Checking the Health of the Network

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Show Mesh Commands

The **show mesh** commands are grouped under the following sections:

Viewing General Mesh Network Details

To view general mesh network details, enter these commands:

- **show mesh env** {**summary** | *AP_name*}—Shows the temperature, heater status, and Ethernet status for either all access points (summary) or a specific access point (AP_name). The access point name, role (RootAP or MeshAP), and model are also shown.
  - The temperature is shown in both Fahrenheit and Celsius.
  - The heater status is ON or OFF.
  - The Ethernet status is UP or DOWN.

Note The battery status appears as N/A (not applicable) in the **show mesh env** *AP_name* status display because it is not provided for access points.

```
(Cisco Controller) > show mesh env summary

AP Name             Temperature(C/F)  Heater  Ethernet  Battery
------------------  ----------------  ------  --------  -------
SB_RAP1              39/102           OFF     UpDnNANA  N/A
SB_MAP1              37/98            OFF     DnDnNANA  N/A
SB_MAP2              42/107           OFF     DnDnNANA  N/A
SB_MAP3              36/96            OFF     DnDnNANA  N/A

(Cisco Controller > show mesh env SB_RAP1
AP Name..................................... SB_RAP1
AP Model.................................... AIR-LAP1522AG-A-K9
AP Role..................................... RootAP

Temperature................................. 39 C, 102 F
Heater...................................... OFF
Backhaul.................................... GigabitEthernet0
GigabitEthernet0 Status..................... UP
    Duplex.................................. FULL
    Speed................................... 100
    Rx Unicast Packets...................... 988175
    Rx Non-Unicast Packets.................. 8563
    Tx Unicast Packets...................... 106420
    Tx Non-Unicast Packets.................. 17122
GigabitEthernet1 Status..................... DOWN
POE Out..................................... OFF
Battery..................................... N/A
```

- **show mesh ap summary**—Revised to show the CERT MAC field that shows a MAC address within an AP certificate that can be used to assign a username for external authentication.

```
(Cisco Controller) > show mesh ap summary
AP Name AP Model           BVI MAC            CERT MAC          Hop Bridge Group Name
------- ---------------    -----------------  ----------------- ---- -----------------
R1      LAP1520            00:0b:85:63:8a:10  00:0b:85:63:8a:10 0    y1
R2      LAP1520            00:0b:85:7b:c1:e0  00:0b:85:7b:c1:e0 1    y1
H2      AIR-LAP1522AG-A-K9 00:1a:a2:ff:f9:00  00:1b:d4:a6:f4:60 1
Number of Mesh APs.............................. 3
Number of RAP................................... 2
Number of MAP................................... 1
```

- **show mesh path**—Displays MAC addresses, access point roles, SNR ratios (dBs) for uplink and downlink (SNRUp, SNRDown) and link SNR for a particular path.

```
(Cisco Controller) > show mesh path mesh-45-rap1
AP Name/Radio Mac Channel Snr-Up Snr-Down Link-Snr Flags State
----------------- ------- ------ -------- -------- ------ -------
mesh-45-rap1      165     15     18       16       0x86b UPDATED NEIGH PARENT BEACON
mesh-45-rap1 is a Root AP.
```

- **show mesh neighbor summary**—Displays summary information about mesh neighbors. Neighbor information includes MAC addresses, parent-child relationships, and uplink and downlink (SNRUp, SNRDown).

```
(Cisco Controller) > show mesh neighbor summary ap1500:62:39:70
AP Name/Radio Mac Channel Snr-Up Snr-Down Link-Snr Flags  State
mesh-45-rap1      165     15     18       16       0x86b  UPDATED NEIGH PARENT BEACON
00:0B:85:80:ED:D0 149     5      6        5        0x1a60 NEED UPDATE BEACON DEFAULT
00:17:94:FE:C3:5F 149     7      0        0        0x860  BEACON
```

Note After review of the **show mesh** commands above, you should be able to see the relationships between the nodes of your network and verify the RF connectivity by seeing the SNR values for every link.

- **show mesh ap tree**—Displays mesh access points within a tree structure (hierarchy).

```
(Cisco Controller) > show mesh ap tree
R1(0,y1)
|-R2(1,y1)
|-R6(2,y1)
|-H2(1,default)
Number of Mesh APs............................. 4
Number of RAP................................. 1
Number of MAP................................. 3
```

Viewing Mesh Access Point Details

To view a mesh access point's configuration, enter these commands:

- **show ap config general** *Cisco_AP*—Displays system specifications for a mesh access point.

```
(Cisco Controller) > show ap config general aps
Cisco AP Identifier............................ 1
Cisco AP Name.................................. AP5
Country code................................... US  - United States
Regulatory Domain allowed by Country............ 802.11bg:-AB    802.11a:-AB
AP Country code................................ US  - United States
AP Regulatory Domain........................... 802.11bg:-A    802.11a:-N
Switch Port Number ............................ 1
MAC Address.................................... 00:13:80:60:48:3e
IP Address Configuration....................... DHCP
IP Address..................................... 1.100.163.133
...
Primary Cisco Switch Name...................... 1-4404
Primary Cisco Switch IP Address................ 2.2.2.2
Secondary Cisco Switch Name.................... 1-4404
Secondary Cisco Switch IP Address.............. 2.2.2.2
Tertiary Cisco Switch Name..................... 2-4404
Tertiary Cisco Switch IP Address............... 1.1.1.4
```

- **show mesh astools stats** [*Cisco_AP*]—Displays anti-stranding statistics for all outdoor mesh access points or a specific mesh access point.

```
(Cisco Controller) > show mesh astools stats

Total No of Aps stranded : 0
> (Cisco Controller) > show mesh astools stats sb_map1

Total No of Aps stranded : 0
```

- **show advanced backup-controller**—Displays configured primary and secondary backup controllers.

```
(Cisco Controller) > show advanced backup-controller
AP primary Backup Controller ..................... controller1 10.10.10.10
AP secondary Backup Controller ............... 0.0.0.0
```

- **show advanced timer**—Displays settings for system timers.

```
(Cisco Controller) > show advanced timer
Authentication Response Timeout (seconds)........ 10
Rogue Entry Timeout (seconds)................... 1300
AP Heart Beat Timeout (seconds).................. 30
AP Discovery Timeout (seconds)................... 10
AP Primary Discovery Timeout (seconds)........... 120
```

- **show ap slots**—Displays slot information for mesh access points.

```
(Cisco Controller) > show ap slots
Number of APs.................................... 3
AP Name Slots AP Model            Slot0    Slot1   Slot2    Slot3
-------------------------------  ------  -------  ------   ------
R1       2    LAP1520            802.11A  802.11BG
H1       3    AIR-LAP1521AG-A-K9 802.11BG 802.11A  802.11A
H2       4    AIR-LAP1521AG-A-K9 802.11BG 802.11A  802.11A 802.11BG
```

Viewing Global Mesh Parameter Settings

Use this command to obtain information on global mesh settings:

- **show mesh config**—Displays global mesh configuration settings.

```
(Cisco Controller) > show mesh config
Mesh Range....................................... 12000
Backhaul with client access status............... disabled
Background Scanning State........................ enabled
Mesh Security
Security Mode................................ EAP
External-Auth................................ disabled
Use MAC Filter in External AAA server......... disabled
Force External Authentication................. disabled
Mesh Alarm Criteria
Max Hop Count................................ 4
Recommended Max Children for MAP............. 10
Recommended Max Children for RAP............. 20
Low Link SNR................................. 12
High Link SNR................................ 60
Max Association Number....................... 10
```

```
Association Interval.......................... 60 minutes
Parent Change Numbers......................... 3
Parent Change Interval........................ 60 minutes
Mesh Multicast Mode........................... In-Out
Mesh Full Sector DFS.......................... enabled
Mesh Ethernet Bridging VLAN Transparent Mode..... enabled
```

Viewing Bridge Group Settings

Use these commands to view bridge group settings:

- **show mesh forwarding table**—Shows all configured bridges and their MAC table entries.
- **show mesh forwarding interfaces**—Displays bridge groups and the interfaces within each bridge group. This command is useful for troubleshooting bridge group membership.

Viewing VLAN Tagging Settings

Use these commands to view VLAN tagging settings:

- **show mesh forwarding VLAN mode**—Shows the configured VLAN Transparent mode (enabled or disabled).
- **show mesh forwarding VLAN statistics**—Displays statistics for the VLAN and the path.
- **show mesh forwarding vlans**—Displays supported VLANs.
- **show mesh ethernet VLAN statistics**—Displays statistics for the Ethernet interface.

Viewing DFS Details

Use this command to view DFS details:

- **show mesh dfs history**—Displays a history of radar detections by channels and resulting outages.

```
(Cisco Controller) > show mesh dfs history
ap1520#show mesh dfs history
Channel 100 detects radar and is unusable (Time Elapsed: 18 day(s), 22 hour(s), 10
minute(s), 24 second(s)).
Channel is set to 136 (Time Elapsed: 18 day(s), 22 hour(s), 10 minute(s), 24 second(s)).
Channel 136 detects radar and is unusable (Time Elapsed: 18 day(s), 22 hour(s), 9
minute(s), 14 second(s)).
Channel is set to 161 (Time Elapsed: 18 day(s), 22 hour(s), 9 minute(s), 14 second(s)).
Channel 100 becomes usable (Time Elapsed: 18 day(s), 21 hour(s), 40 minute(s), 24
second(s)).
Channel 136 becomes usable (Time Elapsed: 18 day(s), 21 hour(s), 39 minute(s), 14
second(s)).
Channel 64 detects radar and is unusable (Time Elapsed: 0 day(s), 1 hour(s), 20 minute(s),
 52 second(s)).
Channel 104 detects radar and is unusable (Time Elapsed: 0 day(s), 0 hour(s), 47
minute(s), 6 second(s)).
Channel is set to 120 (Time Elapsed: 0 day(s), 0 hour(s), 47 minute(s), 6 second(s)).
```

- **show mesh dfs channel** *channel number*—Displays a history of radar detections and outages for a specified channel.

```
(Cisco Controller) > show mesh dfs channel 104
ap1520#show mesh dfs channel 104
Channel 104 is available
Time elapsed since radar last detected: 0 day(s), 0 hour(s), 48 minute(s), 11 second(s).
```

Viewing Security Settings and Statistics

Use this command to view security settings and statistics:

- **show mesh security-stats** *AP_name*—Shows packet error statistics and a count of failures, timeouts, and successes with respect to associations and authentications as well as reassociations and reauthentications for the specified access point and its child.

```
(Cisco Controller) > show mesh security-stats ap417

AP MAC : 00:0B:85:5F:FA:F0
Packet/Error Statistics:
----------------------------
Tx Packets 14, Rx Packets 19, Rx Error Packets 0
Parent-Side Statistics:
--------------------------
Unknown Association Requests 0
Invalid Association Requests 0
Unknown Re-Authentication Requests 0
Invalid Re-Authentication Requests 0
Unknown Re-Association Requests 0
Invalid Re-Association Requests 0
Unknown Re-Association Requests 0
Invalid Re-Association Requests 0
Child-Side Statistics:
--------------------------
Association Failures 0
Association Timeouts 0
Association Successes 0
Authentication Failures 0
Authentication Timeouts 0
Authentication Successes 0
Re-Association Failures 0
Re-Association Timeouts 0
Re-Association Successes 0
Re-Authentication Failures 0
Re-Authentication Timeouts 0
Re-Authentication Successes 0
```

Viewing GPS Status

Procedure

- See location summary of all APs by entering this command:

  show ap gps location summary

```
(Site5_AMC_02) >show ap gps location summary

AP Name              GPS Present   Latitude        Longitude       Altitude        GPS
location Age
-------------------  -----------   ------------    -------------   -------------
------------------------
SJC24-RAP-EAST       NO            N/A             N/A             N/A             N/A
SJC21-RAP-NORTH      NO            N/A             N/A             N/A             N/A
SJC21-RAP-SOUTH      NO            N/A             N/A             N/A             N/A
Site5_21-17          NO            N/A             N/A             N/A             N/A
SJC22-ROOF-MAP       NO            N/A             N/A             N/A             N/A
Site5_21-28          NO            N/A             N/A             N/A             N/A
SJC-24-RAP-WEST      YES           37.42034194     -121.91973098   25.10  meters   000
days, 00 h 00 m 19 s
Site5_24-02          YES           37.41970399     -121.92051996   10.00  meters   000
days, 00 h 00 m 12 s
Site5_22-30          NO            N/A             N/A             N/A             N/A
Site5_23-200         NO            N/A             N/A             N/A             N/A
Site5_25-18          NO            N/A             N/A             N/A             N/A
Site5_22-15          NO            N/A             N/A             N/A             N/A
Site5_25-05          NO            N/A             N/A             N/A             N/A
```

- See a location summary of all mesh APs by entering this command:

  show mesh gps location summary

- See the location information for a particular mesh AP by entering this command:

  show mesh gps location *ap-name*

Viewing Mesh Statistics for a Mesh Access Point

This section describes how to use the controller GUI or CLI to view mesh statistics for specific mesh access points.

Note You can modify the Statistics Timer interval setting on the **All APs > Details** page of the controller GUI.

Viewing Mesh Statistics for a Mesh Access Point (GUI)

Procedure

Step 1 Choose **Wireless > Access Points > All APs** to open the All APs page.

Step 2 To view statistics for a specific mesh access point, hover the mouse over the blue drop-down arrow for the desired mesh access point and choose **Statistics**. The **All APs** > *AP Name* > **Statistics** page for the selected mesh access point appears.

This page shows the role of the mesh access point in the mesh network, the name of the bridge group to which the mesh access point belongs, the backhaul interface on which the access point operates, and the number of the physical switch port. It also displays a variety of mesh statistics for this mesh access point.

Table 1: Mesh Access Point Statistics

Statistics	Parameter	Description
Mesh Node Stats	Malformed Neighbor Packets	The number of malformed packets received from the neighbor. Examples of malformed packets include malicious floods of traffic such as malformed or short DNS packets and malformed DNS replies.
	Poor Neighbor SNR Reporting	The number of times the signal-to-noise ratio falls below 12 dB on the backhaul link.
	Excluded Packets	The number of packets received from excluded neighbor mesh access points.
	Insufficient Memory Reporting	The number of insufficient memory conditions.
	Rx Neighbor Requests	The number of broadcast and unicast requests received from the neighbor mesh access points.
	Rx Neighbor Responses	The number of responses received from the neighbor mesh access points.
	Tx Neighbor Requests	The number of unicast and broadcast requests sent to the neighbor mesh access points.
	Tx Neighbor Responses	The number of responses sent to the neighbor mesh access points.
	Parent Changes Count	The number of times a mesh access point (child) moves to another parent.
	Neighbor Timeouts Count	The number of neighbor timeouts.
Queue Stats	Gold Queue	The average and peak number of packets waiting in the gold (video) queue during the defined statistics time interval.
	Silver Queue	The average and peak number of packets waiting in the silver (best effort) queue during the defined statistics time interval.
	Platinum Queue	The average and peak number of packets waiting in the platinum (voice) queue during the defined statistics time interval.
	Bronze Queue	The average and peak number of packets waiting in the bronze (background) queue during the defined statistics time interval.
	Management Queue	The average and peak number of packets waiting in the management queue during the defined statistics time interval.

Statistics	Parameter	Description
Mesh Node Security Stats	Transmitted Packets	The number of packets transmitted during security negotiations by the selected mesh access point.
	Received Packets	The number of packets received during security negotiations by the selected mesh access point.
	Association Request Failures	The number of association request failures that occur between the selected mesh access point and its parent.
	Association Request Timeouts	The number of association request timeouts that occur between the selected mesh access point and its parent.
	Association Requests Successful	The number of successful association requests that occur between the selected mesh access point and its parent.
	Authentication Request Failures	The number of failed authentication requests that occur between the selected mesh access point and its parent.
	Authentication Request Timeouts	The number of authentication request timeouts that occur between the selected mesh access point and its parent.
	Authentication Requests Successful	The number of successful authentication requests between the selected mesh access point and its parent.
	Reassociation Request Failures	The number of failed reassociation requests between the selected mesh access point and its parent.
	Reassociation Request Timeouts	The number of reassociation request timeouts between the selected mesh access point and its parent.
	Reassociation Requests Successful	The number of successful reassociation requests between the selected mesh access point and its parent.
	Reauthentication Request Failures	The number of failed reauthentication requests between the selected mesh access point and its parent.
	Reauthentication Request Timeouts	The number of reauthentication request timeouts that occur between the selected mesh access point and its parent.
	Reauthentication Requests Successful	The number of successful reauthentication requests that occur between the selected mesh access point and its parent.
	Unknown Association Requests	The number of unknown association requests received by the parent mesh access point from its child. The unknown association requests often occur when a child is an unknown neighbor mesh access point.
	Invalid Association Requests	The number of invalid association requests received by the parent mesh access point from the selected child mesh access point. This state may occur when the selected child is a valid neighbor but is not in a state that allows association.

Statistics	Parameter	Description
Mesh Node Security Stats (continued)	Unknown Reauthentication Requests	The number of unknown reauthentication requests received by the parent mesh access point node from its child. This state may occur when a child mesh access point is an unknown neighbor.
	Invalid Reauthentication Requests	The number of invalid reauthentication requests received by the parent mesh access point from a child. This state may occur when a child is a valid neighbor but is not in a proper state for reauthentication.
	Unknown Reassociation Requests	The number of unknown reassociation requests received by the parent mesh access point from a child. This state may occur when a child mesh access point is an unknown neighbor.
	Invalid Reassociation Requests	The number of invalid reassociation requests received by the parent mesh access point from a child. This state may occur when a child is a valid neighbor but is not in a proper state for reassociation.

Viewing Mesh Statistics for a Mesh Access Point (CLI)

Use these commands to view mesh statistics for a specific mesh access point using the controller CLI:

- To view packet error statistics, a count of failures, timeouts, and successes with respect to associations and authentications, and reassociations and reauthentications for a specific mesh access point, enter this command:

  show mesh security-stats *AP_name*

  Information similar to the following appears:

```
AP MAC : 00:0B:85:5F:FA:F0
Packet/Error Statistics:
----------------------------
x Packets 14, Rx Packets 19, Rx Error Packets 0

Parent-Side Statistics:
--------------------------
Unknown Association Requests 0
Invalid Association Requests 0
Unknown Re-Authentication Requests 0
Invalid Re-Authentication Requests 0
Unknown Re-Association Requests 0
Invalid Re-Association Requests 0
Unknown Re-Association Requests 0
Invalid Re-Association Requests 0

Child-Side Statistics:
--------------------------
Association Failures 0
Association Timeouts 0
```

```
Association Successes 0
Authentication Failures 0
Authentication Timeouts 0
Authentication Successes 0
Re-Association Failures 0
Re-Association Timeouts 0
Re-Association Successes 0
Re-Authentication Failures 0
Re-Authentication Timeouts 0
Re-Authentication Successes 0
```

- To view the number of packets in the queue by type, enter this command:

  show mesh queue-stats *AP_name*

  Information similar to the following appears:

```
Queue Type  Overflows  Peak length  Average length
 ----------  ---------  -----------  --------------
 Silver      0          1            0.000
 Gold        0          4            0.004
 Platinum    0          4            0.001
 Bronze      0          0            0.000
 Management  0          0            0.000
```

  Overflows—The total number of packets dropped due to queue overflow.

  Peak Length—The peak number of packets waiting in the queue during the defined statistics time interval.

  Average Length—The average number of packets waiting in the queue during the defined statistics time interval.

Viewing Neighbor Statistics for a Mesh Access Point

This section describes how to use the controller GUI or CLI to view neighbor statistics for a selected mesh access point. It also describes how to run a link test between the selected mesh access point and its parent.

Viewing Neighbor Statistics for a Mesh Access Point (GUI)

Procedure

Step 1 Choose **Wireless > Access Points > All APs** to open the All APs page.

Step 2 To view neighbor statistics for a specific mesh access point, hover the mouse over the blue drop-down arrow for the desired mesh access point and choose **Neighbor Information**. The All APs > *Access Point Name* > Neighbor Info page for the selected mesh access point appears.

This page lists the parent, children, and neighbors of the mesh access point. It provides each mesh access point's name and radio MAC address.

Step 3 To perform a link test between the mesh access point and its parent or children, follow these steps:

a) Hover the mouse over the blue drop-down arrow of the parent or desired child and choose **LinkTest**. A pop-up window appears.
b) Click **Submit** to start the link test. The link test results appear on the Mesh > LinkTest Results page.
c) Click **Back** to return to the **All APs** > *Access Point Name* > **Neighbor Info** page.

Step 4 To view the details for any of the mesh access points on this page, follow these steps:

a) Hover the mouse over the blue drop-down arrow for the desired mesh access point and choose **Details**. The **All APs** > *Access Point Name* > **Link Details** > *Neighbor Name* page appears.
b) Click **Back** to return to the **All APs** > *Access Point Name* > **Neighbor Info** page.

Step 5 To view statistics for any of the mesh access points on this page, follow these steps:

a) Hover the mouse over the blue drop-down arrow for the desired mesh access point and choose **Stats**. The **All APs** > *Access Point Name* > **Mesh Neighbor Stats** page appears.
b) Click **Back** to return to the **All APs** > *Access Point Name* > **Neighbor Info** page.

Viewing the Neighbor Statistics for a Mesh Access Point (CLI)

Use these commands to view neighbor statistics for a specific mesh access point using the controller CLI.

- To view the mesh neighbors for a specific mesh access point, enter this command:

  show mesh neigh {**detail** | **summary**} *AP_Name*

  Information similar to the following appears when you request a summary display:

```
AP Name/Radio Mac   Channel Snr-Up Snr-Down Link-Snr Flags  State
-----------------  ------- ------ -------- -------- ------  -------
mesh-45-rap1       165     15     18       16       0x86b  UPDATED NEIGH PARENT BEACON
00:0B:85:80:ED:D0  149      5      6        5       0x1a60  NEED UPDATE BEACON DEFAULT
00:17:94:FE:C3:5F  149    7      0        0      0x860      BEACON
```

- To view the channel and signal-to-noise ratio (SNR) details for a link between a mesh access point and its neighbor, enter this command:

  show mesh path *AP_Name*

  Information similar to the following appears:

```
AP Name/Radio Mac  Channel Snr-Up Snr-Down Link-Snr Flags  State
-----------------  ------- ------ -------- -------- ------  -------
mesh-45-rap1       165     15     18       16       0x86b  UPDATED NEIGH PARENT BEACON
mesh-45-rap1 is a Root AP.
```

- To view the percentage of packet errors for packets transmitted by the neighbor mesh access point, enter this command:

  show mesh per-stats *AP_Name*

  Information similar to the following appears:

```
Neighbor MAC Address 00:0B:85:5F:FA:F0
Total Packets transmitted: 104833
Total Packets transmitted successfully: 104833
```

```
Total Packets retried for transmission: 33028

Neighbor MAC Address 00:0B:85:80:ED:D0
Total Packets transmitted: 0
Total Packets transmitted successfully: 0
Total Packets retried for transmission: 0

Neighbor MAC Address 00:17:94:FE:C3:5F
Total Packets transmitted: 0
Total Packets transmitted successfully: 0
Total Packets retried for transmission: 0
```

Note Packet error rate percentage = 1 – (number of successfully transmitted packets/number of total packets transmitted).