The bridge to possible

Support Talks session

How to determine a legitimate hardware issue

Ambrose Taylor, Technical Leader, CCIE #60254

Nathan Pan, Technical Leader

May 13th, 2021

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Ambrose Taylor & Nathan Pan

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Technical Leader
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Nathan Pan
Technical Leader

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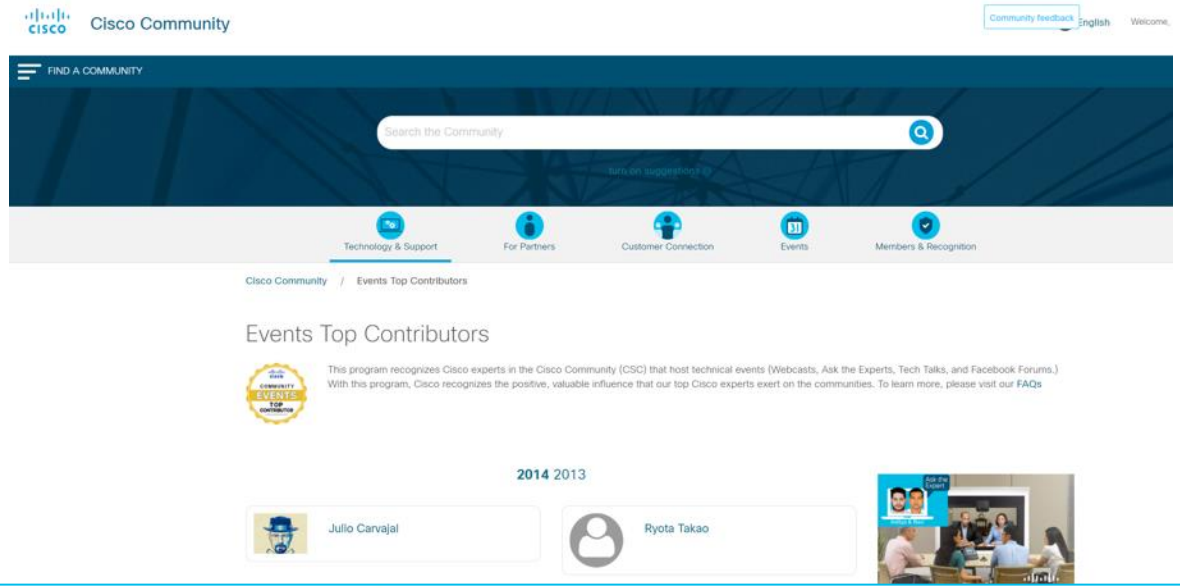

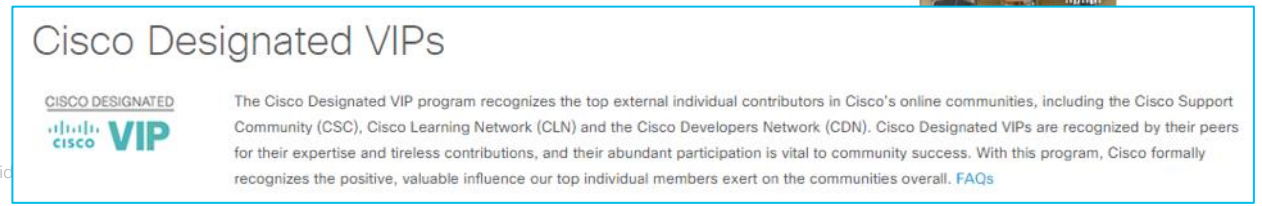

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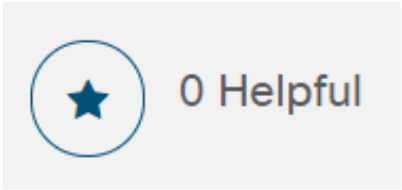

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Ambrose Taylor
Technical Leader
CCIE#60254

Nathan Pan
Technical Leader

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The bridge to possible

Do I Need an RMA?

How to determine a legitimate hardware issue (or something else)?

Nathan Pan – Technical Leader, Enterprise Switching
Ambrose Taylor – Technical Leader, Enterprise Switching

Agenda

- What Is Hardware Failure?
- What is Non-Hardware Failure?
- Hardware & Non-hardware Failure Examples
- Troubleshooting Checklist
- Q&A

Polling Question 1

Do you rely on Cisco hardware diagnostics such as GOLD and POST to help identify hardware issues?

A. Yes

B. No

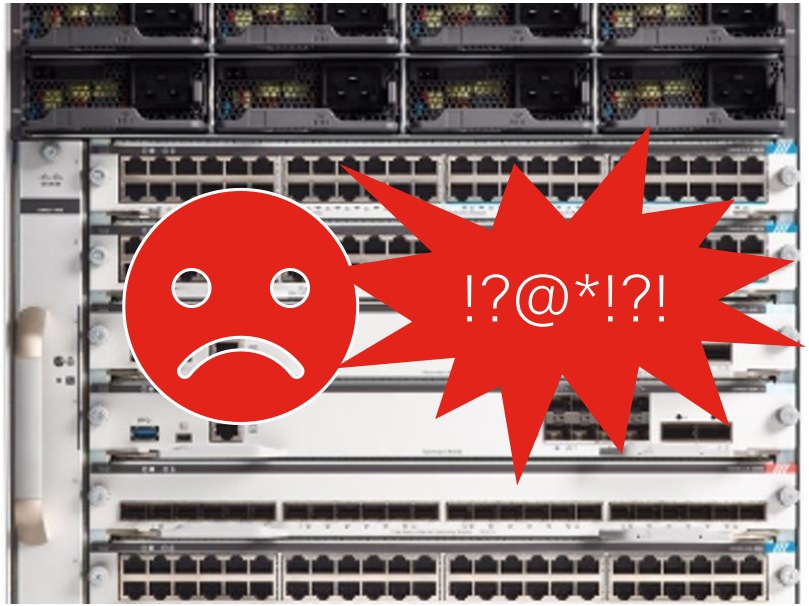
C. I'm not sure

What is Hardware Failure?

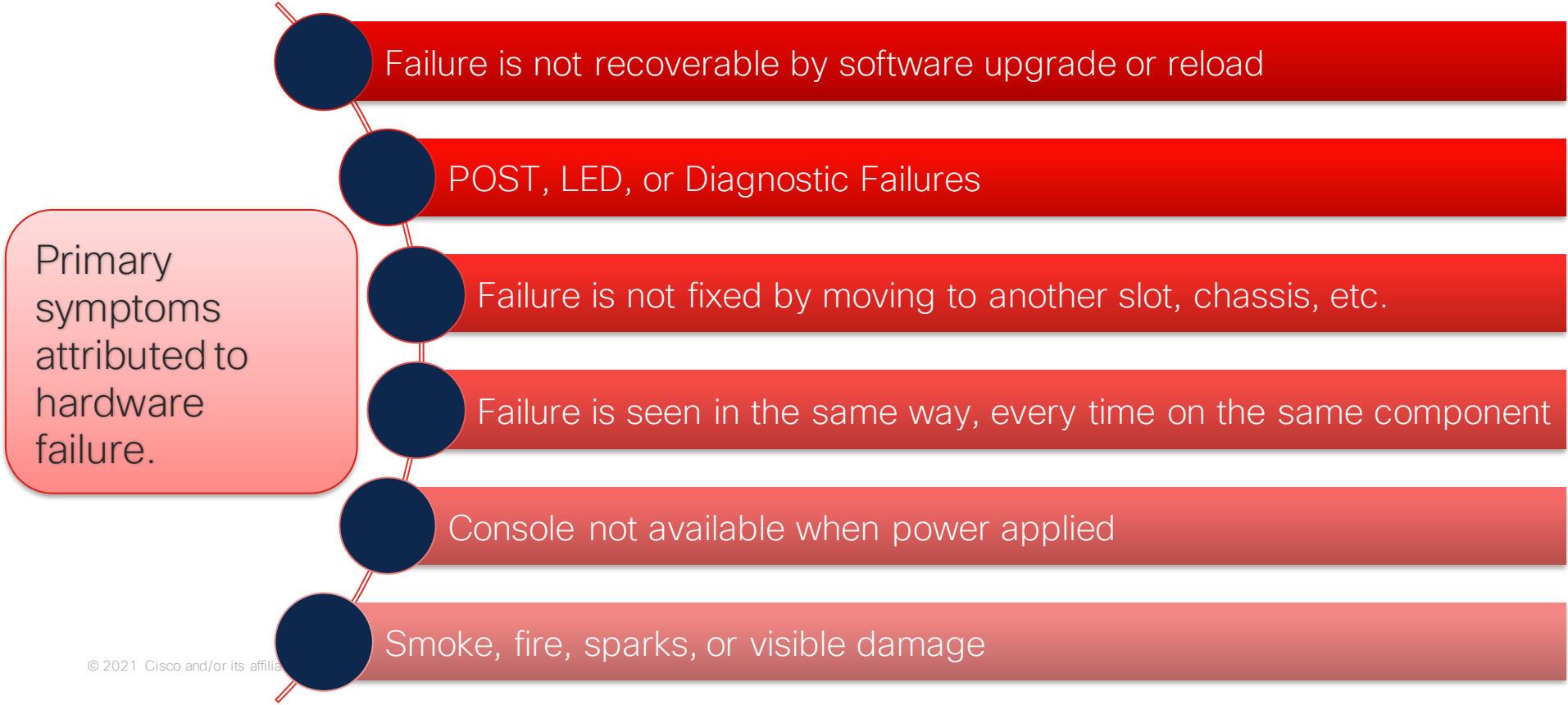
What is Hardware Failure?

Hardware failure is a failure at Layer 1. Hardware failure can be described as a device or component that cannot be recovered or be fixed by any other means.

Genuine hardware failure is extremely rare on Cisco Catalyst devices.



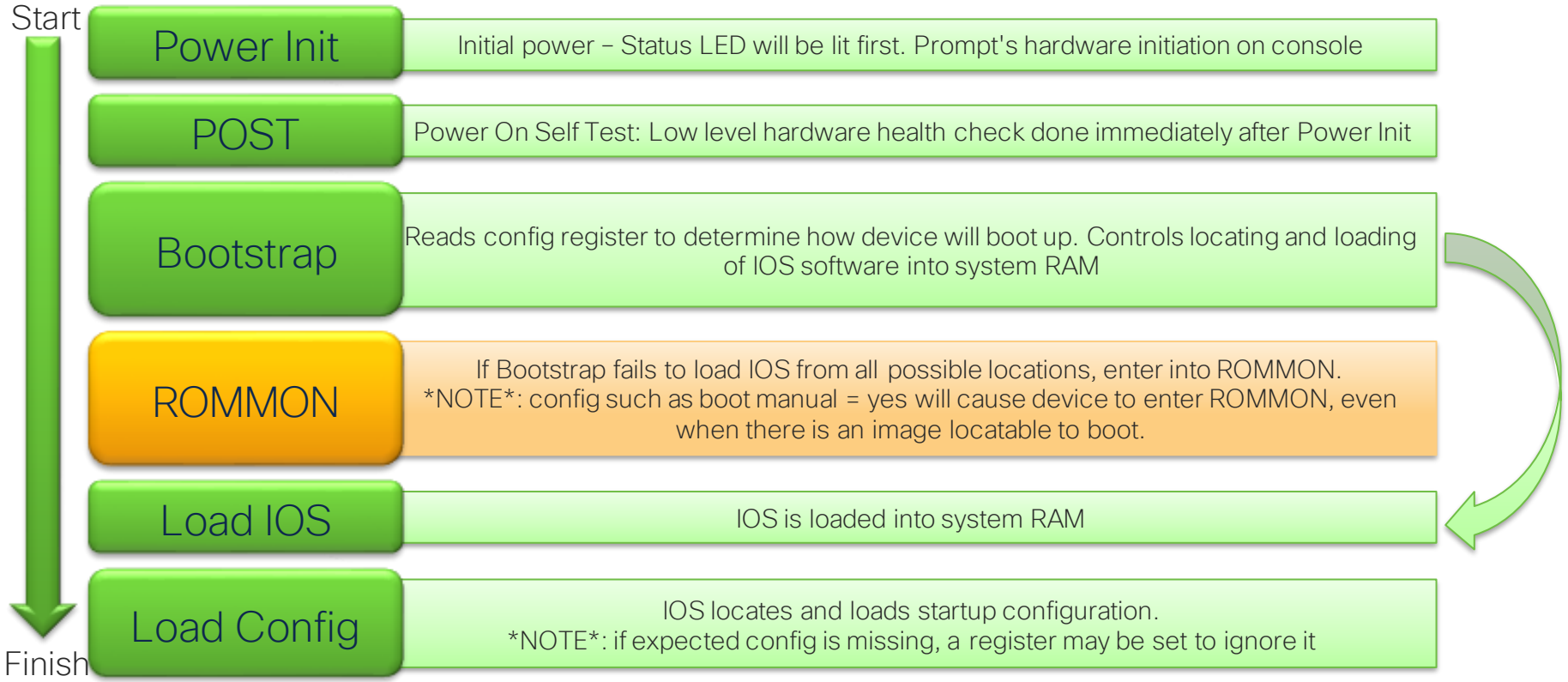
Signs of Legitimate Hardware Failure



Diagnosing Layer 1 Hardware Issues

- Bootup
- LED Status Indicators
- POST/GOLD Diagnostics
- Ports/Stack Ports
- PoE

Bootup



Bootup Question (Legitimate Hardware Failure?)

Console A

```
Initializing Hardware...

Initializing Hardware...

Initializing Hardware...

Initializing Hardware...

Initializing Hardware.

Initializing Hardware...

Initializing Hardware...

Initializing Hardware...

Initializing Hardware...
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
```

Console B

```
Initializing Hardware...

System Bootstrap, Version 16.12.1r [FC1], RELEASE SOFTWARE (P)
Compiled Fri 04/19/2019 15:05:27.48 by rel

Current ROMMON image : Primary
Last reset cause : SoftwareReload
C9300L-48P-4X platform with 8388608 Kbytes of main memory

boot: attempting to boot from [flash:packages.conf]
boot: reading file packages.conf
#
################################################################################
################################################################

Jul 13 21:00:05.405: %PMAN-5-EXITACTION: C0/0: pvp: Process manager is
exiting:

Both links down, not waiting for other switches
Switch number is 1
!
Jul 13 20:53:19.547: %PMAN-3-PROCHOLDDOWN: R0/0: pman: The process
platform_mgr has been helddown (rc 134)
Jul 13 20:53:19.612: %PMAN-0-PROCFAILCRIT: R0/0: pvp: A critical process
platform_mgr has failed (rc 134)
Jul 13 20:53:19.674: %PMAN-3-RELOAD_RP: R0/0: pvp: Reloading: Switch will be
reloaded

Chassis 1 reloading, reason - Non participant detected
Jul 13 20:53:21.810: %PMAN-5-EXITACTION: F0/0: pvp: Process manager is
exiting: reload fp action requested
Jul 13 20:53:23.442: %PMAN-5-EXITACTIONJul 13 20:53:24.449: %PMAN-3-
PROCESS_NOTIFICATION: R0/0: pvp: System report /crashinfo/system-
report_local_20200713-205323-Universal.tar.gz (size: 2128 KB) generated
```

Bootup Question Explained

Console A

```
Initializing Hardware...

Initializing Hardware...

Initializing Hardware...

Initializing Hardware...

Initializing Hardware...

Initializing Hardware...

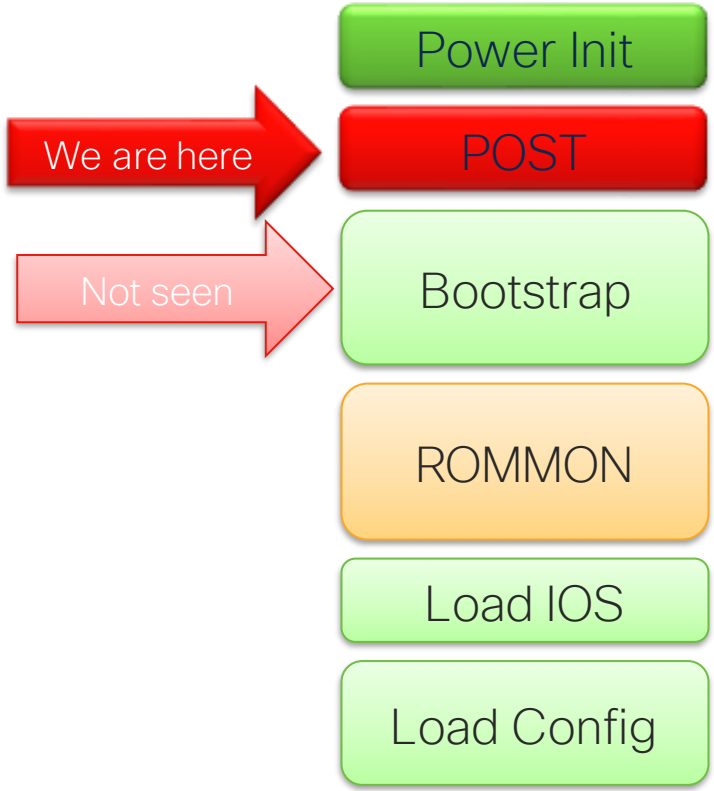
Initializing Hardware...

Initializing Hardware...

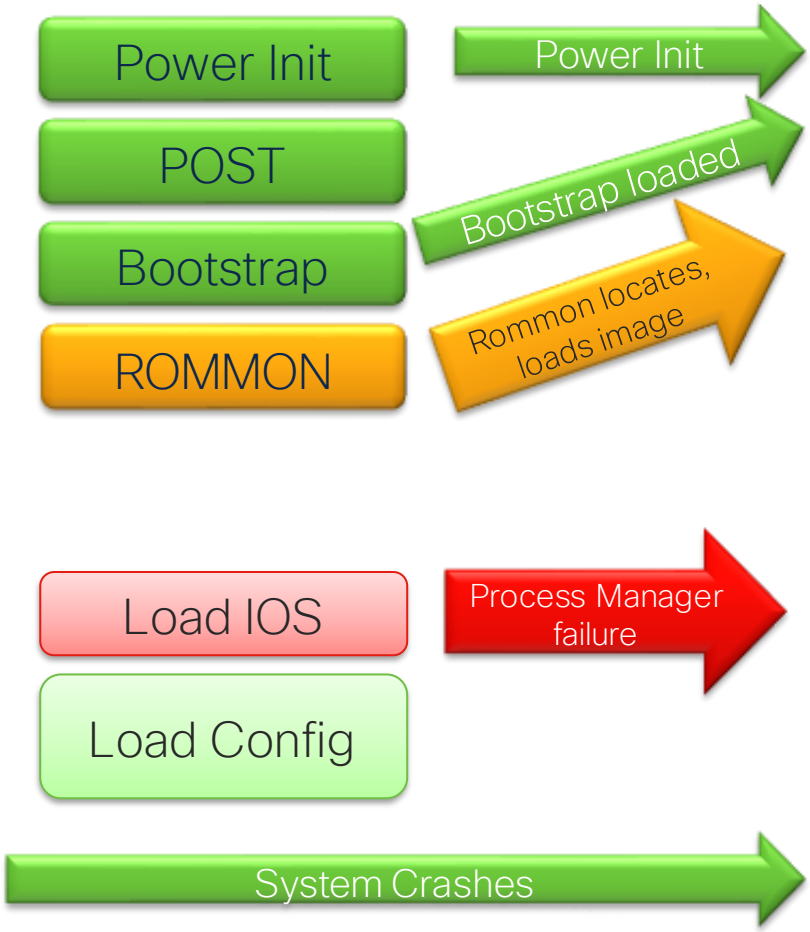
Initializing Hardware...
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
BOOT FAIL W
```

Reports power in it

Bootstrap not seen



Bootup Question Explained



Console B

```
Initializing Hardware...

System Bootstrap, Version 16.12.1r [FC1], RELEASE SOFTWARE (P)
Compiled Fri 04/19/2019 15:05:27.48 by rel

Current ROMMON image : Primary
Last reset cause : SoftwareReload
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PROCESS_NOTIFICATION: R0/0: pvp: System report /crashinfo/system-
report_local_20200713-205323-Universal.tar.gz (size: 2128 KB) generated
```

Led Status Indicators

In this section a few LED status types are noted, with others available in the appropriate Hardware Installation Guide.

Examples we will cover:

- FAN Tray
- Power Supply
- Cat9400 Module

Fan Tray LEDs		
LED Type	**LED Position or Color**	**Meaning**
 STATUS	Off	Fan tray is not getting any power.
	Green	All fans are running and the fan tray is operating normally.
	Amber	**One fan is not running.**
	Red	**Two or more fans are not running.**

Led Status Indicators

Power Supply LEDs		
LED type	**LED Colour**	**Meaning**
 INPUT	Green	AC input voltage is 70 V minimum. DC input voltage is -40 V minimum.
	Off	AC input voltage is less than 70 V. DC input voltage is less than -40 V.
	Blinking Green	AC input voltage is between 70 V and 85 V. DC input voltage is between -37 V and -41 V.
 OUTPUT	Green	55 VDC power supply output and power supply modules are operating within regulation limits.
	Blinking Green	Standby mode or sleep mode. Blinks on for 0.5 seconds and off for 0.5 seconds.
 FAIL	Off	DC output voltages have not exceeded the alarm threshold ranges.
	Red	**An output voltage is out of the specified range,** **...or the power supply module's fan has failed (lack of fan rotation),** **...or the power supply module is turned off after input power is applied.** Illuminates for 2-3 seconds after input is applied or disconnected through the front panel On/ Off rocker switch (for AC-input power supplies) or On/ Off power button (for DC-input power supplies) or a circuit breaker.

Led Status Indicators

Cisco Catalyst 9400 Series Switching Module LEDs		
LED	**LED Color**	**Meaning**
STATUS 	Green	All diagnostic tests have passed, and the module is operational.
	Amber	The module is booting or running diagnostics, or the module is disabled.
	Red	**A test other than an individual port test has failed**. On some modules, this LED turns red immediately after the system is powered on, until the software boot process begins.
	Off	The module is disabled or is not powered up.
PORT LINK 	Green	Port link is up but there is no packet activity.
	Blinking Green	Port link is up and indicating packet activity.
	Amber	Port link is disabled by the user, that is, administratively down.
	Blinking Amber	Hardware **(PHY) has detected a faulty port link**.
	Alternating Green & Amber	**Error packets are being detected on the port link**. The error packets could be bad Cyclic Redundancy Check (CRC) packets, jumbo packets, and so on.
	Off	No signal is detected, the link is down, or the port is not connected.

Diagnostics

This section covers POST and GOLD diagnostics.

- What each tests
- How to view diagnostic results
- How to manually run a diagnostic test

POST (Power On Self Test)
- Seen in show POST
- Checks hardware components including memory and interfaces.

GOLD (Generic OnLine Diagnostics)
- Seen in show diagnostics <options>

Diagnostics Power On Self Test (POST)

```
C9300#show post
Stored system POST messages:

Switch 1
---------

POST: MBIST Tests : Begin
POST: MBIST Tests : End, Status Passed

POST: CRYPTO Tests : Begin
POST: CRYPTO Tests : End, Status Passed

POST: PHY Loopback: loopback Test : Begin
POST: PHY Loopback: loopback Test : End, Status Passed

POST: SIF Tests : Begin
POST: SIF Tests : End, Status Passed

POST: Inline Power Controller Tests : Begin
POST: Inline Power Controller Tests : End, Status
Passed

POST: Thermal, Temperature Tests : Begin
POST: Thermal, Temperature Tests : End, Status Passed

POST: Thermal, Fan Tests : Begin
POST: Thermal, Fan Tests : End, Status Failed
```

Fan Test Failed ?!

Seen in “show post <switch_num>”
Checks hardware components including memory and interfaces.

```
C9300#show environment fan
Switch       FAN   Speed       State
-------------------------------------
  1                              OK
  1     2    0                 NOT PRESENT or FAULTY
  1     3    28000             OK
FAN PS-1 is NOT PRESENT
FAN PS-2 is OK
```

Not Present

Generic On-line Diagnostics (GOLD) Diagnostics

```
### Catalyst 9500 Default Tests ###
C9500#show diagnostic result module all | inc Test
  Test results: (. = Pass, F = Fail, U = Untested)
    1) TestGoldPktLoopback:
    2) TestOBFL ------------------------> U
    3) TestFantray ---------------------> .
    4) TestPhyLoopback:
    5) TestThermal ---------------------> .
    6) TestScratchRegister -------------> .
    7) TestPortTxMonitoring:
    8) TestConsistencyCheckL2 ----------> .
    9) TestConsistencyCheckL3 ----------> .
   10) TestConsistencyCheckMcast -------> .
```

Automatically run

"." = Passed

```
### Catalyst 9300 Default Tests ###
C9300#show diagnostic result switch all | inc Test
  Test results: (. = Pass, F = Fail, U = Untested)
    1) DiagGoldPktTest:
    2) DiagThermalTest -----------------> .
    3) DiagFanTest ---------------------> F
    4) DiagPhyLoopbackTest:
    5) DiagScratchRegisterTest ---------> .
    6) TestUnusedPortLoopback:
    7) TestPortTxMonitoring:
    8) DiagPoETest ---------------------> U
    9) DiagStackCableTest --------------> U
   10) DiagMemoryTest ------------------> U
```

"F" = Failed

"U" = Untested

- Seen in:
  "show diagnostic result <switch|num|all> <module|num|all>"
- For specific list per platform consult the appropriate platform System Management Configuration Guide

```
### Catalyst 9400 Default Tests ###
C9400#show diagnostic result module all | inc
Test
  Test results: (. = Pass, F = Fail, U =
Untested)
    1) TestGoldPktLoopback:
    2) TestPhyLoopback:
    3) TestThermal ---------------------> .
    4) TestScratchRegister -------------> .
    5) TestPoe -------------------------> U
    6) TestUnusedPortLoopback:
    7) TestPortTxMonitoring:

  Test results: (. = Pass, F = Fail, U =
Untested)
    1) TestGoldPktLoopback:
    2) TestFantray ---------------------> .
    3) TestPhyLoopback:
    4) TestThermal ---------------------> .
    5) TestScratchRegister -------------> .
    6) TestMemory ----------------------> U
    7) TestUnusedPortLoopback:
    8) TestPortTxMonitoring:
```

Generic On-line Diagnostics (GOLD) Diagnostics

- In some cases, you may want to run a certain manual test to confirm a specific component is healthy.
- GOLD tests can be run on demand. Note that some tests are disruptive, so use with caution.
- A description of available tests, and if they are disruptive, is available from the CLI

```
C9300# show diagnostic description switch 1 test all

DiagGoldPktTest :
        The GOLD packet Loopback test verifies the MAC level loopback functionality. In this
        test, a GOLD packet, for which doppler provides the support in hardware, is sent. The
        packet loops back at MAC level and is matched against the stored packet. It is a non-
        disruptive test.

DiagThermalTest :
        This test verifies the temperature reading from the                below the yellow
        temperature threshold. It is a non-disruptive test and can be run as a health
        monitoring test

DiagFanTest :
        This test verifies all fan modules h          inserted and working properly on the
        board. It is a non-disruptive test and can be run as a health monitoring test
        <…snip…>

DiagStackCableTest :
        This test verifies the st          oopback functionality in the stacking environment.
        It is a disruptive test cannot be run as a health monitoring test
```

Non-Disruptive

Non-Disruptive

Non-Disruptive

Disruptive

Generic On-line Diagnostics GOLD) Diagnostics

- Another description of available tests, and if they are disruptive, on by default, etc.

```
C9300#show diagnostic description switch 1 test ?

  Diagnostics test suite attributes:
    M/C/* - Minimal bootup level test / Complete bootup level test / NA
      B/* - Basic ondemand test / NA
    P/V/* - Per port test / Per device test / NA
    D/N/* - Disruptive test / Non-disruptive test / NA
      S/* - Only applicable to standby unit / NA
      X/* - Not a health monitoring test / NA
      F/* - Fixed monitoring interval test / NA
      E/* - Always enabled monitoring test / NA
      A/I - Monitoring is active / Monitoring is inactive

                                                    Test Interval   Thre-
  ID   Test Name                                    Attributes      day hh:mm:ss.ms shold
  ==== ========================================== ============     =============== =====
    1) DiagGoldPktTest ----------------->          *BPN*X**I       not configured  n/a
    2) DiagThermalTest ----------------->          *B*N****A       000 00:01:30.00 5
    3) DiagFanTest --------------------->          *B*N****A       000 00:01:30.00 5
    4) DiagPhyLoopbackTest ------------->          *BPD*X**I       not configured  n/a
    5) DiagScratchRegisterTest --------->          *B*N****A       000 00:01:30.00 5
    6) TestUnusedPortLoopback ---------->          *BPN****I       not configured  n/a
    7) TestPortTxMonitoring ------------>          *BPN****A       000 00:01:30.00 1
    8) DiagPoETest --------------------->          ***D*X**I       not configured  n/a
    9) DiagStackCableTest -------------->          ***D*X**I       not configured  n/a
   10) DiagMemoryTest ------------------>          *B*D*X**I       not configured  n/a
```

Diagnostic Key

```
*B*N****A
*B*N****A
*BPD*X**I
*B*N****A
*BPN****I
*BPN****A
***D*X**I
***D*X**I
*B*D*X**I
```

Generic On-line Diagnostics GOLD) Diagnostics

- As seen in the POST example, the switch failed the Fan test due to missing fan #2
- GOLD also runs a fan test by default, and we can see this also fails

```
C9300#show diagnostic description switch 1 test ?
                                                          Test Interval   Thre-
  ID   Test Name                            Attributes     day hh:mm:ss.ms shold
  ==== ================================== ============    =============== =====
 3) DiagFanTest ---------------------> *B*N****A       000 00:01:30.00 5

B = Basic On Demamd Test
N = Non-Disruptive
A = Active

C9300#sh diagnostic result switch 1 test DiagFanTest

Current bootup diagnostic level: minimal
  Test results: (. = Pass, F = Fail, U = Untested)
    3) DiagFanTest ---------------------> F
```

Generic On-line Diagnostics (GOLD) Diagnostics

Running an on-demand GOLD test for DiagFanTest will produce a syslog showing the

```
C9300# diagnostic start switch 1 test DiagFanTest

*Apr  9 18:37:07.030: %DIAG-6-TEST_RUNNING: switch 1: Running DiagFanTest{ID=3} ...
*Apr  9 18:37:07.066: %DIAG-3-TEST_FAIL: switch 1: DiagFanTest{ID=3} has failed. Error code = 0x1 (DIAG_FAILURE)
```

```
C9300# diagnostic start switch 1 test DiagFanTest

*Apr  9 18:43:23.201: %DIAG-6-TEST_RUNNING: switch 1: Running DiagGoldPktTest{ID=1} ...
*Apr  9 18:43:23.264: %DIAG-6-TEST_OK: switch 1: DiagGoldPktTest{ID=1} has completed successfully
```

Test is disruptive, and will flap ports during

```
C9300# diagnostic start switch 1 test DiagPhyLoopbackTest
Diagnostic[switch 1]: Running test(s) 4 may disrupt normal system operation and requires reload
Do you want to continue? [no]:
```

Ports & Stack Ports

Link up Issues

- Self loop cable (verify each end)
- Light levels
- TDR test (Time Domain Reflectometer)

CRC/Input Errors on Interfaces

- Isolate which component (local SFP, Cable, Remote SFP)

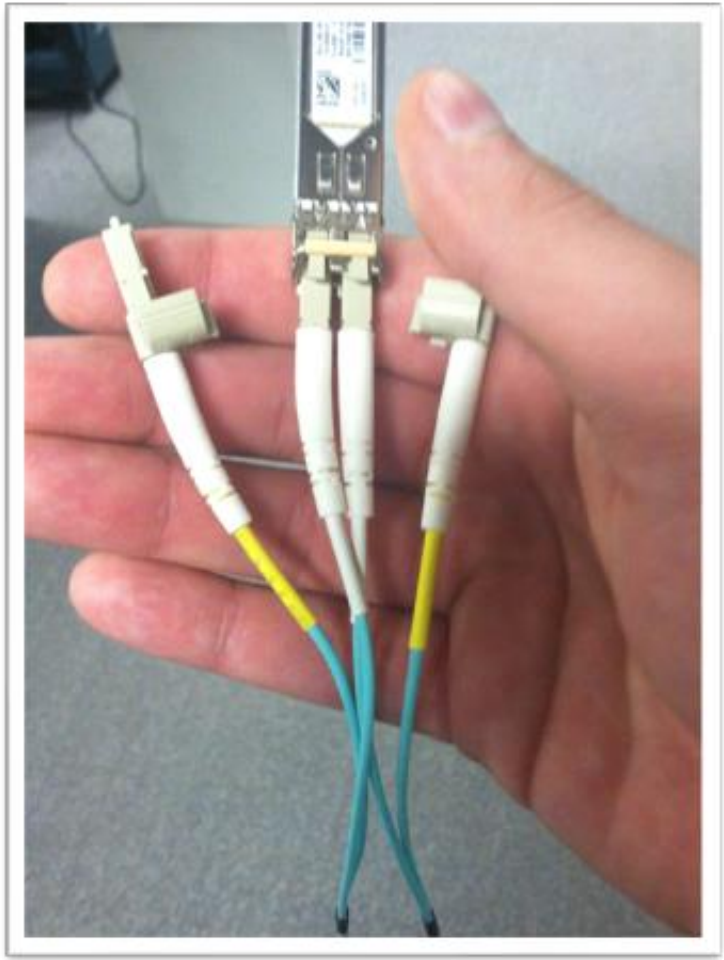
Stack Cable Issues

- Check stack cable errors (like CRCs)
- Check Stack cable stability

Ports & Stack Ports (Link Up)

Self Loop cable

- The cable is split, with **one** of the fiber strands connected to the Tx/Rx sides and connected to known good SFP
- Used to test a **local** port/SFP's ability to come up.
- If it does not come up with self loop cable, then local port is likely problem.
- If port does come up/up, then local port not the issue. Test another end if possible.
- Useful in circumstances where the remote end is unavailable to troubleshoot, such as when working on an ISP circuit



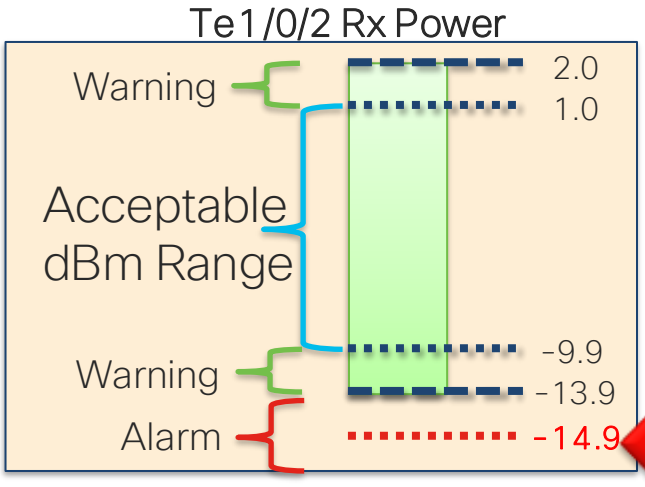
Ports & Stack Ports (Link Up)

SFP light levels

- Requires SFP be Digital Optical Monitoring (DOM) capable
- Can identify if a port is Receiving/Transmitting enough light

Syslogs are generated when upper/lower thresholds are violated

```
%SFF8472-3-THRESHOLD_VIOLATION: Te1/0/24: Rx power low warning; Operating value: -14.9 dBm, Threshold value: -13.9 dBm.
```



DOM shows detailed information about SFP thresholds and current operating light level

```
BLX_CDE_SW_COR_1#show interfaces tengig 1/0/2 transceiver detail

Optical                 High Alarm  High Warn  Low Warn   Low Alarm
                        Transmit Power  Threshold  Threshold  Threshold  Threshold
Port        Lane        (dBm)           (dBm)      (dBm)      (dBm)      (dBm)
---------   ----        ---------       ---------  ---------  ---------  ---------
Te1/0/2     N/A         -2.0                 1.7       -1.3       -7.3      -11.3

                        Optical         High Alarm  High Warn  Low Warn   Low Alarm
                        Receive Power   Threshold  Threshold  Threshold  Threshold
Port        Lane        (dBm)           (dBm)      (dBm)      (dBm)      (dBm)
---------   ----        ---------       ---------  ---------  ---------  ---------
Te1/0/2     N/A         -14.9                2.0       -1.0       -9.9      -13.9
```

Our Reading

Ports & Stack Ports (Link Up)

TDR Cable Test (Catalyst 9300)

- The Time Domain Reflectometer (TDR) feature allows you to check if a copper cable has an OPEN or SHORT fault.
- TDR detects a cable fault by sending a signal through the cable and reading the signal that is reflected back. All or part of the signal can be reflected back due to defects in the cable.

There are several important guidelines to keep in mind when using TDR

- Please consult the TDR documentation for this list

Note: TDR may be implemented differently on different platforms. Consult the appropriate platform hardware guide for a more inclusive list of guidelines and fault indicator meanings.

Ports & Stack Ports (Link Up)
TDR Cable Test (Catalyst 9300)

Start test

```
C9300# test cable-diagnostics tdr int g 1/0/1
TDR test started on interface Gi1/0/1
A TDR test can take a few seconds to run on an interface
Use 'show cable-diagnostics tdr' to read the TDR results.
```

Note: Wait about 10-15 seconds for test to complete, or results may be incomplete or incorrect

View Results

```
C9300# show cable-diagnostics tdr interface g 1/0/1
TDR test last run on: April 12 14:22:58

Interface   Speed Local pair Pair length        Remote pair Pair status
---------   ----- ---------- ------------------ ----------- ------------
Gi1/0/1     1000M Pair A     7    +/- 10 meters Pair B      Normal
                  Pair B     N/A                Pair A      Normal
                  Pair C     9    +/- 10 meters Pair D      Normal
                  Pair D     N/A                Pair C      Normal
```

Ports & Stack Ports (CRC/Input Errors)

Isolating the source of CRCs can help with finding the right hardware to fix

- CRC/Input errors are usually receive errors (remote end is sending bad frames toward the side reporting the error).
- These can be a result of a poor SFP seating, bad port, SFP, cable, or patch panel.

Check for errors and that they are actively incrementing

```
C9300# show interface te1/0/1 | inc line|rate|error|CRC
TenGigabitEthernet1/0/1 is up, line protocol is up (connected)
Queueing strategy: Class-based queueing
5 minute input rate 373384000 bits/sec, 45526 packets/sec
5 minute output rate 147422000 bits/sec, 24284 packets/sec
603963 input errors, 595562 CRC, 0 frame, 0 overrun, 0 ignored
0 output errors, 0 collisions, 2 interface resets
```

Troubleshoot

1. Clear counters on both ports for a clean baseline
2. Swap/Reseat remote end, check for new errors (if clean, issue was with this SFP)
3. Swap/Reseat local end, check for new errors (if clean, issue was with this SFP)
4. Clean/Swap/Move fiber connection (if this fixes, issue with fiber or patch panel

Ports & Stack Ports (Stack Cable)

Stack Cable Errors result in packet loss, or stacks to reload

Syslogs are generated when Stack cables are flapping
Note: stack cable may not flap for every error, but is always telling when it does

```
%STACKMGR-1-STACK_LINK_CHANGE: STANDBY:1 stack-mgr:  Stack port 1 on switch 1 is down  (SW1-1)
%STACKMGR-1-STACK_LINK_CHANGE: STANDBY:1 stack-mgr:  Stack port 1 on switch 1 is up  (SW1-1)
%STACKMGR-1-STACK_LINK_CHANGE: 2 stack-mgr:  Stack port 2 on switch 2 is down
%STACKMGR-1-STACK_LINK_CHANGE: 2 stack-mgr:  Stack port 2 on switch 2 is up
%STACKMGR-1-STACK_LINK_CHANGE: 2 stack-mgr:  Stack port 2 on switch 2 is down
%STACKMGR-6-SWITCH_REMOVED: 2 stack-mgr:  Switch 1 has been removed from the stack.
Starting SWITCH-DELETE sequence, switch 1
```

Cables have counters that can be used to identify actively incrementing errors

```
show platform hardware fed sw <#/active/standby> fwd-asic register read register-name SifRacDataCrcErrorCnt asic <0-1>
Segment with data CRC error
show platform hardware fed sw <#/active/standby> fwd-asic register read register-name SifRacRwCrcErrorCnt asic<0-1>
Incremented on any failed CRC check
show platform hardware fed sw <#/active/standby> fwd-asic register read register-name SifRacPcsCodeWordErrorCnt asic <0-1>
Incremented on invalid PCS code, unknown PCS codeword, running disparity error is detected
show platform hardware fed sw <#/active/standby> fwd-asic register read register-name SifRacInvalidRingWordCnt asic <0-1>
Bit error on stack caused ringword CRC error
```

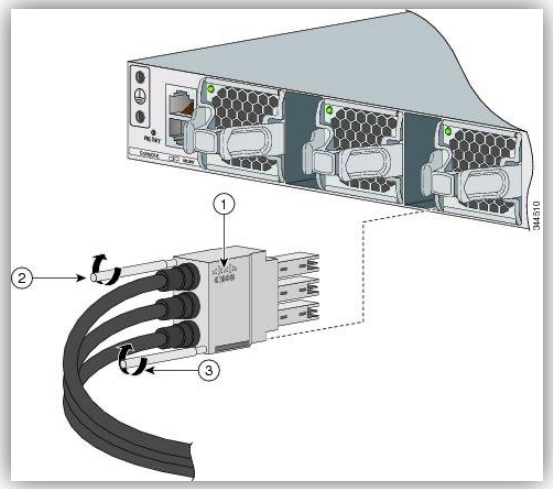
Ports & Stack Ports (Stack Cable)

Stack Cable Errors result in packet loss, or stacks to reload

Checking counters for errors (example SifRacRwCrcErrorCnt)

```
show platform hardware fed sw <#/active/standby> fwd-asic register read register-name
SifRacDataCrcErrorCnt asic <0-1>

SifRacRwCrcErrorCnt on  Asic 0
[0]
              count 0x000000c9  ← Actively  Incrementing  on ring 0
[1]
              count 0x00000001
[2]
              count 0x00000000
[3]
              count 0x00000001
[4]
              count 0x00000000
[5]
              count 0x00000001
```



1	Cisco logo	3	Connector screw
2	Connector screw		

Troubleshoot

- Confirm errors are actively incrementing (check multiple iterations of stack counter commands)
- Swap stack adapter on one end (if switch uses adapter and this is applicable)
- Swap stack adapter on other end (if switch uses adapter and this is applicable)
- Swap stack cable

- **Check cables are properly tightened**. Too loose or too tight connections can cause issues. Stack cables should be finger-tight, not tight by a tool
- **Ensure cable is not upside down.** Stack cables can be installed the wrong way. Ensure the Cisco logo is upright (logo is not upside down)

Polling Question 2

Were the troubleshooting techniques shown so far familiar to you?

A. Yes

B. No

PoE Diagnostics

Test Hardware Functionality of the Poe Component (Diagnostics Test)

Online diagnostics detect problems related but not limited to: PoE hardware components, Interfaces, Solder joints & board integrity

These are run the same way as noted in the GOLD section of this presentation.

- Before running the test, read the information in the table below to understand potential impact.

Platform	Test Name	Disruptive or Non Disruptive	Default Status	Recommendation	Initial Release
Catalyst 9200	DiagPoETest	Disruptive	off	Do not start this diagnostic test during normal switch operation unless recommended/assured by TAC. This test can be run if you experience PoE controller issues with a port and it can be run only as an on-demand test	16.9.2
Catalyst 9300	DiagPoETest	Disruptive	off	Do not start this diagnostic test during normal switch operation unless recommended/assured by TAC. This test can be run if you experience PoE controller issues with a port and it can be run only as an on-demand test	16.6.1
Catalyst 9400	TestPoE	Non Disruptive	off	Run this test if you experience PoE controller issues with a port.	16.6.1

PoE Diagnostics

Test Hardware Functionality of the Poe Component (Diagnostics Test Example)

Catalyst 9300

```
C9300# diagnostic start switch 1 test DiagPoETest ← 1 is switch number, use respective switch number in question
Diagnostic[switch 1]: Running test(s) 8 may disrupt normal system operation and requires reload
Do you want to continue? [no]: yes ← use with caution, this is disruptive test


*Mar 7 06:28:39 CET: %DIAG-6-TEST_RUNNING: switch 1: Running DiagPoETest{ID=8} ...
*Mar 7 06:28:39 CET: %DIAG-6-TEST_OK: switch 1: DiagPoETest{ID=8} has completed successfully


C9348U-1#show diagnostic result switch 1 test DiagPoETest
Current bootup diagnostic level: minimal
Test results: (. = Pass, F = Fail, U = Untested)
8) DiagPoETest ----------------------> . ← expected result is pass "."
```

PoE Power

Confirm Power Budget Available Is Enough to Power Devices

```
C9300# show platform software ilpower system 1  ← This value represents switch number for C9300/C9200 and line card number for C9400

ILP System Configuration
    Slot: 1
   ILP Supported: Yes
   Total Power: 857000
   Used Power: 8896
   Initialization Done: Yes
   Post Done: Yes
   Post Result Logged: No
   Post Result: Success
   Power Summary:
      Module: 0
      Power Total: 857000
      Power Used: 8896
      Power Threshold: 80
      Operation Status: On
   Pool: 1
      Pool Valid: Yes
      Total Power: 857000
      Power Usage: 8896
```

```
C9300#show power inline module 1 <++ This value represents switch number for C9300/C9200 and line card number for C9400

Module   Available     Used         Remaining
         (Watts)      (Watts)       (Watts)
------   ---------   --------      ---------
  1        857.0        8.9           848.1    <++ available PoE budget on switch 1

Interface  Admin    Oper     Power       Device          Class Max
                            (Watts)
---------- ------ ---------- ------- ------------------ ----- ----
Gi1/0/1    off    off         0.0         n/a              n/a 60.0
Gi1/0/2    auto   off         0.0         n/a              n/a 60.0
Gi1/0/3    auto   off         0.0         n/a              n/a 60.0
Gi1/0/4    auto   on          8.9       IP Phone 8851       4  60.0
```

Oper status of "Bad" or "Faulty" may mean there is a hardware issue, but not always

PoE Log Messages

ILPOWER POWER DENY

This error means that there is not enough power remaining in the switch to supply to the Power over Ethernet (PoE) port.
This is likely due to total inline power being greater than available power. Verify power budgeting. Install more power supplies if needed.
Changing power supply redundancy from redundant to combined may also help. For stacked systems, stack power can be considered to pool total power across stacks.

Note*: this message is not necessarily a hardware issue, but can indicate to check power supplies, stack power, cabling, etc.*

```
%ILPOWER-5-IEEE_DISCONNECT: Interface Gi1/0/1: PD removed
%ILPOWER-7-DETECT: Interface Gi1/0/1: Power Device detected: IEEE PD
%ILPOWER-5-ILPOWER_POWER_DENY: Interface Gi1/0/1: inline power denied. Reason: insufficient power
```

CONTROLLER POST ERR

Switch decided to shut off PoE because Power On Self Test (POST) failed on this switch. Run “show post” to confirm diagnostic result

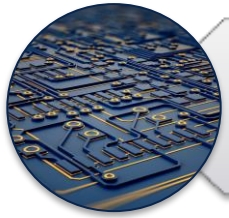
```
%ILPOWER-3-CONTROLLER_POST_ERR: Inline Power Feature is disabled on this switch because Power On Self Test (POST)
failed on this switch.
```

Other PoE Log Messages

- There are many possible log messages that can help in isolating a PoE issue.
- Messages can point to a problem with config, PD failure, etc. and not indicate a problem with the Switch
- Consult the PoE troubleshooting guide for the detailed list, definitions, actions to troubleshoot further.

Other PoE Troubleshooting

Methods of Isolating a PoE Issue via Moving/Swapping Hardware



Did this device work before, and for how long?

If this PD was operating normally, then fails (versus never working) may indicate something might have failed. Follow steps to swap in/out components to isolate which device

Does this same port/device work for other types of PoE (Can you swap out a suspect AP for a phone and see the same issue)?

If port powers the test device, then this is likely config, compatibility, or some problem other than HW

Does this only impact one type of IEEE class device (IEEE class 3 works, but class 4 does not)?

Same as above.

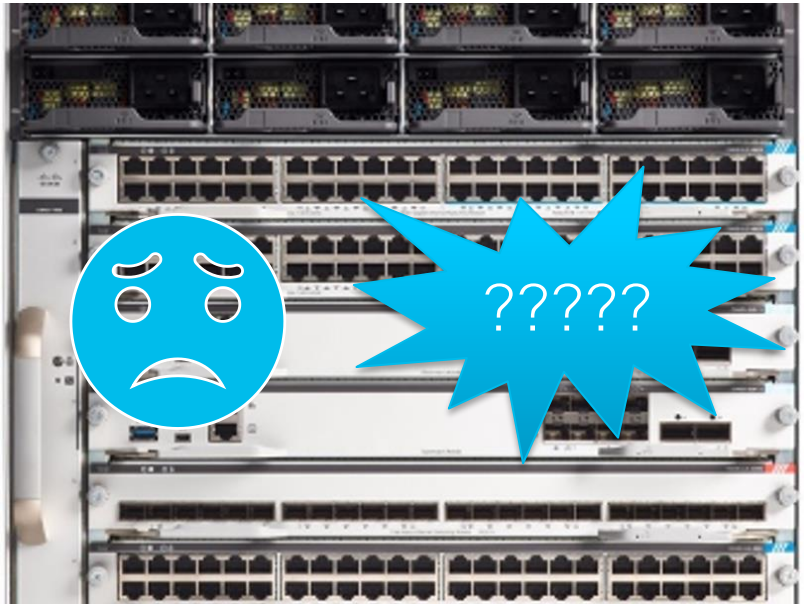
Does the issue follow the port/device or the PD endpoint?

If it follows the PD across other devices, then the problem is likely with the PD. If it always follows the port/switch them focus investigation there.

What is Non-Hardware Failure?

What is Non-Hardware Failure?

Non-hardware failure is anytime a device is not behaving as expected but recovers on its own, or a change in configuration, traffic profile, reboot, or software upgrade resolves the issue.



Diagnosing Other Issues

- Bootup
- PoE
- Software Defects

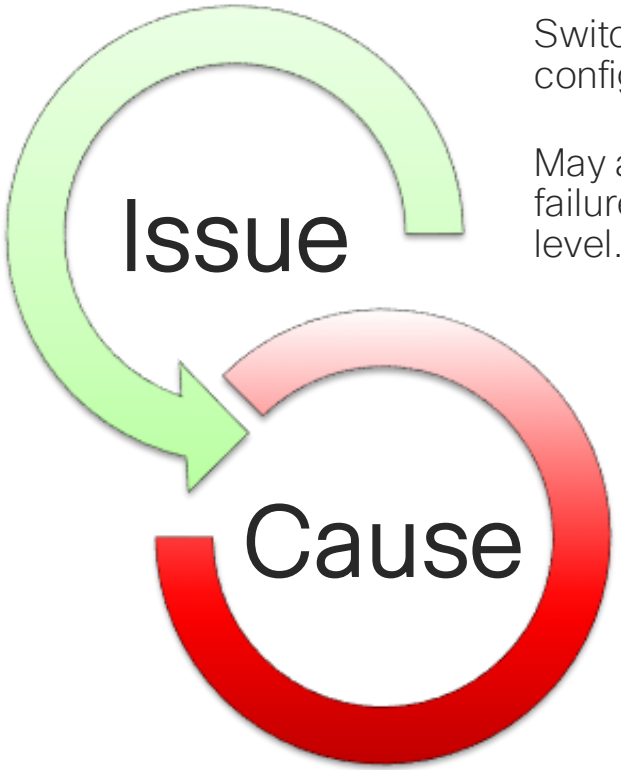
Signs of Non-Hardware Failure

- Failure is recoverable by software upgrade or reload
- POST, LED, or Diagnostics PASS
- Failure is fixed by moving to another slot, chassis, etc.
- Failure is not seen in the same way, every time on the same component
- Console remains available when power applied
- Symptom is transient and recovers on its own

When a device or feature is failing at Layer 2 or higher, with all L1 diagnostics as PASS, troubleshooting is needed. Layers beyond L1 are more susceptible to software defects, config issues, traffic, etc.

Bootup

Switch Ignoring Startup config



Switch boots up with zero configuration.

May appear as hardware failure since it happens at low level.

Switch is configured to ignore startup-config, resulting in this behavior.

Verify

```
C9300# show romvar
ROMMON variables:
<snip>
SWITCH_NUMBER="2"
STACK_1_1="0_0"
ABNORMAL_RESET_COUNT="1"
BOOT="flash:cat9k_iosxe.16.12.04.SPA.bin;"
RET_2_RTS="16:45:55 UTC Tue Mar 9 2021"
RET_2_RCALTS=""
ROMMON_AUTOBOOT_ATTEMPT="3"
BSI="0"
RANDOM_NUM="2025409930"
SWITCH_IGNORE_STARTUP_CFG="1"
```

```
switch: set
ROMMON variables:
<snip>
SWITCH_NUMBER="2"
STACK_1_1="0_0"
ABNORMAL_RESET_COUNT="1"
BOOT="flash:cat9k_iosxe.16.12.04.SPA.bin;"
RET_2_RTS="16:45:55 UTC Tue Mar 9 2021"
RET_2_RCALTS=""
ROMMON_AUTOBOOT_ATTEMPT="3"
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```

Bootup

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ROMMON_AUTOBOOT_ATTEMPT="3"
BSI="0"
RANDOM_NUM="2025409930"
SWITCH_IGNORE_STARTUP_CFG=”0”
```

```
switch: set
ROMMON variables:
<snip>
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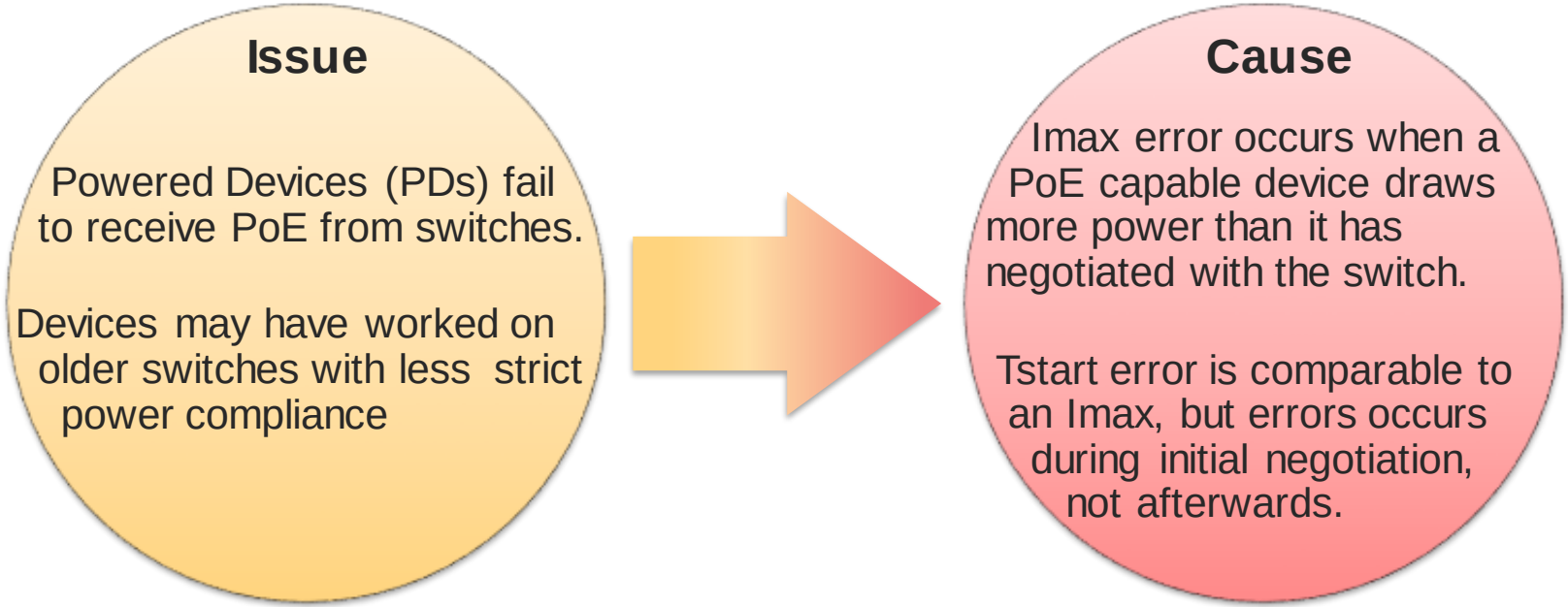
STACK_1_1="0_0"
ABNORMAL_RESET_COUNT="1"
BOOT="flash:cat9k_iosxe.16.12.04.SPA.bin;"
RET_2_RTS="16:45:55 UTC Tue Mar 9 2021"
RET_2_RCALTS=""
ROMMON_AUTOBOOT_ATTEMPT="3"
BSI="0"
RANDOM_NUM="2025409930"
SWITCH_IGNORE_STARTUP_CFG=”0”
```

Remediate

```
C9300(config)#no system ignore startupconfig switch all
OR
switch: set SWITCH_IGNORE_STARTUP_CFG=0
```

PoE

Imax and Tstart Errors



PoE

Imax and Tstart Errors

Verify

```
Jul 19 09:28:06.460: %ILPOWER-3-CONTROLLER_PORT_ERR: Controller port error, Interface
Te1/0/43: Power Controller reports power Imax error detected
Jul 19 09:28:16.461: %ILPOWER-5-IEEE_DISCONNECT: Interface Te1/0/43: PD removed
```

```
Jan 19 2021 05:19:34.038 UTC: %ILPOWER-3-CONTROLLER_PORT_ERR: Controller port error,
Interface Gi1/0/14: Power Controller reports power Tstart error detected
Jan 19 2021 05:19:44.038 UTC: %ILPOWER-5-IEEE_DISCONNECT: Interface Gi1/0/14: PD removed
```

Remediate

- PD is not IEEE compliant, contact appropriate vendor
- Potential mitigation through a longer Ethernet cable, use of power injector

Software Defects

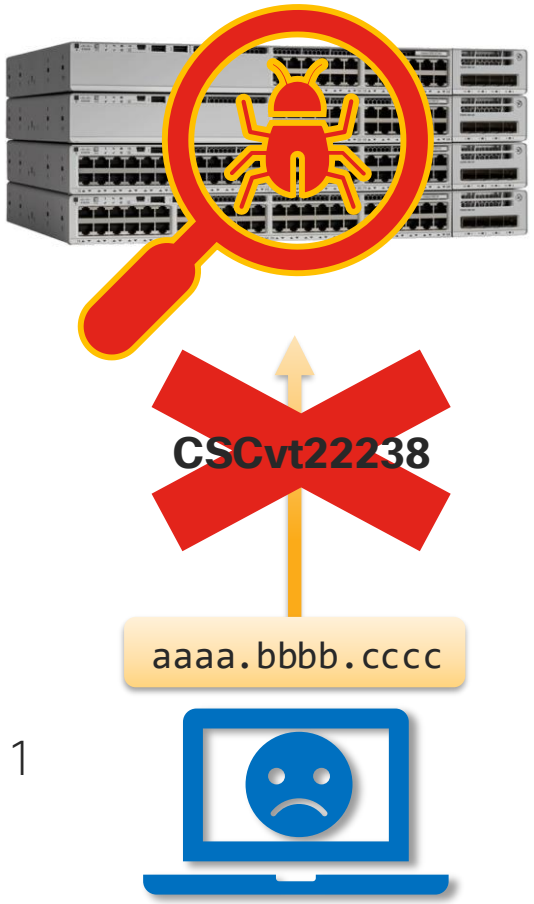
Example: CSCvt22238 MAC Learning Bug

Symptoms:

- Interface counters do not increment
- MAC addresses do not get learnt, age out, etc.
- Packet loss to hosts, and Unicast flooding
- Impacts devices based on uptime of 49 days
- Reload fixes issue, but it returns

Conclusions:

- Issue presents itself like hardware failure but is not.
- Issues and symptoms experienced are above Layer 1
- Further troubleshooting would be required



Polling Question 3

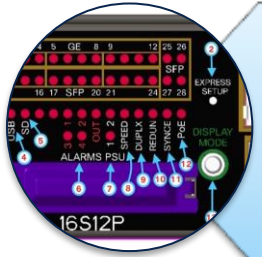
What other platforms (or deeper dive into a single technology) would you like to see hardware troubleshooting sessions for?

A. Security
B. Collaboration & video
C. Service Provider
D. Wireless
E. Data Center
F. Other___

Troubleshooting Checklist

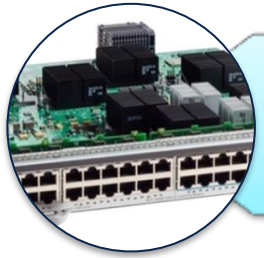
Quick Checklist for Common Issues

Bootup



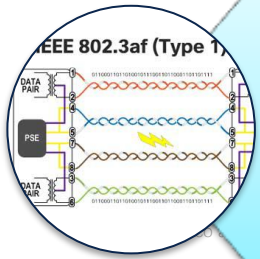
- ✓ Confirm LED lights. Are they blinking, etc?
- ✓ Boot configuration is correct?
- ✓ Attempt manual boot from ROMMON
- ✓ Copy new image with confirmed good MD5
- ✓ Package file is pointing to right image
- ✓ Boot different image from USB, TFTP

Line Card



- ✓ On supported code?
- ✓ Do the same diagnostics fail each time?
- ✓ Is it working in other slot or chassis?
- ✓ Is it one port, group of ports, or whole card?

PoE

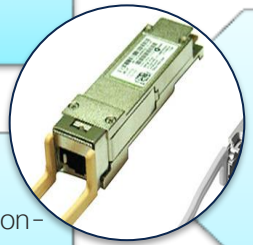


- ✓ Was this working previously, or new implementation?
- ✓ Does this port only fail power? comes up for non-powered device?
- ✓ Does this only fail with certain PDs but not others?
- ✓ Does card support the right power (IEEE, power remaining for PoE)?
- ✓ Is the cable length too long?

Crash, Device Responsiveness

- ✓ Still console access when device is unreachable?
- ✓ Any logs produced prior to loss of access or crash?
- ✓ Any environmental issues? Power outage, etc.?
- ✓ Did this start after code change, new devices added?
- ✓ Was a system report, crash/core file written to flash?

Link Up



- ✓ Is the optic supported on current code?
- ✓ Has optic ever worked previously, or is this new?
- ✓ Is the type/length of cable/fiber correct?
- ✓ Does the optic work in other ports/switches?
- ✓ Is optic Cisco-branded?
- ✓ Does link come up using self loop test?

General Questions to Consider In Relation to Hardware

To isolate an issue, it is helpful to think holistically and understand if there is anything about the problem that may indicate something other than hardware failure.

If the issue is still not clear, use these guidelines to help validate:

Does reload, code upgrade, other action taken fix it?

- If so, then this is likely not hardware

Is this happening with a large number of devices at once, or in multiple sites?

- Issues across sites, or many devices at once are less likely hardware

Does it fix itself, or does it require intervention and what kind?

- Issues that go away on their own or can be solved via user action are not likely hardware

Any recent changes to the network that might be related?

- Network, server, other changes can change traffic or device behavior. Good communication with other network teams is very helpful in understanding what recent events may be playing a role in the issue.

Configuration, White Papers, Best Practices, Cisco Validated Design, Release Notes

- Config and design validation is needed prior to considering hardware as the cause.

Variables unique to the network (traffic, ESD, electrical grounding, etc.)

- Devices located in harsh environments, older buildings, closets can build up dirt, be poorly grounded, etc impacting hardware.

Is there another identical device that is operating normally at this site or another site with the same design?

- Networks are almost never identical. There are almost always differences (such as traffic) that are not known without deeper investigation. This data point is not a strong indicator of a hardware problem and requires further triage.

Resources

- Tips and Tricks for Utilizing Cisco's Hardware Replacement Services
- The Top 7 Problems that People Think Are Hardware, But Are Not
- Cisco Catalyst 9400 Series Switches Hardware Installation Guide
- System Management Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Catalyst 9600 Switches)
- Interface and Hardware Components Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Catalyst 9300 Switches) (TDR test)
- IOS-XE Syslog Error and System Messages
- Cisco Optics-to-Device Compatibility Matrix
- Recover from Corrupt or Missing File Image or in ROMmon Mode

TAC/BU Authored

- Troubleshoot Bootloader (Rommon) and Password Recovery on Catalyst 9000 Series Switches
- Catalyst 9000 Switches booting to switch: prompt due to Stack 1+1 variable
- Upgrade Guide for Cisco Catalyst 9000 Switches
- Troubleshooting Power over Ethernet (PoE) on Catalyst 9000 switches
- Configuration Register equivalent CLIs in IOS-XE
- Troubleshooting Power over Ethernet (PoE) on Catalyst 9000 switches
- Troubleshooting 3650/3850 reloads by stack manager through a system report

Note: this list is not exhaustive. System Management Guide, Hardware install guides, etc. are samples. Please refer to your exact HW/SW guides where applicable.

The bridge to possible

Submit Your Questions Now!

Use the Q&A panel to submit your questions, our expert will respond

Ask Me Anything following the event

Now through Friday
May 21st, 2021

With
Ambrose Taylor & Nathan Pan

http://bit.ly/ama-rma-may13

Ambrose Taylor
Technical Leader
CCIE#60254

Nathan Pan
Technical Leader

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Check the events calendar here:
https://community.cisco.com/t5/custom/page/page-id/Events?categoryId=technology-support

Thank you for Your Time!

Please take a moment to complete the survey

Thanks For Joining today!

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