System Health Monitoring

Monitoring critical system resources is very important to maintain stability of the network. We recommend that you monitor the switch CPU, memory, file systems, and environmental resources on a regular basis.

This workflow discusses the commonly used commands and procedures to monitor and maintain system health.

Prerequisites for System Health Monitoring

Obtain information about your switch such as the running software release, duration of switch run time, and the reason for the most recent reload. To obtain this information, use the **show version** command. The command with the pipe feature gives the duration of uptime and any reload information.

```
show version|inc software|uptime|Last
Cisco IOS Software, IOS-XE Software, Catalyst L3 Switch Software
(CAT3K_CAA-UNIVERSALK9-M), Version 03.03.02.SE RELEASE SOFTWARE (fc2)
3850-access-Bld1Flr1 uptime is 5 weeks, 3 days, 2 hours, 59 minutes
Last reload reason: reload
```

Show Running Status

Identify the reasons for uptime and reload. Over time, switches can crash and reload without your knowledge.

Step 1 Use the **show version** command to retrieve the overall switch status.

If you are only interested in the switch uptime and last reload, you can run a more direct command using the pipe "|" feature built into Cisco IOS XE (and Cisco IOS) software.

This example shows that Cisco IOS XE release 3.3.2 SE was running for five weeks before a privileged user initiated a switch reload.

```
show version|inc software|uptime|Last
Cisco IOS Software, IOS-XE Software, Catalyst L3 Switch Software
(CAT3K_CAA-UNIVERSALK9-M), Version 03.03.02.SE RELEASE SOFTWARE (fc2)

3850-access-Bld1Flr1 uptime is 5 weeks, 3 days, 2 hours, 59 minutes

Last reload reason: reload
```

Run a System Baseline for Core Resources

Set your system baseline usage during normal production time and determine if there is a change from your expected resource values. If the increase in usage is not justified, investigate to find the cause. Ideally, it is best to setup some form of Network Monitoring System (NMS) to automatically monitor these values, however it is also important to learn how to manually poll these values.

After you have identified the switch running status, examine core resources to ensure that they are all at optimal values.

Obtain CPU and Core Processor Usage

Step 2 Use the **show process cpu** command to display CPU and core processor usage.

To find CPU usage due to the subprocesses and tasks operating under a specific process, use the **show process cpu detailed** command. To sort for high activity usage, use **show process cpu sorted** command.

CPU usage can be monitored on a per-switch basis in a stacked environment.

At periodic intervals, we recommend that you run the following variations of the **show process cpu** command.

Note The switch is a multicore platform that is different from its predecessors. A single core can experience high CPU, so it is important to monitor each core when running these commands.

This output shows the five-second, one-minute, and five-minute periods on each CPU core. It also

shows the Forwarding Engine Driver (FED), IOS daemon IOSd, and Wireless Controller Module (WCM) processes have the highest CPU utilization.

```
show process cpu sorted | ex 0.00
Core 0: CPU utilization for five seconds: 4%; one minute: 5%;  five minutes:
5%
Core 1: CPU utilization for five seconds: 2%; one minute: 1%;  five minutes:
1%
Core 2: CPU utilization for five seconds: 0%; one minute: 0%;  five minutes:
0%
Core 3: CPU utilization for five seconds: 1%; one minute: 2%;  five minutes:
1%
PID     Runtime(ms) Invoked  uSecs  5Sec     1Min     5Min     TTY   Process
5639    1598657     15898882 68     0.98     1.06     1.08     1088  fed
8503    1554112     10180648 52     0.54     0.50     0.44     0     iosd
8499    982266      14501353 18     0.20     0.15     0.15     0     wcm
5640    427135      54197163 16     0.05     0.10     0.11     0
platform_mgr
6170    502150      9040937  55     0.05     0.01     0.01     0     obfld
6177    2057130     87345912 23     0.05     0.01     0.03     0     pdsd
```

Step 3   Use the **history** command to display a graph of sustained CPU utilization.

This graph helps to formulate patterns. For example, if you observe a spike to 100 percent every 30 minutes, you can conclude that something might be polling the switch on a regular schedule. Examine your SNMP configuration to help determine the cause.

```
show process cpu history

History information for system:


                            1111122222222222222222222
    111111111111111111111111111111112222255558888888886666666666
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
             CPU% per second (last 60 seconds)
```

Reference:

For detailed information to help troubleshoot your high CPU usage concerns, see the *Catalyst 3850 Series Switch High CPU Usage Troubleshooting* document.

Obtain Switch Memory Usage

Step 4   Use the **show process memory** command to display the state of memory usage on your switch.

To find memory usage due to the subprocesses and tasks operating under a specific process, use the **show process memory detailed** command. To sort for high activity usage, use the **show process memory detailed sorted** command.

Memory usage can be monitored on a per-switch basis in a stacked environment.

```
show process memory sorted
System memory  : 3930840K total, 1487028K used, 2443812K free, 222004K kernel
reserved
Lowest(b)      : 1915568076
PID     Text         Data      Stack     Heap      RSS        Total      Process
5681    9988         269088    92        476       233060     584844     fed
10162   72268        34364     104       288       206548     343980     iosd
10158   24260        519732    88        10628     108612     662328     wcm
```

Monitor File Systems Usage

Step 5   At regular intervals, use the **show file systems** command to monitor the file systems within the switch to ensure that there is always sufficient space available.

Unlike previous platforms, the switch writes crash files to a separate directory. For example, the **show file systems** command output shows that the crashifo folder is populated. Compare the size of the folder against the free space available.

The switch has different file systems that can be listed by using the **show file systems** command.

```
show file systems
File Systems:

    Size(b)        Free(b)      Type  Flags   Prefixes
    248354816      148799488     disk    rw    crashinfo: crashinfo-1:
    248512512      178782208     disk    rw    crashinfo-2: stby-crashinfo:
*   1621966848     346673152     disk    rw    flash: flash-1:
    1622147072     350224384     disk    rw    flash-2: stby-flash:
```

Note   An (*) asterisk indicates the default file system. If the file system has a dash (-) or a zero (0) for the Size(b) field, that indicates that the file system is not present or not recognized.

Step 6   Use the **dir filesystem** or the **show filesystem** command to list the files under a specific files system.

When you find crash files, it is important to immediately retrieve them to diagnose a system failure or unexpected crash.

This example shows that crash files were created in the directory.

```
dir crashinfo
Directory of crashinfo:/

 6073  drwx         1024  Jul 17 2013 17:53:48 +00:00  ap_crash
   12  -rwx            0   Jan 1 1970 00:00:06 +00:00  koops.dat
   11  -rwx          357   Jun 1 2014 13:05:15 +00:00  last_systemreport_log
   13  -rwx      1128623  Nov 22 2013 12:33:27 +00:00
system-report_2_20131122-123229-UTC.gz
   14  -rwx           39   Jun 1 2014 13:05:15 +00:00  last_systemreport
   15  -rwx       657766   Jun 5 2013 09:17:03 +00:00
system-report_1_20130605-091616-UTC.gz
   16  -rwx       737390  Jun 26 2013 22:48:22 +00:00
system-report_1_20130626-224726-UTC.gz
```

Run a System Baseline for Environmental Resources

Step 7   Use the **show environment** command to display an overview of switch health.

It is important to monitor environmental resource values because something as small as a fan failure can lead to a serious hardware problem. If your switches provide Power Over Ethernet (POE), then the **show environment** command will also provide a view into the power supplies and if they are performing as expected.

```
show environment all
Switch 1 FAN 1 is OK
Switch 1 FAN 2 is OK
Switch 1 FAN 3 is OK
FAN PS-1 is OK
FAN PS-2 is OK
Switch 1: SYSTEM TEMPERATURE is OK
SW  PID                Serial#      Status           Sys Pwr  PoE Pwr  Watts
--  -----------------  ----------   ---------------  -------  -------  -----
1A  PWR-C1-715WAC      LIT171310MT  OK               Good     Good     715
1B  PWR-C1-715WAC      LIT171310PS  OK               Good     Good     715
```

Step 8   If your switches are in a stack, run the **show environment stack** command to view all of the environmental outputs stack wide.

Although some of settings are adjustable, we recommend leaving the settings with their default values.

```
show environment stack
SWITCH: 1
Switch 1 FAN 1 is OK
Switch 1 FAN 2 is OK
Switch 1 FAN 3 is OK
FAN PS-1 is OK
FAN PS-2 is OK
Switch 1: SYSTEM TEMPERATURE is OK
Inlet Temperature Value: 34 Degree Celsius
Temperature State: GREEN
Yellow Threshold : 41 Degree Celsius
Red Threshold    : 56 Degree Celsius
Hotspot Temperature Value: 45 Degree Celsius
Temperature State: GREEN
Yellow Threshold : 105 Degree Celsius
Red Threshold    : 125 Degree Celsius
SWITCH: 2
Switch 2 FAN 1 is OK
Switch 2 FAN 2 is OK
.
.
.
```

Other System Monitoring Considerations

Spanning Tree Monitoring

Spanning tree design is beyond the scope of this document, however, the goal of this procedure is to provide simple spanning tree monitoring commands. It is important to always understand your spanning tree topology within your network. There are a number of simple commands that you can run to verify that your switch is performing the expected spanning tree role.

Step 9 Use the **show spanning-tree summary** command to periodically monitor the stability of your spanning tree environment and ensure a loop-free environment.

This example output shows that the switch is actually operating as the root bridge for all of the VLANs which can cause extreme network degradation if incorrectly configured.

```
show spanning-tree summary
Switch is in pvst mode
Root bridge for: VLAN0001, VLAN0011, VLAN0015, VLAN0100-VLAN0101
  VLAN0881-VLAN0883
Extended system ID           is enabled
Portfast Default             is disabled
PortFast BPDU Guard Default  is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default            is disabled
EtherChannel misconfig guard is enabled
UplinkFast                   is disabled
BackboneFast                 is disabled
Configured Pathcost method used is short


Name                  Blocking Listening Learning Forwarding STP Active
--------------------- -------- --------- -------- ---------- ----------
VLAN0001                     0         0        0          2          2
VLAN0011                     0         0        0          1          1
VLAN0015                     0         0        0          1          1
VLAN0100                     0         0        0          1          1
VLAN0101                     0         0        0          1          1
VLAN0777                     0         0        0          2          2
VLAN0881                     0         0        0          1          1


Name                  Blocking Listening Learning Forwarding STP Active
--------------------- -------- --------- -------- ---------- ----------
VLAN0882                     0         0        0          1          1
VLAN0883                     0         0        0          1          1
--------------------- -------- --------- -------- ---------- ----------
9 vlans                      0         0        0         11         11
```

Step 10   Use the **show spanning-tree detail** command to frequently check STP stability.

This command displays network stability information about the number of topology changes within each VLAN, the last time a TCN was received, and so forth. Frequently monitoring this information is critical to maintaining overall health of the switch and network.

```
show spanning-tree detail |inc ieee|occur|from|is|exec
 VLAN0001 is executing the ieee compatible Spanning Tree protocol
  Number of topology changes 55 last change ed 4d07h ago
          from GigabitEthernet1/0/1
 VLAN0011 is executing the ieee compatible Spanning Tree protocol
  Number of topology changes 7 last change ed 4d07h ago
          from GigabitEthernet1/0/1
 VLAN0015 is executing the ieee compatible Spanning Tree protocol
  Number of topology changes 7 last change ed 4d07h ago
          from GigabitEthernet1/0/1
 VLAN0100 is executing the ieee compatible Spanning Tree protocol
  Number of topology changes 7 last change ed 4d07h ago
          from GigabitEthernet1/0/1
 VLAN0101 is executing the ieee compatible Spanning Tree protocol
  Number of topology changes 7 last change ed 4d07h ago
          from GigabitEthernet1/0/1
 VLAN0777 is executing the ieee compatible Spanning Tree protocol
  Number of topology changes 12 last change ed 4d07h ago
          from GigabitEthernet1/0/1
 VLAN0881 is executing the ieee compatible Spanning Tree protocol
  Number of topology changes 7 last change ed 4d07h ago
          from GigabitEthernet1/0/1
```