Cambium
450 Platform Series Release Notes

System Release 15.2

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General Information

Version Information

The following shows the issue status of this document since it was first released:

Issue	Date of issue	System Release
001v000	July 2018	System Release 15.2

450 Platform Release 15.2 Information

Introduction

This document provides information for 450 Platform Series System Release 15.2.

Software updates for Cambium products are available from:

https://support.cambiumnetworks.com/files

System Release 15.2 adds support for the following features:

- Two additional QoS levels

- Weighted Fair Queuing

- SM prioritization

- AES-256 encryption (enabled with feature key)

- Maximum and minimum modulation

- Higher UL throughput from single SM

- LQI enhancements

- PMP 450m features:
  - Additional flood test features for AP
  - Sounding statistics

- Additional enhancements:
  - Displaying distances in kilometers
  - Increased site name length
  - Displaying received Pulse Per Second count
  - Retransmission counters
  - Configurable maximum limit of SMs

- Internal features:
  - Keep alive per LUID
  - Persistent LUID assignment
  - Fast Rate Adapt
  - Rate Adapt per LUID

- Important bug fixes

Applicability

Software release 15.2 is compatible with all 450 platform models (both PMP and PTP), also 430 SM in 450 compatibility mode.

NOTE

450b SM requires version of CNUT 4.11.2 (Canopy Network Updater Tool) or later for upgrades and downgrades. CNUT 4.11.4 is the current recommended version. 450b Mid-Gain cannot be downgraded to any software version prior to 15.1.2. 450b High Gain cannot be downgraded to any software version prior to 15.1.4.

NOTE

When using the new 4.11.4 CNUT version, the Auto-upgrade of SM software is now supported if upgrading to release 15.2. However, if using a 450AP, and selecting "The Access Point" for File Server Type in CNUT, you will need to select one SM type at a time in the "Auto Update SM Type" selection table in the Update Configuration GUI. For example, if attempting to upgrade 450b and 450i SMs under a 450 AP, first perform auto-upgrade of the 450i SMs, then change the configuration to select only 450b SMs and invoke a second auto-upgrade. This multi-step process is not necessary if using a different file server type, or using an AP other than 450.

Feature Overview

System Release 15.2 includes:

Products Affected	Features	Description
PMP/PTP 450/450i/450b/450m	Additional QoS Levels	This release introduces two additional quality of services (QoS) levels in both downlink and uplink direction. There are now total of 4 Data Channels available.
PMP 450/450i AP	Weighted Fair Queueing (WFQ)	This feature provides committed frame space for each of the Data Channel priority levels.
PMP 450/450i/450b/430	SM Prioritization	This feature allows the user to group SMs, registered to an AP into two different prioritization groups - "High" and "Low".
PMP/PTP 450/450i/450b/450m	AES-256 Encryption	This release supports over-the-air data encryption using AES-256 bit key enabled with a feature key.
PTP 450/450i	PTP Maximum and Minimum Modulation Rate	This feature supports the PTP Backhaul to let the user configure maximum and minimum modulation rate it can transmit and receive.
PMP 450/450i/450b /450m	PMP Maximum Modulation Rate	This feature supports the user to limit the maximum modulation rate in both downlink and uplink.
PMP 450/450i AP	Higher UL throughput from single SM	This feature supports higher uplink throughput from single SM for frame configuration with more than 63 uplink data slots configured.
All	LQI enhancements	This feature displays additional Link Quality Indicator (LQI) statistics in the SM's GUI.
PMP 450m AP	Additional flood test features	This feature supports additional flood test features such as the option to select the priority levels to be included in flood test, ignore CIR, and display priority level in summary table.
PMP 450m AP	Sounding Statistics	Sounding statistics is reorganized and moved from Statictics -> Radio to Statistics -> Sounding tab.

Products Affected	Features	Description
All	Display distance in Kilometers	This feature gives option to display distances in either miles or km on the GUI.
All	Site name length	This feature lets user configure the site name of the radio up to 120 characters.
PMP/PTP 450/450i/450m AP/BHMs	Pulse Per Second count	This feature displays the percentage of correctly received sync pulses in Home -> Sync Status page.
PMP/PTP 450/450i/450b/450m	Retransmission counters	This feature supports retransmission counters which are available in Statistics -> Data Channel -> Fragment Modulation
All APs	Configurable maximum limit of SMs	This feature allows configurable limit for maximum number of SMs that can be registered to a PMP AP.
All APs	Keep Alive per LUID	This feature improves the link stability when multiple priority Data Channels are configured.
All APs	Persistent LUID assignment	This feature maps MAC to LUID such that upon AP reboot, SMs will be assigned the previous LUID. Clearing Idle SMs will cause the LUID table to be reset for non-registered LUIDs.
PMP/PTP 450/450i/450b	Fast Rate Adapt	This feature quickly adapts the modulation rate up to the maximum rate that the link is capable of at registration. It eliminates the need to run link test or have traffic sent to explicitly adapt the rate up.
PMP/PTP 450/450i/450b/450m	Rate Adapt per LUID	This feature consolidates the rate adapt engines to provide a single modulation per LUID vs separate modulation rate per Data Channel. It more accurately indicates actual link conditions regardless of traffic patterns.

Features Description

Additional QoS Levels

This release introduces two additional quality of services (QoS) levels in both downlink and uplink direction.

Users can now configure 1 to 4 bi-directional Data Channels on the SM for user data on PMP/PTP 450/450i/450b/450m. PMP 430 only supports up to 2 Data Channels. Previously, devices supported Low and High Priority Data Channels. The new Data Channels are called Low, Medium, High, and Ultra High.

To access the Data Channels on the SM connected to PMP/PTP 450/450i/450b/450m APs:

1. Go to the **Session Status -> Session Status List -> Device** in the AP GUI.

2. Click the SM connected to the device under **Subscriber** to open the SM GUI.

3. Go to **Configuration -> Quality of Service (QoS) -> Device Channel Priority Settings** in the SM GUI.

With this Additional QoS Levels feature, more Vendor Specific Attributes - VSA's, are available for customers configuring their radios via an AAA Server. The new 15.2 Radius Dictionary can be found on the Cambium Support site:

https://support.cambiumnetworks.com/files/pmp450/

Following five new attributes are introduced for Additional QoS Levels:

- Cambium-Canopy-DATACHANCOUNT
- Cambium-Canopy-MPULCIR

- Cambium-Canopy-MPDLCIR

- Cambium-Canopy-UHPULCIR

- Cambium-Canopy-UHPDLCIR

The DATACHANCOUNT, with values 1 to 4, replaces the older HPENABLE attribute, which enabled or disabled the High Priority Data Channel per SM. The HPENABLE attribute can be retained for backward compatability. If both are downloaded to an SM, the DATACHANCOUNT takes precendence for an SM on 15.2 or later releases.

One additional attribute, Cambium-Canopy-SMPrioritizationGroup, is also available as a VSA now in 15.2. This setting and the SM Prioritization feature are described in more detail later in these release notes.

> **⚠ NOTE**
>
> Customers already using High Priority Data Channels prior to release 15.2 will notice that the default priority entries for DiffServ Codepoint have changed in release 15.2. While these changes will not modify the HP vs LP data channel mapping for the most common codepoints, customers using HP data channels prior to upgrade might want to examine this table after the upgrade to make sure the mappings are optimal for their network.

Weighted Fair Queueing (WFQ)

This feature provides committed frame space for each of the Data Channel priority levels.

It lets the user assign a percentage of air interface resources to each of the 4 Data Channel priority levels as well as Broadcast/Multicast channel, in the downlink and uplink.

One of the benefits of WFQ is that the configuration can be accomplished at the AP rather than at each individual SMs.

This feature can be used with or in place of existing CIR settings. Unlike CIR, which is set in kbps independent of the modulation rate, the WFQ feature operates on a percentage of air interface resources, or timeslots.

A more detailed description of the WFQ feature, its interactions with CIR and the SM Prioritization feature, and examples can be found in the 15.2 450 Platform and User Guide.

To access Weighted Fair Queuing Configuration, go to **Configuration -> Quality of Service (QoS)** in the AP GUI.

Weighted Fair Queuing Configuration	
Data Channel Count - Low Priority :	6 (33%)
Data Channel Count - Medium Priority :	3 (16%)
Data Channel Count - High Priority :	6 (33%)
Data Channel Count - Ultra High Priority :	3 (16%)
Weighted Fair Queuing :	⦿ Enabled ○ Disabled
WFQ Configuration :	**Valid**
Data Channel Allocation - Broadcast/Multicast :	4 %
Data Channel Allocation - Low Priority :	24 %
Data Channel Allocation - Medium Priority :	24 %
Data Channel Allocation - High Priority :	24 %
Data Channel Allocation - Ultra High Priority :	24 %

SM Prioritization

This feature allows the user to group SMs registered to an AP into two different prioritization groups - "High" and "Low".
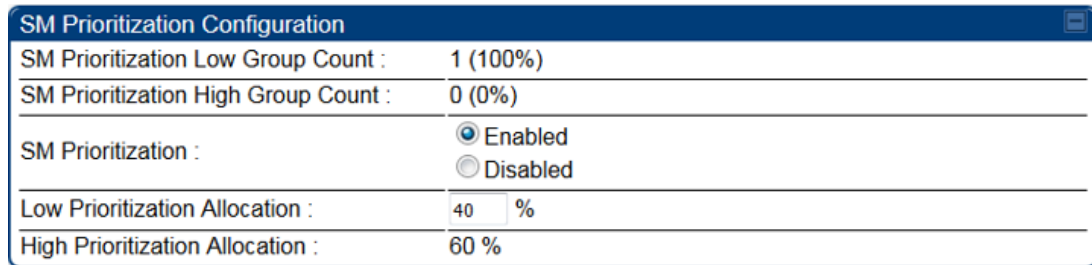
It guarantees the group of SMs at the same prioritization level with a certain percentage of resources, in both downlink and uplink.

The percentage of resources between 1% and 100% guaranteed for "Low" priority group can be configured on the AP.

The rest of the resources will then be guaranteed for "High" priority group.

AP configuration

1. Go to **Configuration -> Quality of Service (QoS) -> SM Prioritization Configuration** on the GUI.
2. Configure percentage of Low Priority SMs. Percentage of High Priority SMs is automatically calculated to add up to 100%.

SM Prioritization Configuration	
SM Prioritization Low Group Count :	1 (100%)
SM Prioritization High Group Count :	0 (0%)
SM Prioritization :	⦿ Enabled ◯ Disabled
Low Prioritization Allocation :	40 %
High Prioritization Allocation :	60 %

AP shows configuration for each SM under **Home -> Session Status -> Session Status List -> Configuration -> SM Prioritization Group** column.

SM configuration

Go to **Configuration -> Quality of Service (QoS) -> SM Prioritization Configuration** in the GUI and configure **Prioritization Group**.

SM Prioritization Configuration	
Prioritization Group :	◯ High ⦿ Low

WFQ works within SM prioritization percentages. A more detailed explanation of the SM Prioritization feature, its interactions with CIR and the WFQ feature, and examples can be found in the 15.2 450 Platform configuration and user guide.

AES-256 Encryption

This release supports over-the-air data encryption using AES-256 bit key. A feature key needs to be purchased to enable this feature. Support for over-the-air data encryption using DES key is discontinued, starting from this release.

- A device with 15.2 software release can communicate with a pre-15.2 device using AES-128.
- An AP with 15.2 software release can operate with a mixed sector of SMs (some using AES-128 and some using AES-256).
- Devices operating at DES before upgrade will operate with no encryption after upgrade.
- PMP 430 SMs with 15.2 software release operate with no encryption.

Under **Home -> General Status -> Device information**, the AP displays both its capability and its encryption configuration.

Encryption :	Capable of AES-256 but configured to None

Recommendations for upgrading DES sectors:

- Upgrade AP first: all links operate with no encryption after upgrade
- Upgrade all SMs: as the AP no longer has DES configuration, the SMs can operate with no encryption without being stranded
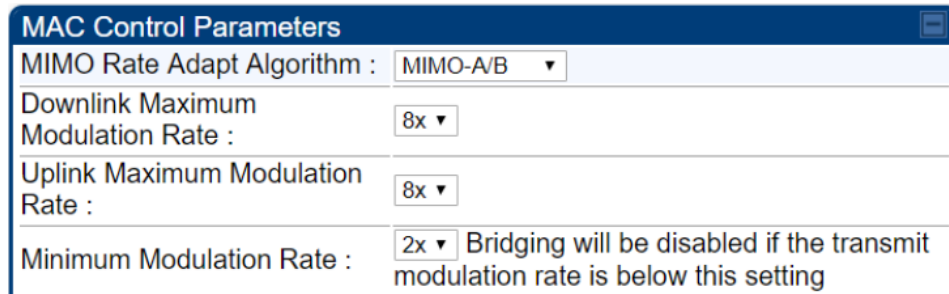
PTP Maximum and Minimum Modulation Rate

This feature supports the PTP Backhaul to let the user configure maximum and minimum modulation rate it can transmit and receive.

If the modulation rate of the link goes below the configured minimum modulation rate, the ethernet port will be briefly disabled and bridging the traffic over the wireless link is disabled.

To configure PTP maximum and minimum modulation rate:

1. Go to **Configuration -> Radio -> MAC Control Parameters** on the GUI.

2. Select the **MIMO Rate Adapt Algorithm**.

3. Configure **Downlink Maximum Modulation Rate** and **Uplink Maximum Modulation Rate** to set maximum modulation in downlink and uplink direction. The Rate Adapt algorithm does not allow the modulation to go above the configured limit.

4. Configure **Minimum Modulation Rate**. If Rate Adapt goes below the threshold, then bridging is disabled. This is used if the PTP network can route traffic along another path.
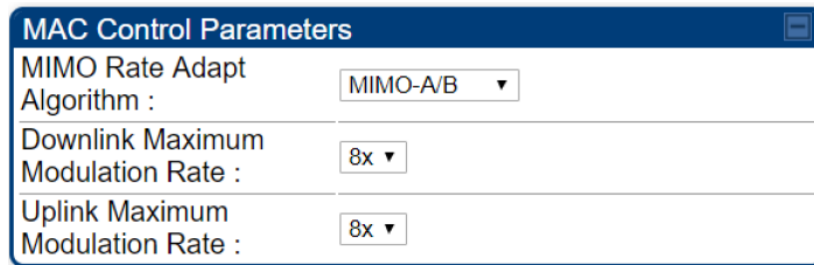
PMP Maximum Modulation Rate

This feature supports the user to limit the maximum modulation rate in both downlink and uplink.

If the maximum modulation rate is configured at the AP, then the modulation rate is limited for all the SMs registered to that AP.

If the maximum modulation rate is configured at the SM, then the modulation rate is limited for that SM alone.

To configure PMP maximum modulation rate:

1. Go to **Configuration -> Radio -> MAC Control Parameters** on the GUI.

2. Select the **MIMO Rate Adapt Algorithm**.

3. Configure **Downlink Maximum Modulation Rate** and **Uplink Maximum Modulation Rate** to set maximum modulation in downlink and uplink direction. The Rate adapt algorithm does not allow the modulation to go above the configured limit.

No minimum modulation rate can be configured as there is no alternate path.

⚠ NOTE

For PMP 450m, **Uplink Maximum Modulation Rate** parameter affects both SU-MIMO and MU-MIMO rate adapt algorithms.

Higher UL throughput from single SM

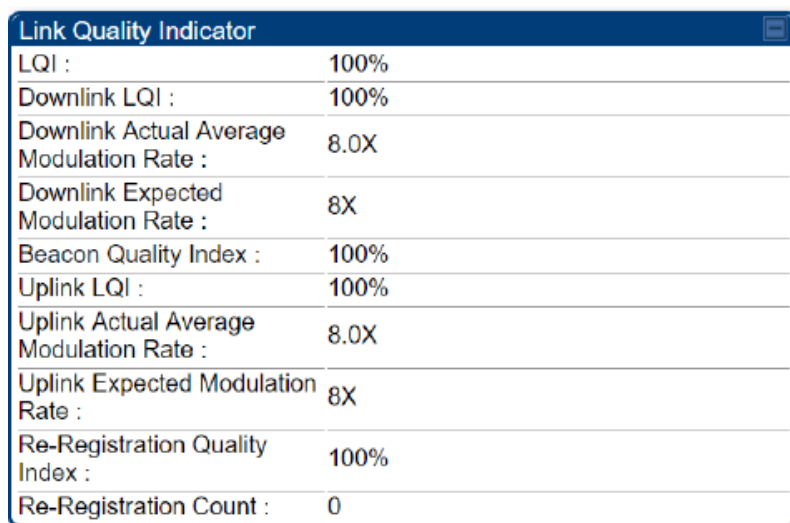This feature supports higher uplink throughput from single SM.

The PMP 450/450i AP scheduler supports scheduling of more than 63 symbols from a single Data Channel in each frame.

This allows one AP to achieve more than 100 Mbps even when not operating at the highest modulation (256-QAM dual stream).

LQI enhancements

This feature displays additional Link Quality Indicator (LQI) statistics in the SM's GUI.

Go to **Tools -> Link status -> Link Quality Indicator** on the GUI.

Link Quality Indicator	
LQI :	100%
Downlink LQI :	100%
Downlink Actual Average Modulation Rate :	8.0X
Downlink Expected Modulation Rate :	8X
Beacon Quality Index :	100%
Uplink LQI :	100%
Uplink Actual Average Modulation Rate :	8.0X
Uplink Expected Modulation Rate :	8X
Re-Registration Quality Index :	100%
Re-Registration Count :	0

Additional flood test features

This feature supports additional flood test features such as

- Option to select the priority levels to be included in flood test - the options include from Low only to all levels.

- Option to ignore CIR - if enabled, data is scheduled regardless of the CIR configuration for each SM.

- Display priority level in summary table.

Note that by default only Low and Medium Priority traffic is grouped. Selecting only groupable Data Channels gives higher throughput in the flood test.

If CIR is Disabled in the flood test, the scheduler has fewer constraints when grouping, and the flood test throughput is expected to be higher.

Sounding Statistics

Sounding statistics is reorganized and moved from Statictics -> Radio to **Statistics -> Sounding** tab.

Sounding Statistics

Subscriber	LUID	Spatial Frequency	Azimuth (Degrees)	Sounding State	MU-MIMO Rate
.103 SM 5.7 MIMO P11 [0a-00-3e-a2-c7-09]	002	400	-29.1, 18.1	TRACKING	8X/1X MIMO-A
.98 SM 5.7 MIMO P11 [0a-00-3e-a2-c4-a9]	003	856	-7.5, 41.8	TRACKING	8X/1X MIMO-A
.102 SM 5.7 MIMO P11 [0a-00-3e-a2-c5-17]	004	287	-35.0, 12.9	TRACKING	8X/2X MIMO-A
.97 SM 5.7 MIMO P11 [0a-00-3e-a2-c4-3c]	005	727	-13.4, 34.5	TRACKING	8X/2X MIMO-A
.99 SM 5.7 MIMO P11 [0a-00-3e-a2-c7-77]	006	973	-2.3	TRACKING	8X/2X MIMO-A
.100 SM 5.7 MIMO P11 [0a-00-3e-a2-c4-7e]	007	74	3.3	TRACKING	8X/1X MIMO-A
.101 SM 5.7 MIMO P11 [0a-00-3e-a2-c4-a3]	008	176	-41.3, 7.9	TRACKING	8X/2X MIMO-A

Display distance in Kilometers

This feature gives user the option to display distances in either miles or km on the GUI.
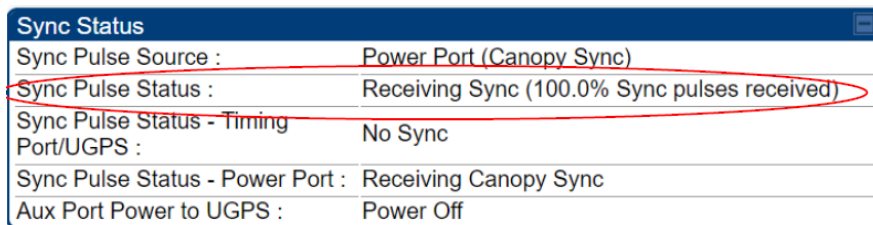
Site name length

This feature lets user configure the site name of the radio up to 120 characters.

Pulse Per Second count
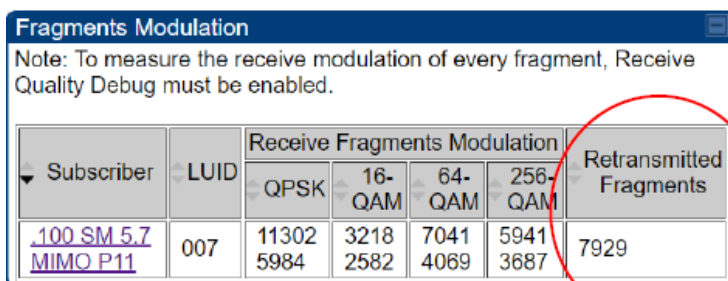
This feature displays the percentage of correctly received sync pulses in **Home -> Sync Status** page.

Retransmission counters

This feature supports retransmission counters which is available in **Statistics -> Data Channels -> Fragment Modulation**

Configurable maximum limit of SMs

This feature allows configurable limit for maximum number of SMs that can be registered to a PMP AP.

Go to **Configuration -> Radio -> Advanced** on the GUI.

An SM trying to register after the limit has been reached, is locked out for 15 minutes and a message is displayed at the SM.

Keep Alive per LUID

This feature improves the link stability when multiple priority Data Channels are configured.

Persistent LUID assignment

This feature maps MAC to LUID such that upon AP reboot, SMs will be assigned with the previous LUID. Clearing Idle SMs will cause the LUID table to be reset for non-registered LUIDs.

Fast Rate Adapt

This feature quickly adapts the modulation rate up to the maximum rate that the link is capable of at registration.

It eliminates the need to have traffic sent or run a link test to explicitly adapt the rate up.

Rate Adapt per LUID

This feature consolidates the rate adapt engines to provide a single modulation per LUID vs separate modulation rate per Data Channel.

It more accurately indicates actual link conditions regardless of traffic patterns.

Release 15.2 System Documentation

Provided with this release are several documents for your reference:

- 450 Platform User Guide: Includes information on all radio configuration parameters and a set of tasks to configure and secure the network.
- PMP 450b SM Specification Sheets: Includes up-to-date specifications for the 450b SM.
- PMP 450m Series Specification Sheets: Includes up-to-date specifications for the 450m Series product line.
- LINKPlanner: Includes up-to-date information about Cambium product performance.

Embedded Software

Prior to upgrading 450 Platform Series software, please read section Upgrading Software. System Release 15.2 may be installed via CNUT (Canopy Network Updater Tool) using the following software package:

CANOPY15_2BUILDofficial_PXP45x_S.pkg3

Or via cnMaestro:

CANOPY_15.2.tar.gz

Upgrading Software

Use version 4.11.4 of the Canopy Network Updater Tool (CNUT) to upgrade to Release 15.2.

CNUT 4.11.4 supports legacy Cambium products.

CNUT and its release notes can be downloaded from the Cambium support web site:
https://support.cambiumnetworks.com/files/cnut/

Network Management

Wireless Manager v4.5.6 may be used to manage Cambium PMP networks, including managing the RADIUS features. For additional information, see the Wireless Manager website at:

http://www.cambiumnetworks.com/products/management-tools/wireless-manager

A RADIUS dictionary file is available from the software site:
https://support.cambiumnetworks.com/files/pmp450/

cnMaestro may also be used to manage Cambium devices. For additional information, see the cnMaestro website at:

http://www.cambiumnetworks.com/products/software-tools/cnmaestro

Canopy MIB

The Cambium Enterprise MIB (Management Information Base) consists of 7 MIB definition files and supports SNMP access to Canopy modules. The MIB files are available for download from:

https://support.cambiumnetworks.com/files/pmp450/

MIB files are used by Network Management Systems and Element Management Systems, such as the Wireless Manager system to support a host of surveillance, monitoring, control, and operational tasks.

If you are using an SNMP network management system (NMS) or element management system (EMS) other than Wireless Manager: Load the MIBs per the instructions for your NMS or EMS.

> **⚠ NOTE**
>
> When loading the MIB files:
>
> - First, load the standard MIB files
>
> - Then, load the Radio-specific MIB files

Some NMSs are not sensitive to order, but some require a specific loading order to build a MIB tree. Loading in the recommended order avoids these issues.

Problems and Limitations Corrected in 15.2

Problems and limitations, which have been corrected in Software Release 15.2 are listed in Table 1:

Table 1 System Release 15.2 problems and limitations corrected

Products Affected	Tracking	Description
All	CPY-12713	Fixed issue where factory defaulting SM from GUI did not select frequencies in 5.1 and 5.2GHz band on 450i SM.
All	CPY-12851	Fixed issue with PMP AP not able to resolve DNS name of Syslog Server.
All	CPY-13551	Fixed issue where Vertical and Horizontal polarity values of SNR and RSSI are flipped on radio GUI of PMP450.
All	CPY-13556	Fixed issue where when QinQ is enabled, SM did not tag or un-tag intra-AP traffic correctly.
All	CPY-14481	Fixed issue where "currentChanFreq" OID on SM returns incorrect value when SM is connected to CC 0.
All	CPY-14648	Fixed issue where any references to "Data VCs" are now called "Data Channels" going forward.
All	CPY-14719	Fixed issue where SM dropped session when failing to adjust internal clock.
All	CPY-14730	Fixed issue with Config file missing band configuration for 3.5/3.6 radio
All	CPY-14743	Fixed issue where Broadcast and Multicast frames of size 1529 to 1700 bytes are no longer dropped
All	CPY-14754	Fixed issue with some of the OIDs in "ifXTable" which did not return proper values.
All	CPY-14760	Fixed issue with PPPoE session uptime counter increments during idle timeout.
All	CPY-14765	Fixed issue where it was not able to make any changes on Confguration >> General page when SM was factory defaulted.
All	CPY-14774	Fixed issue where Frame utilization slot counts were inaccurate after changing Frame period from 2.5 ms to 5 ms.

Products Affected	Tracking	Description
All	CPY-14789	Fixed issue with Sync status page where it now shows map or UGPS info when running off a non-UGPS sync source, even when it is available.
All	CPY-14827	Fixed issue with SM not able to be accessed from web proxy, when Bcast/Mcast MIR is too low.
All	CPY-14840	Fixed issue with PPPoE timer period which saved invalid value until rebooted.
All	CPY-14851	Fixed issue where it was unable to send Accounting Message when connectivity to RADIUS Server is restored.
All	CPY-13593	Fixed issue with modulation rates being color coded with wrong colors, in Link Status page.
All	CPY-13598	Fixed issue with SM not re-registering back to its primary AP automatically if "Subscriber Color Code Wait Period for Idle" parameter has a non-zero value.
All	CPY-13973	Fixed issue where ability to sort disappears in Session Status page, once the table is sorted by Air Delay Distance.
All	CPY-14119	Fixed issue with VLAN priority remarking not working in the downlink.
All	CPY-14598	Fixed issue with not able to establish PPPoE sessions due to "Empty tag value found for tag 0x101".
All	CPY-14607	Fixed issue with SM running 15.1.3, crashing in DAGT task, while accessing from cnMaestro.
All	CPY-11542	Fixed issue with Config file not containing rebootIfRequired and setToDefaults flags by default.
All	CPY-14471	Fixed issue with secondary DNS never working.
All	CPY-14498	Fixed issue with pop-up message when region/country is not set.
All	CPY-14681	Fixed issue with PPPoE Control Message Priority config options to be "Normal" and "High".
All	CPY-14737	Added support to send "System name" TLV in LLDP messages.

Products Affected	Tracking	Description
All	CPY-14764	Fixed issue with sorting issues in session status->link quality tab and statistics->MIR/Burst tabs.
All	CPY-14768	Fixed issue with OFDM Frame Calculator to support max range up to 120 miles, for 900 MHz devices.
450/450i/450b	CPY-14091	Fixed issue by changing Maximum allowed Duty Cycle on 3 GHz 450i back to 85% for FCC.
450/450i/450b	CPY-14615	PMP 450i 3 GHz SM frequency range 3600-3650 MHz are no longer blocked for Canada Country Code.
450/450i/450b	CPY-13370	Fixed issue with DFS is triggered by out-of-band radar pulses, on a 450i ETSI SM.
450/450i/450b	CPY-13523	Fixed issue with 450 BHM sync LED not lighting up, after sync is reacquired.
450/450i/450b	CPY-13644	Fixed issue with 450i AP not always sending SNMP traps when sync is acquired or lost.
450/450i/450b	CPY-13983	Fixed issue 450 SM's not accurately limiting uplink broadcast traffic when limit specified in kbps.
450/450i/450b	CPY-14173	Fixed issue with SNR not reported in "Alignment Tool" page of PMP450i SM.
450/450i/450b	CPY-14407	Fixed issue with DAGT crash on PMP450i SM.
450/450i/450b	CPY-14418	Fixed issue with Fatal Error in HTTP Task due to Data Abort and "Bad Memory block signature:" on PMP450i AP.
450/450i/450b	CPY-14465	Fixed issue with PMP 450i AP crashing when trying to access field_diags.cgi.
450/450i/450b	CPY-14748	Fixed issue with TELNET crash in 450i AP.
450m	MUMIMO-2474	Fixed issue with SM receiving corrupt data counts.
450m	MUMIMO-2273	Fixed issue with SNMP support for slot grouping histogram.
PTP 450/450i	CPY-14734	Changed Default value for "24 Hour Encryption Refresh" to "Disabled". This used to be "Enabled" by default, due to DES being inherently less secure. It is no longer needed since DES is not supported starting Release 15.2.

Products Affected	Tracking	Description
450/450i/450m AP	CPY-14445	Fixed issue with AP sending incorrect response "timingPortUGPSSync (2)" to an SNMP autoSyncStatus get request when running in Generate Sync mode.
450b/450i SM	CPY-14170	Fixed issue where occasionally traffic will stop passing on a VC in the downlink to 450b or 450i SM. The link may auto-recover after 5 minutes by dropping the session. Otherwise the session will need to be manually dropped at the AP.
PMP 450b	CPY-14931	Fixed issue with PMP 450b SM which crashed due to NiFreeBuf() bfr already freed.
PMP 450i AP	CPY-14881	Fixed issue with UGPS bad write reported on 450i AP.
All	CPY-14776	Updated description of OID "numAuthCerts" in WHISP-SM-MIB

Enhancements

Enhancements made in Release 15.2 are listed in Table 2:

Table 2 System Release 15.2 Enhancements

Products Affected	Tracking	Description
All	CPY-14786	Allow to display IDLE time for IDLE SMs in Session List.
All	CPY-14804	Provide mechanism to bounce Ethernet port.
All	CPY-13514	Support PAP for user authentication.
All	CPY-13613	Allow sorting the tables in "Session Status" tab, by site name.
All	CPY-14659	Added ESN to the LQI SNMP table.
All	CPY-14951	Support DHCP Option 12 (Host Name).
All	CPY-14935	Add 5.1/5.2/5.7GHz support for Nigeria.

Known Problems or Limitations

Known open issues in Release 15.2 are listed in Table 3.

Table 3 System Release 15.2 known problems and limitations

Products Affected	Tracking	Description
All APs	CPY-13724	SNMP sync traps generated in indeterminate order during sync source swaps.
All APs	CPY-14460	Importing a JSON config file with alternate frequencies fails for those alternate frequencies if the radio is configured for a band that does not support alternate frequencies.
All SMs	CPY-14742	IPv4 data is blocked when configuration file is loaded on PMP450 SM with Protocol filtering enabled. To workaround this issue, select some filters randomly, in **Configuration -> Protocol** page, undo the changes, save and reboot the SM.
PMP 450b SM	CPY-14972	Spectrum analyzer has noise floor -79 dBm compared to 450i -99 dBm SA results under same conditions.
PMP/PTP 450 SM/BHS	CPY-14973	V and H reported power values are swapped in Aiming Mode.

Products Affected	Tracking	Description
All SMs	CPY-15038	SM with installation color code always tries to connect to AP with color code 0 instead of best AP. To workaround this issue, set color code of AP or SM to non-zero.
PMP 450/450i/450b SM	CPY-15062	Frequency list in configuration file is truncated to 1300 characters.

> **NOTE**
>
> Please refer to the 450 Platform User Guide for the list of the supported Bands, Regions, and Countries.

Appendix A: Technical Procedures

Running 15.2 on PMP 450m AP with PMP 430 SMs

For customers who wish to register 430 SMs to a 450m AP, the following procedure must be followed to avoid the "PMP 430 SM Registration" setting from getting flipped from "Allow" to "Deny". This issue is seen when upgrading the 450m AP from releases older than 15.1.3 to 15.1.3 and newer releases. Perform the following steps to avoid the issue:

1. Prior to upgrade of the PMP 450m, set the Carrier Frequency to "None".
2. Perform the upgrade to 15.2.
3. Change the "PMP 430 SM Registration" to "Allow" and save the change (reboot if requested).
4. Set the Carrier Frequency back to the original setting and reboot to re-enable the sector.

Appendix B: Reference Information

Specifications

Please see the Spec Sheets listed on the Cambium Networks website for the most up-to-date specifications:

http://www.cambiumnetworks.com/resources/

Cambium Networks

Cambium Networks provides professional grade fixed wireless broadband and microwave solutions for customers around the world. Our solutions are deployed in thousands of networks in over 153 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that's easy to deploy and proven to deliver outstanding metrics.

Our flexible Point-to-Multipoint (PMP) solutions operate in the licensed, unlicensed and federal frequency bands, providing reliable, secure, cost effective access networks. With more than three million modules deployed in networks around the world, our PMP access network solutions prove themselves day-in and day-out in residential access, leased line replacement, video surveillance and smart grid infrastructure applications.

Our award-winning Point to Point (PTP) radio solutions operate in licensed, unlicensed and defined use frequency bands including specific FIPS 140-2 solutions for the U.S. Federal market. Ruggedized for 99.999% availability, our PTP solutions have an impeccable track record for delivering reliable high-speed backhaul connectivity even in the most challenging non-line-of-sight RF environments.

Cambium Networks' solutions are proven, respected leaders in the wireless broadband industry. We design, deploy and deliver innovative data, voice and video connectivity solutions that enable and ensure the communications of life, empowering personal, commercial and community growth virtually everywhere in the world.

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