107DD138 7F74107DF330 001 ----- *Init*
:559FB88BD000+9093511
7F74107DF330 0000000568 7F74107DF1B0 7F74107DF5C0 001 ----- *Init*
:559FB88BD000+9099C4A
7F74107DF5C0 0000032776 7F74107DF330 7F74107E7620 001 ----- Managed Chunk Q
:559FB88BD000+90832BF
7F74107E7620 0000000056 7F74107DF5C0 7F74107E76B0 001 ----- *Init*
:559FB88BD000+5EC98DD
7F74107E76B0 0000032776 7F74107E7620 7F74107EF710 001 ----- Queue Pair - Q
:559FB88BD000+90B02EF
7F74107EF710 0000012808 7F74107E76B0 7F74107F2970 001 ----- *Init*
:559FB88BD000+13BF988B
7F74107F2970 0000032776 7F74107EF710 7F74107FA9D0 001 ----- List Elements
:559FB88BD000+904DB29
7F74107FA9D0 0000032776 7F74107F2970 7F7410802A30 001 ----- List Headers
:559FB88BD000+904DB77
7F7410802A30 0000032776 7F74107FA9D0 7F741080AA90 001 ----- IOSXE Process S
:559FB88BD000+A664348
7F741080AA90 0000032776 7F7410802A30 7F7410812AF0 001 ----- IOSXE Queue Pro
:559FB88BD000+A66438A
7F7410812AF0 0000065544 7F741080AA90 7F7410822B50 001 ----- IOSXE Queue Bal
:559FB88BD000+A6643C5
7F7410822B50 0000000328 7F7410812AF0 7F7410822CF0 001 ----- *Init*
:559FB88BD000+13BF1567
7F7410822CF0 0000000328 7F7410822B50 7F7410822E90 001 ----- *Init*
:559FB88BD000+13BF1567
7F7410822E90 0000000192 7F7410822CF0 7F7410822FA8 001 ----- *Init*
:559FB88BD000+90C3F74
7F7410822FA8 0000036872 7F7410822E90 7F741082C008 001 ----- *Init*
:559FB88BD000+A65A3A8
7F741082C008 0000010008 7F7410822FA8 7F741082E778 001 ----- Platform VM Pag
:559FB88BD000+A68A8A3
7F741082E778 0000002008 7F741082C008 7F741082EFA8 001 ----- *Init*
iosd_crb_crankshaft_unix:7F7460E22000+7D8CB
7F741082EFA8 0000200712 7F741082E778 7F7410860008 001 ----- Interrupt Stack
:559FB88BD000+A65A3A8
7F7410860008 0000000328 7F741082EFA8 7F74108601A8 001 ----- *Init*
:559FB88BD000+13BF1567
7F74108601A8 0000003008 7F7410860008 7F7410860DC0 001 ----- Watched Semapho
:559FB88BD000+90BBCE8
7F7410860DC0 0000000400 7F74108601A8 7F7410860FA8 001 ----- *Init*
:559FB88BD000+13BF1567
7F7410860FA8 0000036872 7F7410860DC0 7F741086A008 001 ----- *Init*
```

```

:559FB88BD000+A65A3A8
7F741086A008 0000000328 7F7410860FA8 7F741086A1A8 001 ----- *Init*
:559FB88BD000+13BF1567
7F741086A1A8 0000000184 7F741086A008 7F741086A2B8 001 ----- *Init*
:559FB88BD000+90A4B10
7F741086A2B8 0000000184 7F741086A1A8 7F741086A3C8 001 ----- *Init*
:559FB88BD000+90A4B10
7F741086A3C8 0000000184 7F741086A2B8 7F741086A4D8 001 ----- *Init*
:559FB88BD000+90A4B10
7F741086A4D8 0000000184 7F741086A3C8 7F741086A5E8 001 ----- *Init*
:559FB88BD000+90A4B10
7F741086A5E8 0000000184 7F741086A4D8 7F741086A6F8 001 ----- *Init*
:559FB88BD000+90A4B10
7F741086A6F8 0000000096 7F741086A5E8 7F741086A7B0 001 ----- *Init*
:559FB88BD000+90A4AA4
7F741086A7B0 0000000152 7F741086A6F8 7F741086A8A0 001 ----- Crypto CA
:559FB88BD000+98E58BF
7F741086A8A0 0000000152 7F741086A7B0 7F741086A990 001 ----- Crypto CA
:559FB88BD000+98E58BF
7F741086A990 0000000152 7F741086A8A0 7F741086AA80 001 ----- Crypto CA
:559FB88BD000+98E58BF
7F741086AA80 0000000152 7F741086A990 7F741086AB70 001 ----- Crypto CA
:559FB88BD000+98E58BF
7F741086AB70 0000000176 7F741086AA80 7F741086AC78 001 ----- Crypto CA
:559FB88BD000+98E58BF
7F741086AC78 0000000272 7F741086AB70 7F741086ADE0 001 ----- Crypto CA
:559FB88BD000+98E5875
7F741086ADE0 0000000096 7F741086AC78 7F741086AE98 000 7F741C306070 7F7415EC2CE8 (fragment)
:559FB88BD000+98E5875
7F741086AE98 0000000184 7F741086ADE0 7F741086AFA8 001 ----- Init
:559FB88BD000+52443C9
7F741086AFA8 0000036872 7F741086AE98 7F7410874008 001 ----- *Init*
:559FB88BD000+A65A3A8
7F7410874008 0000000328 7F741086AFA8 7F74108741A8 001 ----- *Init*
:559FB88BD000+13BF1567
7F74108741A8 0000000184 7F7410874008 7F74108742B8 001 ----- *Init*
:559FB88BD000+90A4B10
7F74108742B8 0000000064 7F74108741A8 7F7410874350 001 ----- Parser Linkage
:559FB88BD000+5D90EDA
7F7410874350 0000000216 7F74108742B8 7F7410874480 001 ----- IPv4 FIB subblo
:559FB88BD000+5A2947A
7F7410874480 0000000224 7F7410874350 7F74108745B8 001 ----- *Init*
:559FB88BD000+9060A7C
7F74108745B8 0000000224 7F7410874480 7F74108746F0 001 ----- *Init*
:559FB88BD000+9060A7C
7F74108746F0 0000000328 7F74108745B8 7F7410874890 001 ----- *Init*
:559FB88BD000+9060A7C
7F7410874890 0000000328 7F74108746F0 7F7410874A30 001 ----- *Init*
:559FB88BD000+9060A7C
7F7410874A30 0000000328 7F7410874890 7F7410874BD0 001 ----- *Init*
:559FB88BD000+9060A7C
7F7410874BD0 0000000896 7F7410874A30 7F7410874FA8 001 ----- *Init*
:559FB88BD000+9060A7C
7F7410874FA8 0000200712 7F7410874BD0 7F74108A6008 001 ----- Interrupt Stack
:559FB88BD000+A65A3A8
7F74108A6008 0000000968 7F7410874FA8 7F74108A6428 001 ----- *Init*
iosd_crb_crankshaft_unix:7F7460E22000+3AC76
7F74108A6428 0000002008 7F74108A6008 7F74108A6C58 001 ----- Watcher Message
:559FB88BD000+90BB7B
7F74108A6C58 0000000360 7F74108A6428 7F74108A6E18 001 ----- Process Events
:559FB88BD000+90B6840
7F74108A6E18 0000000096 7F74108A6C58 7F74108A6ED0 001 ----- SWIDB_SB_PTP
:559FB88BD000+5324CAA
7F74108A6ED0 0000000128 7F74108A6E18 7F74108A6FA8 001 ----- *Init*

```

```

:559FB88BD000+9060A7C
7F74108A6FA8 0000036872 7F74108A6ED0 7F74108B0008 001 ----- *Init*
:559FB88BD000+A65A3A8
7F74108B0008 0000002840 7F74108A6FA8 7F74108B0B78 001 ----- *Init*
:559FB88BD000+B529B9D
7F74108B0B78 0000000984 7F74108B0008 7F74108B0FA8 001 ----- Watched Message
:559FB88BD000+90BBD4A
7F74108B0FA8 0000200712 7F74108B0B78 7F74108E2008 001 ----- Interrupt Stack
:559FB88BD000+A65A3A8
7F74108E2008 0000002336 7F74108B0FA8 7F74108E2980 001 ----- Process Array
:559FB88BD000+90C3DC0
7F74108E2980 0000000360 7F74108E2008 7F74108E2B40 001 ----- Process Events
:559FB88BD000+90B6840
7F74108E2B40 0000000328 7F74108E2980 7F74108E2CE0 001 ----- *Init*
:559FB88BD000+13BF1567
7F74108E2CE0 0000000120 7F74108E2B40 7F74108E2DB0 001 ----- *Init*
:559FB88BD000+90A4347
7F74108E2DB0 0000000184 7F74108E2CE0 7F74108E2EC0 001 ----- *Init*
:559FB88BD000+90A4B10
7F74108E2EC0 0000000144 7F74108E2DB0 7F74108E2FA8 001 ----- *Init*
:559FB88BD000+4FFE35D
7F74108E2FA8 0000036872 7F74108E2EC0 7F74108EC008 001 ----- *Init*
:559FB88BD000+A65A3A8
7F74108EC008 0000001232 7F74108E2FA8 7F74108EC530 001 ----- Process
:559FB88BD000+90C3F05
7F74108EC530 0000001232 7F74108EC008 7F74108ECA58 001 ----- Process
:559FB88BD000+90C3F05
7F74108ECA58 0000000096 7F74108EC530 7F74108ECB10 001 ----- Init
:559FB88BD000+8FF0694
7F74108ECB10 0000000184 7F74108ECA58 7F74108ECC20 001 ----- *Init*
:559FB88BD000+90A4B10
7F74108ECC20 0000000184 7F74108ECB10 7F74108ECD30 001 ----- *Init*
:559FB88BD000+90A4B10
7F74108ECD30 0000000184 7F74108ECC20 7F74108ECE40 001 ----- *Init*
:559FB88BD000+90A4B10
7F74108ECE40 0000000272 7F74108ECD30 7F74108ECFA8 001 ----- *Init*
:559FB88BD000+90A4B10
7F74108ECFA8 0000200712 7F74108ECE40 7F741091E008 001 ----- Interrupt Stack
:559FB88BD000+A65A3A8
7F741091E008 0000000184 7F74108ECFA8 7F741091E118 001 ----- *Init*
:559FB88BD000+90A4B10
7F741091E118 0000003008 7F741091E008 7F741091ED30 001 ----- Reg Function Li
:559FB88BD000+905FC68
7F741091ED30 0000000064 7F741091E118 7F741091EDC8 001 ----- Parser Linkage
:559FB88BD000+5D90C9A
7F741091EDC8 0000000064 7F741091ED30 7F741091EE60 001 ----- Parser Linkage
:559FB88BD000+5D90EDA
7F741091EE60 0000000064 7F741091EDC8 7F741091EEF8 001 ----- Parser Linkage
:559FB88BD000+5D90C9A
7F741091EEF8 0000000088 7F741091EE60 7F741091EFA8 001 ----- *Init*
:559FB88BD000+5EC98DD
7F741091EFA8 0000036872 7F741091EEF8 7F7410928008 001 ----- *Init*
:559FB88BD000+A65A3A8
7F7410928008 0000000184 7F741091EFA8 7F7410928118 001 ----- *Init*
:559FB88BD000+90A4B10
7F7410928118 0000001504 7F7410928008 7F7410928750 001 ----- Reg Function Se
:559FB88BD000+905FCC2
7F7410928750 0000001504 7F7410928118 7F7410928D88 001 ----- Reg Function Ca
:559FB88BD000+905FCEF
7F7410928D88 0000000064 7F7410928750 7F7410928E20 001 ----- Parser Linkage
:559FB88BD000+5D90C9A
7F7410928E20 0000000064 7F7410928D88 7F7410928EB8 001 ----- Parser Linkage
:559FB88BD000+5D90EDA
7F7410928EB8 0000000152 7F7410928E20 7F7410928FA8 001 ----- Init

```

```

:559FB88BD000+500508B
7F7410928FA8 0000200712 7F7410928EB8 7F741095A008 001 ----- Interrupt Stack
:559FB88BD000+A65A3A8
7F741095A008 0000006888 7F7410928FA8 7F741095BB48 001 ----- TTY data
:559FB88BD000+8F75806
7F741095BB48 0000004104 7F741095A008 7F741095CBA8 001 ----- TTY Input Buf
:559FB88BD000+8F77B6F
7F741095CBA8 0000004104 7F741095BB48 7F741095DC08 001 ----- TTY Output Buf
:559FB88BD000+8F77BC7
7F741095DC08 0000024584 7F741095CBA8 7F7410963C68 001 ----- proc_hist_lmt_v
:559FB88BD000+D06DC00
7F7410963C68 0000008200 7F741095DC08 7F7410965CC8 001 ----- proc_hist_lmt_v
:559FB88BD000+D06DC48
7F7410965CC8 0000008200 7F7410963C68 7F7410967D28 001 ----- proc_hist_lmt_v
:559FB88BD000+D06DC82
7F7410967D28 0000005008 7F7410965CC8 7F7410969110 001 ----- messages
:559FB88BD000+90BBB5
7F7410969110 0000005008 7F7410967D28 7F741096A4F8 001 ----- Watched message
:559FB88BD000+90BBED
7F741096A4F8 0000020008 7F7410969110 7F741096F378 001 ----- Watched Queue
:559FB88BD000+90BBC1E
7F741096F378 0000065544 7F741096A4F8 7F741097F3D8 001 ----- Watched Queue I
:559FB88BD000+90BCC55
7F741097F3D8 0000020008 7F741096F378 7F7410984258 001 ----- Watched Boolean
:559FB88BD000+90BCC86
7F7410984258 0000020008 7F741097F3D8 7F74109890D8 001 ----- Watched Bitfield
:559FB88BD000+90BBCB7
7F74109890D8 0000010008 7F7410984258 7F741098B848 001 ----- Watcher Info
:559FB88BD000+90BBD19
7F741098B848 0000010008 7F74109890D8 7F741098DFB8 001 ----- Read/Write Lock
:559FB88BD000+90BBDAC
7F741098DFB8 0000000184 7F741098B848 7F741098E0C8 001 ----- *Init*
:559FB88BD000+90A4B10
7F741098E0C8 0000000064 7F741098DFB8 7F741098E160 001 ----- Init
:559FB88BD000+98AD5C3
7F741098E160 0000000576 7F741098E0C8 7F741098E3F8 001 ----- *Init*
:559FB88BD000+9060A7C
7F741098E3F8 0000000400 7F741098E160 7F741098E5E0 001 ----- *Init*
:559FB88BD000+9060A7C
7F741098E5E0 0000001240 7F741098E3F8 7F741098EB10 001 ----- *Init*
:559FB88BD000+9060A7C
7F741098EB10 0000000488 7F741098E5E0 7F741098ED50 001 ----- *Init*
:559FB88BD000+9060A7C
7F741098ED50 0000000072 7F741098EB10 7F741098EDF0 001 ----- Init
:559FB88BD000+98DB044
7F741098EDF0 0000000056 7F741098ED50 7F741098EE80 001 ----- Init
:559FB88BD000+5D94FF6
7F741098EE80 0000000208 7F741098EDF0 7F741098EFA8 001 ----- *Init*
:559FB88BD000+C1E0292
7F741098EFA8 0000028104 7F741098EE80 7F7410995DC8 001 ----- Process Stack
:559FB88BD000+A65A3A8
7F7410995DC8 0000000152 7F741098EFA8 7F7410995EB8 001 ----- *Init*
:559FB88BD000+90C3F74
7F7410995EB8 0000000152 7F7410995DC8 7F7410995FA8 001 ----- *Init*
:559FB88BD000+9060A7C
7F7410995FA8 0000016104 7F7410995EB8 7F7410999EE8 001 ----- Process Stack
:559FB88BD000+A65A3A8
7F7410999EE8 0000032776 7F7410995FA8 7F74109A1F48 001 ----- List Elements
:559FB88BD000+904DF98
7F74109A1F48 0000032776 7F7410999EE8 7F74109A9FA8 001 ----- List Elements
:559FB88BD000+904DF98
7F74109A9FA8 0000032776 7F74109A1F48 7F74109B2008 001 ----- List Elements
:559FB88BD000+904DF98
7F74109B2008 0000032776 7F74109A9FA8 7F74109BA068 001 ----- List Elements

```

```

:559FB88BD000+904DF98
7F74109BA068 0000032776 7F74109B2008 7F74109C20C8 001 ----- List Elements
:559FB88BD000+904DF98
7F74109C20C8 0000032776 7F74109BA068 7F74109CA128 001 ----- List Elements
:559FB88BD000+904DF98
7F74109CA128 0000032776 7F74109C20C8 7F74109D2188 001 ----- List Element

```

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

```

Router# show process cpu
CPU utilization for five seconds: 1%/0%; one minute: 1%; five minutes: 1%
PID Runtime(ms) Invoked uSecs 5Sec 1Min 5Min TTY Process
PID Runtime(ms) Invoked uSecs 5Sec 1Min 5Min TTY Process
1 3 21 142 0.00% 0.00% 0.00% 0 Chunk Manager
2 166 399 416 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 17 14 1214 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 1017 304 3345 0.47% 0.06% 0.03% 0 Check heaps
10 5 34 147 0.00% 0.00% 0.00% 0 Pool Manager
11 0 1 0 0.00% 0.00% 0.00% 0 DiscardQ Backgro
12 1 2 500 0.00% 0.00% 0.00% 0 Timers
13 0 53 0 0.00% 0.00% 0.00% 0 WATCH_AFS
14 0 1 0 0.00% 0.00% 0.00% 0 MEMLEAK_PROCESS
15 4 18 222 0.00% 0.00% 0.00% 0 ARP Input
16 37 2132 17 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
23 130 50 2600 0.00% 0.00% 0.00% 0 Entity MIB API
24 179 83 2156 0.00% 0.00% 0.00% 0 PrstVbl
25 2 247 8 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 10 1000 10 0.00% 0.00% 0.00% 0 IOSXE heartbeat
30 31 1023 30 0.00% 0.00% 0.00% 0 DB Lock Manager
31 33 1989 16 0.00% 0.00% 0.00% 0 GraphIt
32 0 1 0 0.00% 0.00% 0.00% 0 DB Notification
33 0 1 0 0.00% 0.00% 0.00% 0 IPC Apps Task
34 0 1 0 0.00% 0.00% 0.00% 0 ifIndex Receive
35 5 401 12 0.00% 0.00% 0.00% 0 IPC Event Notifi
36 32 1952 16 0.00% 0.00% 0.00% 0 IPC Mcast Pendin
37 0 1 0 0.00% 0.00% 0.00% 0 Platform appsess
38 0 34 0 0.00% 0.00% 0.00% 0 IPC Dynamic Cach
39 1 401 2 0.00% 0.00% 0.00% 0 IPC Service NonC
40 0 1 0 0.00% 0.00% 0.00% 0 IPC Zone Manager
41 16 1952 8 0.00% 0.00% 0.00% 0 IPC Periodic Tim
42 19 1952 9 0.00% 0.00% 0.00% 0 IPC Deferred Por
43 0 1 0 0.00% 0.00% 0.00% 0 IPC Process leve
44 0 1 0 0.00% 0.00% 0.00% 0 IPC Seat Manager
45 0 115 0 0.00% 0.00% 0.00% 0 IPC Check Queue
46 0 1 0 0.00% 0.00% 0.00% 0 IPC Seat RX Cont
47 0 1 0 0.00% 0.00% 0.00% 0 IPC Seat TX Cont
48 10 201 49 0.00% 0.00% 0.00% 0 IPC Keep Alive M
49 33 401 82 0.00% 0.00% 0.00% 0 IPC Loadometer
50 0 1 0 0.00% 0.00% 0.00% 0 IPC Session Deta
51 0 1 0 0.00% 0.00% 0.00% 0 SENSOR-MGR event
52 2 201 9 0.00% 0.00% 0.00% 0 Compute SRP rate

```

```
53 0 1 0 0.00% 0.00% 0.00% 0 IFS Agent Manage
54 0 1 0 0.00% 0.00% 0.00% 0 License IPC stat
55 0 1 0 0.00% 0.00% 0.00% 0 License IPC serv
56 0 7 0 0.00% 0.00% 0.00% 0 Net Input
57 0 2 0 0.00% 0.00% 0.00% 0 Dialer event
58 0 1 0 0.00% 0.00% 0.00% 0 SERIAL A'detect
59 0 1 0 0.00% 0.00% 0.00% 0 IOSXE signals IO
60 0 1 0 0.00% 0.00% 0.00% 0 client_entity_se
61 1 1 1000 0.00% 0.00% 0.00% 0 RF SCTPthread
62 0 1 0 0.00% 0.00% 0.00% 0 CHKPT RG SCTPthr
63 0 2 0 0.00% 0.00% 0.00% 0 XML Proxy Client
64 0 1 0 0.00% 0.00% 0.00% 0 ARP Snoop
65 28 1999 14 0.00% 0.00% 0.00% 0 Dynamic ARP Insp
66 1216 110 11054 0.00% 0.00% 0.00% 0 crypto sw pk pro
67 0 2 0 0.00% 0.00% 0.00% 0 License Client N
68 0 1 0 0.00% 0.00% 0.00% 0 Image License br
69 24 133 180 0.00% 0.00% 0.00% 0 SAEventLog
70 11 2 5500 0.00% 0.00% 0.00% 0 SASStorage
71 1 4 250 0.00% 0.00% 0.00% 0 SASConnect
72 41 1165 35 0.00% 0.00% 0.00% 0 SASRcvWQ
73 2 5 400 0.00% 0.00% 0.00% 0 SACConnect
74 30 1183 25 0.00% 0.00% 0.00% 0 SACRcvWQ
75 8 68 117 0.00% 0.00% 0.00% 0 Licensing Auto U
76 0 1 0 0.00% 0.00% 0.00% 0 License HA Consi
77 0 1 0 0.00% 0.00% 0.00% 0 Token Daemon
78 0 1 0 0.00% 0.00% 0.00% 0 Critical Bkgnd
79 221 1374 160 0.00% 0.00% 0.00% 0 Net Background
80 0 3 0 0.00% 0.00% 0.00% 0 IDB Work
81 8 101 79 0.00% 0.00% 0.00% 0 Logger
82 71 1985 35 0.00% 0.00% 0.00% 0 TTY Background
83 53 24 2208 0.00% 0.00% 0.00% 0 CTS CORE
84 1 3 333 0.00% 0.00% 0.00% 0 SXP CORE
85 56 1164 48 0.00% 0.00% 0.00% 0 SASRcvWQWrk1
86 3 14 214 0.00% 0.00% 0.00% 0 IF-MGR control p
87 0 28 0 0.00% 0.00% 0.00% 0 IF-MGR event pro
88 0 2 0 0.00% 0.00% 0.00% 0 CTS HA
89 0 2 0 0.00% 0.00% 0.00% 0 CTS HA IPC flow
90 0 1 0 0.00% 0.00% 0.00% 0 CTS HA operation
91 5357 18052 296 0.15% 0.20% 0.20% 0 IOSD ipc task
92 213 5786 36 0.00% 0.00% 0.00% 0 IOSD chasfs task
93 0 2 0 0.00% 0.00% 0.00% 0 Crimson interfac
94 274 19 14421 0.00% 0.00% 0.00% 0 Crimson Database
95 681 2548 267 0.00% 0.02% 0.00% 0 Crimson flush tr
96 4 287 13 0.00% 0.00% 0.00% 0 REDUNDANCY FSM
97 0 1 0 0.00% 0.00% 0.00% 0 Punt FP Stats Du
98 171 953 179 0.00% 0.00% 0.00% 0 PuntInject Keepa
99 0 16 0 0.00% 0.00% 0.00% 0 ESG MATM Learnin
100 141 401 351 0.00% 0.00% 0.00% 0 CMAN RP Msg Proc
101 118 1998 59 0.00% 0.00% 0.00% 0 Environmental Mo
102 42 1998 21 0.00% 0.00% 0.00% 0 RP HA Periodic
103 0 2 0 0.00% 0.00% 0.00% 0 cpf_msg_holdq_pr
104 0 1 0 0.00% 0.00% 0.00% 0 cpf_msg_rcvq_pro
105 0 1 0 0.00% 0.00% 0.00% 0 cpf_process_tpQ
106 0 1 0 0.00% 0.00% 0.00% 0 CEF RRP RF waite
107 0 1 0 0.00% 0.00% 0.00% 0 CONSOLE helper p
108 175 50 3500 0.00% 0.00% 0.00% 0 DBAL EVENTS
109 0 1 0 0.00% 0.00% 0.00% 0 XDR RRP RF waite
110 50 1999 25 0.00% 0.00% 0.00% 0 REDUNDANCY peer
111 337 19959 16 0.00% 0.00% 0.00% 0 100ms check
112 0 1 0 0.00% 0.00% 0.00% 0 CWAN APS HA Proc
113 1 34 29 0.00% 0.00% 0.00% 0 RF CWAN HA Proce
114 0 1 0 0.00% 0.00% 0.00% 0 CWAN IF EVENT HA
115 0 4 0 0.00% 0.00% 0.00% 0 ANCF HA
116 0 2 0 0.00% 0.00% 0.00% 0 ANCF HA IPC flow
```

```

117 0 1 0 0.00% 0.00% 0.00% 0 QoS HA ID RETAIN
118 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
119 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
120 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
121 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
122 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
123 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
124 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
125 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
126 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
127 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
128 0 1 0 0.00% 0.00% 0.00% 0 CHKPT Test clien
129 0 1 0 0.00% 0.00% 0.00% 0 DHCPC HA
130 0 1 0 0.00% 0.00% 0.00% 0 DHCPD HA
131 0 1 0 0.00% 0.00% 0.00% 0 DHCPv6 Relay HA
132 0 1 0 0.00% 0.00% 0.00% 0 DHCPv6 Server HA
133 0 2 0 0.00% 0.00% 0.00% 0 SISF HA Process
134 0 5 0 0.00% 0.00% 0.00% 0 ARP HA
135 0 1 0 0.00% 0.00% 0.00% 0 IOSXE-RP Punt Se
136 0 1 0 0.00% 0.00% 0.00% 0 IOSXE-RP Punt IP
137 0 1 0 0.00% 0.00% 0.00% 0 ACL Log Punt Ser
138 0 1 0 0.00% 0.00% 0.00% 0 ACL deny punt se
139 1576 124342 12 0.07% 0.06% 0.07% 0 L2 LISP Punt Pro
140 0 1 0 0.00% 0.00% 0.00% 0 OFSDN Punject Pr
141 1653 124341 13 0.15% 0.08% 0.07% 0 SIS Punt Process
142 0 1 0 0.00% 0.00% 0.00% 0 IOSXE-RP SPA TSM
143 0 1 0 0.00% 0.00% 0.00% 0 IOSXE-RP QFP HA
144 0 1 0 0.00% 0.00% 0.00% 0 Network-rf Notif
145 0 1 0 0.00% 0.00% 0.00% 0 DHCP Snooping cl
146 1 18 55 0.00% 0.00% 0.00% 0 DHCP Snooping
147 0 1 0 0.00% 0.00% 0.00% 0 DHCP Snooping db
148 0 1 0 0.00% 0.00% 0.00% 0 IKE HA Mgr
149 0 1 0 0.00% 0.00% 0.00% 0 IPSEC HA Mgr
150 0 1 0 0.00% 0.00% 0.00% 0 Crypto PKI-HA
151 3 12 250 0.00% 0.00% 0.00% 0 RF Master Main T
152 0 7 0 0.00% 0.00% 0.00% 0 RF Master Status
153 39 1009 38 0.00% 0.00% 0.00% 0 SACRcvWQWrk1
154 28 1009 27 0.00% 0.00% 0.00% 0 SACRcvWQWrk2
155 103 1185 86 0.00% 0.00% 0.00% 0 SACRcvWQWrk3
156 0 1 0 0.00% 0.00% 0.00% 0 BACK CHECK
157 323 210 1538 0.00% 0.00% 0.00% 0 SAMsgThread
158 25 202 123 0.00% 0.00% 0.00% 0 Compute load avg
159 515 107 4813 0.00% 0.02% 0.00% 0 Per-minute Jobs
160 167 2009 83 0.00% 0.00% 0.00% 0 Per-Second Jobs
161 0 1 0 0.00% 0.00% 0.00% 0 Transport Port A
162 167 9 18555 0.00% 0.00% 0.00% 0 ACT2 Crypto Engi
163 0 1 0 0.00% 0.00% 0.00% 0 AggMgr Process
164 0 4 0 0.00% 0.00% 0.00% 0 EEM ED MAT
165 4 73 54 0.00% 0.00% 0.00% 0 EEM ED ND
166 0 1 0 0.00% 0.00% 0.00% 0 MACSEC POST rest
167 0 1 0 0.00% 0.00% 0.00% 0 MACSEC POST hand
168 0 1 0 0.00% 0.00% 0.00% 0 MACSEC POST hand
169 0 1 0 0.00% 0.00% 0.00% 0 IOSXE-RP FastPat
170 0 6 0 0.00% 0.00% 0.00% 0 NGIO_BRI_POLL_DE
171 0 1 0 0.00% 0.00% 0.00% 0 ASYNC Input
172 21 2001 10 0.00% 0.00% 0.00% 0 IR8340 Alarm Con
173 0 2 0 0.00% 0.00% 0.00% 0 dialer isdn sess
174 0 1 0 0.00% 0.00% 0.00% 0 DSX3MIB ll handl
175 29 1961 14 0.00% 0.00% 0.00% 0 fanrp_l2fib
176 0 1 0 0.00% 0.00% 0.00% 0 POS APS Event Pr
177 0 2 0 0.00% 0.00% 0.00% 0 netclk_process
178 0 1 0 0.00% 0.00% 0.00% 0 netclk_ha_proces

```

```
Router#show process cpu platform sorted
```



```

CPU utilization for five seconds: 21%, one minute: 22%, five minutes: 22%
Core 0: CPU utilization for five seconds: 4%, one minute: 5%, five minutes: 5%
Core 1: CPU utilization for five seconds: 2%, one minute: 5%, five minutes: 5%
Core 2: CPU utilization for five seconds: 4%, one minute: 6%, five minutes: 6%
Core 3: CPU utilization for five seconds: 4%, one minute: 6%, five minutes: 6%
Core 4: CPU utilization for five seconds: 5%, one minute: 5%, five minutes: 5%
Core 5: CPU utilization for five seconds: 2%, one minute: 2%, five minutes: 2%
Core 6: CPU utilization for five seconds: 41%, one minute: 42%, five minutes: 43%
Core 7: CPU utilization for five seconds: 100%, one minute: 100%, five minutes: 100%
Pid PPid 5Sec 1Min 5Min Status Size Name
-----

```

```

15435 15419 158% 158% 157% S 226748 ucode_pkt_PPE0
16998 16972 7% 6% 7% S 14252 btman
56 2 3% 5% 5% S 0 ksmd
15179 15139 2% 2% 2% S 171524 fman_fp_image
3821 3807 2% 3% 3% S 584524 linux_iosd-imag
26565 26536 1% 1% 1% S 52764 fman_cc
29044 2 0% 0% 0% I 0 kworker/u32:0-events
26536 16605 0% 0% 0% S 3788 pman
25912 25906 0% 0% 0% S 116208 fed main event
25906 16605 0% 0% 0% S 3796 pman
25689 25684 0% 0% 0% S 5036 nginx
25688 25684 0% 0% 0% S 5868 nginx
25684 25678 0% 0% 0% S 9980 nginx
25678 2784 0% 0% 0% S 3792 pman
25359 25349 0% 0% 0% S 8448 ngiolite
25349 16605 0% 0% 0% S 3792 pman
25048 25043 0% 0% 0% S 9876 ngiolite
25043 16605 0% 0% 0% S 3792 pman
24784 24779 0% 0% 0% S 12352 ngiolite
24779 16605 0% 0% 0% S 3824 pman
24713 2 0% 0% 0% I 0 kworker/1:2H
24688 24446 0% 0% 0% S 432 sleep
24446 1 0% 0% 0% S 2100 memory_monitor.
24341 24333 0% 0% 0% S 12300 ngiolite
24333 16605 0% 0% 0% S 3824 pman
24164 2 0% 0% 0% S 0 SarIosdMond
22339 2 0% 0% 0% I 0 gobisetpower-2-
22338 2 0% 0% 0% I 0 gobireadcb-2-2-
22337 2 0% 0% 0% I 0 gobiprobe-2-2-3
22139 22129 0% 0% 0% S 62172 iomd
22129 16605 0% 0% 0% S 3768 pman
21734 21723 0% 0% 0% S 62064 iomd
21723 16605 0% 0% 0% S 3768 pman
21566 2 0% 0% 0% I 0 kworker/1:3-gobiread
21466 21458 0% 0% 0% S 61992 iomd
21458 16605 0% 0% 0% S 3768 pman
21135 2 0% 0% 0% I 0 gobisetpower-1-
21131 2 0% 0% 0% I 0 gobireadcb-1-2-
21129 2 0% 0% 0% I 0 gobiprobe-1-2-2
21128 2 0% 0% 0% I 0 gobisetpower-0-
21127 2 0% 0% 0% I 0 gobireadcb-0-2-
21126 2 0% 0% 0% I 0 gobiprobe-0-2-2
21120 21113 0% 0% 0% S 74960 iomd
21113 16605 0% 0% 0% S 3820 pman
20788 20780 0% 0% 0% S 63312 iomd
20780 16605 0% 0% 0% S 3768 pman
19604 19582 0% 0% 0% S 18360 btman
19582 16605 0% 0% 0% S 3772 pman
19136 2 0% 0% 0% I 0 kworker/7:2H
18966 18953 0% 0% 0% S 23472 cmcc
18953 16605 0% 0% 0% S 3768 pman
18687 18674 0% 0% 0% S 12420 hman
18674 16605 0% 0% 0% S 3768 pman

```

```

18341 18320 0% 0% 0% S 7020 pttcd
18320 2784 0% 0% 0% S 3776 pman
18046 18031 0% 0% 0% S 78104 pubd
18031 2784 0% 0% 0% S 3776 pman
17396 2 0% 0% 0% I 0 kworker/5:0H
17301 16605 0% 0% 0% S 712 inotifywait
17057 1 0% 0% 0% S 3356 rotee
16972 14118 0% 0% 0% S 3768 pman
16605 1 0% 0% 0% S 8020 pvp.sh
16567 16545 0% 0% 0% S 19688 cman_fp
16545 14118 0% 0% 0% S 3768 pman
16331 16317 0% 0% 0% S 170672 cpp_cp_svr
16317 14118 0% 0% 0% S 3768 pman
16108 16095 0% 0% 0% S 66440 cpp_driver
16095 14118 0% 0% 0% S 3768 pman
15888 15873 0% 0% 0% S 70160 cpp_ha_top_leve
15873 14118 0% 0% 0% S 3772 pman
15660 15646 0% 0% 0% S 80592 cpp_sp_svr
15646 14118 0% 0% 0% S 3768 pman
15419 14118 0% 0% 0% S 3772 pman
15139 14118 0% 0% 0% S 3768 pman
14861 14844 0% 0% 0% S 12420 hman
14844 14118 0% 0% 0% S 3768 pman
14745 14731 0% 0% 0% S 1676 sort_files_by_i
14731 2784 0% 0% 0% S 3756 pman
14405 14118 0% 0% 0% S 712 inotifywait
14282 1 0% 0% 0% S 3356 rotee
14118 1 0% 0% 0% S 7988 pvp.sh
13169 13160 0% 0% 0% S 4224 flash_check.sh
13160 2784 0% 0% 0% S 3764 pman
12444 12435 0% 0% 0% S 14176 lman
12435 2784 0% 0% 0% S 3772 pman
12306 5095 0% 0% 0% S 3108 journalctl
10703 2784 0% 0% 0% S 712 inotifywait
10439 10345 0% 0% 0% S 712 inotifywait
10431 1 0% 0% 0% S 3360 rotee
10347 1 0% 0% 0% S 1180 xinetd
10346 1 0% 0% 0% S 1188 xinetd
10345 1 0% 0% 0% S 12168 rollback_timer.
10343 1 0% 0% 0% S 2068 auxinit.sh
9415 1 0% 0% 0% S 1012 xinetd
9412 1 0% 0% 0% S 1176 xinetd
9150 2 0% 0% 0% I 0 kworker/2:2H-kblockd
8448 1 0% 0% 0% S 6240 dhcpd
8198 8176 0% 0% 0% S 6784 tam_svcs_esg_cf
8176 2784 0% 0% 0% S 3776 pman
7929 7914 0% 0% 0% S 8432 tamd_proc
7914 2784 0% 0% 0% S 3776 pman
7673 7658 0% 0% 0% S 7904 tams_proc
7658 2784 0% 0% 0% S 3776 pman
7422 7405 0% 0% 0% S 32684 btman
7405 2784 0% 0% 0% S 3772 pman
7127 7106 0% 0% 0% S 26272 cli_agent
7106 2784 0% 0% 0% S 3780 pman
6878 6862 0% 1% 1% S 27788 cmand
6862 2784 0% 0% 0% S 3776 pman
6600 6583 0% 0% 0% S 92300 dbm
6583 2784 0% 0% 0% S 3772 pman
6059 6025 0% 0% 0% S 84992 fman_rp
6025 2784 0% 0% 0% S 3772 pman
5779 2 0% 0% 0% S 0 lfts_sar_aux
5778 5763 0% 0% 0% R 15868 hman
5763 2784 0% 0% 0% S 3772 pman
5568 5103 0% 0% 0% S 712 inotifywait

```

```
5560 1 0% 0% 0% S 3356 rotee
5412 5388 0% 0% 0% S 11452 keyman
5388 2784 0% 0% 0% S 3772 pman
5287 1 0% 0% 0% S 3360 rotee
5103 1 0% 0% 0% S 5640 iptbl.sh
5095 5086 0% 0% 0% S 10900 plogd
5086 2784 0% 0% 0% S 3780 pman
5054 13169 0% 0% 0% S 440 sleep
5043 4729 0% 0% 0% S 716 inotifywait
5030 14745 0% 0% 0% S 432 sleep
4940 1 0% 0% 0% S 3424 rotee

Router#
```

## 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, 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 2 seconds ago
Load Average: healthy
1-Min: 2.07, status: healthy, under 9.30
5-Min: 2.03, status: healthy, under 9.30
15-Min: 1.92, status: healthy, under 9.30
Memory (kb): healthy
Total: 8000724
Used: 2565652 (32%), status: healthy
Free: 5435072 (68%)
Committed: 3263176 (41%), under 90%
Per-core Statistics
CPU0: CPU Utilization (percentage of time spent)
User: 0.80, System: 4.00, Nice: 0.00, Idle: 95.19
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU1: CPU Utilization (percentage of time spent)
User: 2.50, System: 1.60, Nice: 0.00, Idle: 95.90
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU2: CPU Utilization (percentage of time spent)
User: 2.90, System: 1.80, Nice: 0.00, Idle: 95.30
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU3: CPU Utilization (percentage of time spent)
User: 1.49, System: 7.79, Nice: 0.00, Idle: 90.70
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU4: CPU Utilization (percentage of time spent)
User: 4.60, System: 1.80, Nice: 0.00, Idle: 93.59
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU5: CPU Utilization (percentage of time spent)
User: 0.99, System: 1.89, Nice: 0.00, Idle: 97.10
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU6: CPU Utilization (percentage of time spent)
User: 24.10, System: 18.30, Nice: 0.00, Idle: 57.60
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU7: CPU Utilization (percentage of time spent)
User: 92.50, System: 7.50, Nice: 0.00, Idle: 0.00
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
```

```

Router#
Router# show platform software status control-processor brief
Load Average
Slot Status 1-Min 5-Min 15-Min
RPO Healthy 2.01 2.01 1.91

Memory (kB)
Slot Status Total Used (Pct) Free (Pct) Committed (Pct)
RPO Healthy 8000724 2565240 (32%) 5435484 (68%) 3263124 (41%)

CPU Utilization
Slot CPU User System Nice Idle IRQ SIRQ IOwait
RPO 0 0.70 3.30 0.00 96.00 0.00 0.00 0.00
1 4.39 7.39 0.00 88.11 0.00 0.09 0.00
2 4.80 9.30 0.00 85.80 0.00 0.10 0.00
3 3.39 8.69 0.00 87.91 0.00 0.00 0.00
4 4.40 1.80 0.00 93.80 0.00 0.00 0.00
5 1.00 1.90 0.00 97.10 0.00 0.00 0.00
6 24.64 23.54 0.00 51.80 0.00 0.00 0.00
7 92.60 7.40 0.00 0.00 0.00 0.00 0.00

Router#

```

# Monitoring Hardware Using Alarms

## 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

### 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)