





# RELEASE NOTES

# **450 Platform Series**

System Release 20.0/20.0.1



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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		Date of issue	System Release
001v000	)	November 2020	System Release 20.0
002v000	)	December 2020	System Release 20.0.1

# Platform Release 20.0/20.0.1 Information

# Introduction

This document provides information for 450 Platform series System Release 20.0.

Software updates for Cambium products are available from:

https://support.cambiumnetworks.com/files

System release 20.0 adds support for:

- Improved Link Performance
- Increased Packets Per Second
- Intermediate Modulation Modes
- IPv6
- TLS 1.2 and 1.3
- User Certificate Import
- SSHv2
- SNMPv3 Security Protocol
- Reconfigure without Reboot
- Point to Point Target Receive Power Level on BHM
- Enhanced Frame Utilization Statistics
- DSCP Stream Prioritization

No new features are introduced in system release 20.0.1 as this release is mainly for fixing few critical bugs.

# $\bigcirc$

# Note

For CBRS customers using Google SAS, the latest Google SAS code expects bulk heartbeat requests with not more than 120 SMs per message. For compatibility, it is critical that any sectors using Google SAS and containing more than 120 SMs per sector be upgraded to System release 16.2.1 or a later build. In addition, Cambium suggests any customers with CBRS sectors using Google SAS and approaching 120 SMs per sector also upgrade those sectors ASAP to avoid any future problems.



#### Attention

- Upgrade SMs first to System release 20.0 and then upgrade the AP, otherwise SMs will connect but at a maximum modulation rate of 2X MIMO-B, until both sides are running System release 20.0.
- System Release 20.0 introduces support for TLS v1.2 and v1.3. TLS v1.1 is no longer supported. CNUT 4.13.3 supports TLS v1.1 only and cannot upgrade PMP/PTP devices running System release 20.0 or later that are configured for HTTPS only web access.

# **Feature overview**

System Release 20.0 includes:

Features	Description
Improved Link Performance	This release introduces an improved scrambling/descrambling that increases the reliability of the link in a variety of traffic payloads.
Increased Packets Per Second	This release enhances the aggregate sector Packets Per Second (PPS) performance of 450i, 450b and MicroPoP APs, from 45K PPS to over 150K PPS.
Intermediate Modulation Modes	This feature enables operation of 3x (8-QAM MIMO-B), 5x (32-QAM MIMO-B), and 7x (128-QAM MIMO-B) modulations. The automatic rate adapt may select these rates as necessary based on signal quality, providing higher throughput. These rates are also available for use with Multicast Data Channel and PTP Min/Max Modulation Rate feature.
IPv6	This release supports radio management using IPv6 address
TLS 1.2 and 1.3	This release supports web server using TLS 1.2 and TLS 1.3 for HTTPS connections.
User Certificate Import	This feature allows users to import their own certificate to be used by HTTPS server.
SSHv2	This release introduces SSHv2 support and once the user is logged in via SSH, the Command Line Interface (CLI) which is the same as Telnet will be presented to the user.
SNMPv3 Security Protocol	This feature supports SHA-1 and SHA-256 as choices for SNMPv3 Authentication Protocol.
Reconfigure without Reboot	<ul> <li>This release avoids device reboot for the following configuration parameters:</li> <li>Sector ID on AP</li> <li>Transmit Power on AP</li> <li>Site Name</li> <li>Site Contact</li> <li>Site Location</li> </ul>
Point to Point Target Receive Power Level on BHM	This feature allows the Backhaul Master to control the transmit power of the Backhaul Slave.
Enhanced Frame Utilization Statistics	This release introduces an enhanced Frame Utilization Statistics on GUI (Not available on 450m).
DSCP Stream Prioritization	This features allows certain DSCP streams to be prioritized, irrespective of the Diffserv configuration, in both downlink and uplink directions.

# **Feature description**

# **Improved Link Performance**

This release introduces an improved scrambling/descrambling that increases the reliability of the link in a variety of traffic payloads. It also decreases the likelihood of lower modulation or a dropped session due to a specific packet payload. For this reason, we recommend that SMs are upgraded first. If the AP is upgraded first, each link will run at a maximum of 2X MIMO-B until the SM side is also upgraded. As always, it is recommended that both sides of the link should be running the same software version.

### **Increased Packets Per Second**

This release enhances the aggregate sector Packets Per Second (PPS) performance of 450i, 450b and MicroPoP APs, from 45K PPS to over 150K PPS.

### **Intermediate Modulation Modes**

This feature is automatically enabled at the AP and will be functional if the AP and SM are running System release 20.0 or later software. This feature adds 3 new modulations:

- 3x (8-QAM)
- 5x (32-QAM)
- 7x (128-QAM).

It is supported on 450, 450i and MicroPoP APs. This feature is currently not supported on 450m APs. As shown in the figure below, the additional modulation levels are added to the following configuration parameters:

- Downlink Maximum Modulation Rate (PMP and PTP)
- Uplink Maximum Modulation Rate (PMP and PTP)
- Multicast Data Channel Modulation Rate (PMP only)
- Minimum Modulation Rate (PTP only)

MAC Control Parameters		
MIMO Rate Adapt Algorithm :	MIMO-A/B 🗸	
Downlink Maximum Modulation Rate :	8x 🗸	
Uplink Maximum Modulation Rate :	8x 🗸	
	1x	
Frame Configuration	2x 3v	
Max Range :	4x miles V (Range: 1 – 40 miles / 64 km)	
Downlink Data :	5× 6× 3% (Range: 15 — 85 %)	
Contention Slots :	7x (Range: 1 — 15)	

Multicast Data Control		
Multicast Data Channel :	Disable 🗸	
Multicast Repeat Count	Disable 2X (MIMO-B)	0-2)
Multicast Downlink CIR :	3X (MIMO-B)	(kbps)
	4X (MIMO-B) 5X (MIMO-B)	
Advanced	6X (MIMO-B)	

MAC Control Parameters	
MIMO Rate Adapt Algorithm :	MIMO-A/B 🗸
Downlink Maximum Modulation Rate :	8x •
Uplink Maximum Modulation Rate :	8x 🗸
Minimum Modulation Rate :	1x v Bridging will be disabled if the transmit modulation rate is below this setting
	1×
Frame Configuration	
Downlink Data :	4x (Range: 15 — 85 %)
<u> </u>	5x
Power Control	6x 7x
Transmit Power :	8x dBm (Range: -30 — +19 dBm) (2 dBm V / 2 dBm H)

Ses	sion Status List									
Dat	a:		<u>SessionStatus x</u>	ml						
	Device	Session	Power	C	onfiguration	Link Quality				
F		Subscriber		¢LUID	Hardware	Downlink Rate	Uplink Rate	AP Rx Power (dBm)	Signal Strength Ratio (dB)	Signal to Noise Ratio (dB)
1	to8 PMP455SM1	10.10.114.1 [0a	-00-3e-bb-00-a7]	002	PMP 450i	8X/8X MIMO-B	8X/8X MIMO-B	-56.5	-1.0dB V - H	18 V / 32 H
1	to8 PMP455SM2	10.10.114.2 [0a	-00-3e-bb-00-83]	005	PMP 450i	8X/8X MIMO-B	8X/8X MIMO-B	-55.5	1.0dB V - H	24 V / 33 H
1	to8 PMP455SM3	10.10.114.3 [0a	-00-3e-bb-00-9a]	008	PMP 450i	8X/8X MIMO-B	8X/8X MIMO-B	-57.0	0.0dB V - H	32 V / 32 H
1	to8 PMP455SM4	10.10.114.4 [0a	-00-3e-bb-00-c6]	003	PMP 450i	8X/8X MIMO-B	8X/8X MIMO-B	-56.2	3.0dB V - H	12 V / 34 H
	to8 PMP455SM5	10.10.114.5 [0a	-00-3e-bb-01-3e]	006	PMP 450i	8X/8X MIMO-B	8X/8X MIMO-B	-55.0	0.0dB V - H	18 V / 33 H
	to8 PMP455SM6	10.10.114.6 [0a	-00-3e-bb-01-18]	009	PMP 450i	8X/8X MIMO-B	8X/7X MIMO-B	-66.9	2.0dB V - H	24 V / 24 H
1	to8 PMP455SM7	10.10.114.7 [0a	-00-3e-bb-00-e2]	004	PMP 450i	8X/8X MIMO-B	8X/8X MIMO-B	-53.5	4.0dB V - H	11 V / 33 H
1	to8 PMP455SM8	10.10.114.8 [0a	-00-3e-bb-04-91]	007	PMP 450i	8X/8X MIMO-B	8X/7X MIMO-B	-68.2	3.0dB V - H	24 V / 17 H
										L L

## IPv6

### **Configuration:**

To enable this feature, perform the following steps:

- 1. Go to Configuration -> IP -> LAN1 IPv6 Network Interface Configuration.
- 2. Set the IPv6 parameter as Enabled.

LAN1 IPv6 Network Interface Configuration					
IPv6 :	Enabled     Disabled				
IPv6 Address :					
Prefix Length :	64				
Gateway IPv6 Address :	::				
Preferred DNS Server :					
Alternate DNS Server :					
DHCPv6 :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>				

3. Once IPv6 is enabled and the device is rebooted, the device generates a link-local IPv6 address using the EUI-64 format.

When the IPv6 feature is enabled, the IPv6 LAN interface addresses are displayed on **General -> Network Interface** page of the radio GUI.

LAN1 IPv6 Network Interface		
Global IPv6 Address :	FD01::1111:123 (Static)	
Link Local IPv6 Address :	FE80::A00:3EFF:FEBB:7945	
Gateway IPv6 Address :	FE80::2	
Primary DNS IPv6 Address :	2620:119:35::35	
Secondary DNS IPv6 Address :	2620:119:53::53	
DHCPv6 status :	Disabled	
Multicast Addresses :	FF02::1:FF11:123 FF02::1 FF02::1:FFBB:7945	

Once the Stateless Auto Address Configuration (SLAAC) IP is received, **Network Interface** page is updated with most recent SLAAC IP address and gateway information as follows:

LAN1 IPv6 Network Interface		E
Global IPv6 Address :	FD01::A00:3EFF:FEBB:7945 (SLAAC)	
Link Local IPv6 Address :	FE80::A00:3EFF:FEBB:7945	
Gateway IPv6 Address :	FE80::2	
Primary DNS IPv6 Address :		
Secondary DNS IPv6 Address :		
DHCPv6 status :	Disabled	
Multicast Addresses :	FF02::1 FF02::1:FFBB:7945	

### **IPv6 Trap Addresses**

Go to **Configuration -> SNMP -> IPv6 Trap Addresses** of radio to configure a maximum of five IPv6 trap addresses. Any changes made to the IPv6 Trap Addresses requires a reboot.

IPv6 Trap Addresses		
Trap Address 1 :	FD01::ABCD:1	
Trap Address 2 :	::	
Trap Address 3 :	::	
Trap Address 4 :	::	]
Trap Address 5 :	::	]

#### **IPv6 Statistics:**

Go to **Statistics -> IPv6 MIB Statistics** of radio to view the IPv6 and ICMPv6 MIB statistics.

IPv6 MIB Statistics	ľ
Forwarding:2	
Interfaces:0	
IfTableLastChange:0	
RouteNumber:0	
ip6InPkts:849	
ip6InErrs:18	
ip6InDrops:0	
ip6OutPkts:1093	
ip6OutErrs:0	J

ICMPv6 MIB Statistics	Ξ.
ICMPv6 stats for iface et0	
InMsgs:17	
InErrors:0	
InDestUnreachs:0	
InAdminProhibs:0	
InTimeExcds:0	
InParmProblems:0	
InPktTooBigs:0	
InEchos:0	
InEchoReplies:0	
InRouterSolicits:0	
InRouterAdvertisements:5	
InNeighborSolicits:5	
InNeighborAdvertisements:7	
InRedirects:0	
InGroupMembQueries:0	
InGroupMembResponses:0	
InGroupMembReductions:0	
OutMsgs:19	
OutErrors:0	
OutDestUnreachs:0	
OutAdminProhibs:0	
OutTimeExcds:0	
OutParmProblems:0	
OutPktTooBigs:0	
OutEchos:0	
OutEchoReplies:0	
OutRouterSolicits:2	
OutRouterAdvertisements:0	
OutNeighborSolicits:12	
OutNeighborAdvertisements:5	
OutRedirects:0	
OutGroupMembQueries:0	
OutGroupMembResponses:0	
OutGroupMembReduction:0	

# IPv6 Neighbor Discovery Cache

Go to Statistics -> IPv6 Neighbor Discover Cache of the GUI to view Neighbor Discovery Cache.

Neighbor Discovery Cache							E
	Interface	Pending	IPv6 Address	State	Timeout	MAC Address	
	et0	n	2620:119:35::35	NDS_STALE	4294967273	38-0e-4d-8b-08-b2	
	et0	n	FE80::2	NDS_STALE	174268	38-0e-4d-8b-08-b2	
	et0	n	FE80::C476:56E9:3E9D:DCF7	NDS_REACHABLE	4294967003	8c-ec-4b-ec-50-a4	

Table 1: IPv6 SNMP Object

GUI Name	OID	MIB	Access	Syntax
ipv6State	.1.3.6.1.4.1.161.19.3.3.2.178.0	WHISP-BOX- MIB	read- write	INTEGER {disable (0), enable (1)}



# Note

The IPv6 feature is supported with HTTP, HTTPS, SSH, Telnet, SNMPv2c, and SNMPv3 application protocols.

### **IPv6 Ping Test**

To perform IPv6 ping test, perform the following steps:

- 1. Go to **Tools -> Ping Test -> Ping IPv6 Test Settings** of the radio.
- 2. Configure the IPv6 Address parameter
- 3. Configure the **Count** parameter with any value from 3 to 64.
- 4. Click Perform Ping v6 Test. The IPv6 ping test results are displayed under Ping IPv6 Test Results.

Ping IPv6 Test Settings		E				
IPv6 Address :	FD01::A00:3EFF:FEBB:427E					
Count :	3					
	Perform Ping v6 Test					
		-				
Ping IPv6 Test Results	Ping IPv6 Test Results					
ping6, sending 3 pings of 64 byte length to FD01::A00:3EFF:FEBB:427E						
Sent ping; sess: 0, Seq: 1 to FD01::A00:3EFF:FEBB:427E						
ping6 reply for session 0 (seq: 0) [	ping6 reply for session 0 (seq: 0) [FD01::A00:3EFF:FEBB:427E]					
Sent ping; sess: 0, Seq: 2 to FD01	::A00:3EFF:FEBB:427E					
ping6 reply for session 0 (seq: 1) [FD01::A00:3EFF1FEBB:427E]						
Sent ping; sess: 0, Seq: 3 to FU01::A00:3EFF:FEBB:427E						
pingo reply for session 0 (seq. 2) [FU01.A00.3EFF.FEBB.427E]						
End of session 0, sent 3, recv.3	End of session 0, sent 3, recv:3					

### DHCPv6

- DHCPv6 can either be enabled explicitly or can be enabled when radio receives **Managed** bit set in Router Advertisement (RA).
- DHCPv6 Status can be: Disabled/Enabled (explicitly enabled) or Managed (DHCPv6 enabled due to M-bit been set in RA).

LAN1 IPv6 Network Interface	
Global IPv6 Address :	FD01::2046:2917:458E:C322 (DHCPv6)
Link Local IPv6 Address :	FE80::A00:3EFF:FEBB:7945
Gateway IPv6 Address :	FE80::2
Primary DNS IPv6 Address :	2620:119:35::35
Secondary DNS IPv6 Address :	2620:119:53::53
DNS Suffix Search List :	cambiumnetworks.com
DHCPv6 status :	Managed Lease Remaining: 00:14:39 Release Renew
DHCPv6 IAID :	01bb7945
DHCPv6 Client DUID :	00-03-00-01-0a-00-3e-bb-79-45
Multicast Addresses :	FF02::1:FF8E:C322 FF02::1 FF02::1:FFBB:7945

#### **AP Statistics:**

When this feature is enabled a new statistics page is available on the AP GUI. To access this page,

1. Go to Statistics -> DHCPv6 Statistics.



#### **DHCPv6 Relay Agent**

DHCPv6 relay agent currently supports "Inserting Option 82" only. "Full Relay Operation" mode is currently not supported with DHCPv6. DHCP Relay Agent configuration is common for both DHCPv4 and DHCPv6.

DHCP Relay Agent					
DHCP Relay Agent :	Enable - Only Insert Option 82 ᅌ				
DHCP Server (Name or IP Address) :	Append DNS Domain Name • Disable DNS Domain Name				
	255.255.255.255				
Option 82 Circuit ID :	\$apmacbi\$				
Option 82 Remote ID :	\$smmacbi\$				
Option 82 Vendor Specific ID : \$smsn\$					
Note: DHCPv6 relay is supported only in "Insert Option 82" mode					

DHCPv4 and DHCPv6. DHCPv4 Option 82 sub-options are mapped to DHCPv6 options as follows:

DHCPv4 sub options	DHCPv6 options		
Sub option 1 (Agent Circuit-ID)	Option 18 (Interface-ID)		
Sub option 2 (Agent Remote-ID)	Option 37 (Remote-Identifier)		
Sub option 2 (Agent Remote-ID)	Option 37 (Remote-Identifier)		
Sub option 9 (Vendor Specific	Option 17 (\	/endor Specific information)	
		Note	
		Sub option is replaced with encapsulated vendor	
	specific option, option ID '1'		
	Option 16 (vendor Class) will have radio model information, for example: "Cambium PMP 450 AP".		

Following is an example of **Statistics -> DHCP Relay** page:

DHCPv6 Relay Statistics	
Requests Received :	9
Requests Relayed :	9
Requests Discarded :	0
Replies Received :	0
Replies Relayed :	0
Replies Discarded :	0
Relay Info Exceeding Max Message Size (DHCPv6 message relayed without Option 82) :	0

ſ	DHCP Relay Option 82 Data							
	Subscriber LUID			Circuit ID \$apmacbi\$	Remote ID \$smmacbi\$	Vendor Specific ID \$smsn\$		
I						Binary Option 82 Data		
I		Binary ASCII	Binary	0a003ea2edd2	0a003ea131f4	000000a10a13080106326e6420534d		
	2nd SM		ASCII			2nd SM		
		OUL	Full Option 82 Binary Data	522101060a003ea2edd202060a003ea13114090f000000a10a13080106326e6420534d				
I			Binary	Binary 0a003ea2edd2 0a003eb1b		000000a110130e010c4e6f2053697465204e616d65		
L	No Site Name	003	ASCII			No Site Name		
	The sale Hume		Full Option 82 Binary Data	522701060a003ea	2edd202060a003eb1	be3a0915000000a110130e010c4e6f2053697465204e616d65		

### DNSv6

DNS information can be obtained 3 different ways in IPv6:

- 1. Router Advertisement support DNS information as mentioned by RFC 8106. If the router sends DNSv6 information, radio will display on Network Interface page.
- 2. **Stateless DHCPv6**: In this scenario Router Advertisement won't send any DNS information but will set O-bit. Radio will initiate a DHCPv6 Information Request transaction (RFC 8415) and fetch the DNS information from server.
- 3. **Stateful DHCPv6**: Router Advertisement will be sent with M-bit set, Radio will initiate a complete DHCPv6 transaction to obtain IPv6 address and DNSv6 information.

LAN1 IPv6 Network Interface		
Global IPv6 Address :	FD01::2046:2917:458E:C322 (DHCPv6)	
Link Local IPv6 Address :	FE80::A00:3EFF:FEBB:7945	
Gateway IPv6 Address :	FE80::2	
Primary DNS IPv6 Address :	2620:119:35::35	
Secondary DNS IPv6 Address :	2620:119:53::53	
DNS Suffix Search List :	cambiumnetworks.com	

Maximum two DNS IPv6 server are supported. If there is a static entry configured, it will be overridden with received value.



# Note

DNS Recursive Name Server & DNS Suffix Search List are the only vendor options that are currently supported.

### **DNS IPv6 Resolution**

DNS test tool can be used to resolve IPv6 address for Fully Qualified Domain Name (FQDN) using DNS IPv6 Lookup.

DNS Test Settings		
Fully Qualified Domain Name :	www.google.com	
	Perform DNS Lookup	
	Perform DNS IPv6 Lookup	J
DNS Test Results		
www.google.com resolves to: 2404:6800:40	09:800::2004	

DNS resolution will use two IPv4 DNS server address and two IPv6 address in a round robin manner.

## TLS 1.2 and 1.3

This release supports web server using TLS 1.2 and TLS 1.3 for HTTPS connections. Protocol version will be selected after handshake.

### **User Certificate Import**

This feature allows user to import their own certificate to be used by HTTPS server. This option can be found under **Configuration -> Security**.

Users can import a certificate in PKCS12 format which contains a private key and certificate signed CA. Private key can be password protected and a password field is also given to user while importing.

Import PKCS#12 File		Ð
Upload Certificate File		
File: Choose File No file chosen		
Password :	Import PKCS#12 File	

After successful import, the certificate information will be displayed as follows:

```
Certificate
emailAddress=support@cambiumnetworks.com,CN=smruti,OU=PMP,O=CAMBIUM,ST=KA,C=IN
Issued by: PMP 450 BLR
Valid from 20-01-2020 to 17-01-2030
Signature Algorithm: sha256WithRSAEncryption
Delete
```

If certificate must be deployed on multiple radio, following configuration file template can be pushed through cnMaestro.

{ "userParameters":

{ "networkConfig":

{ "httpsCertificates":

Ε

{ "certificate": },

{ "encryptedPassword":}

{ "encryptedPrivateKey":}

]

}

.

},

}

certificate: Certificate in PEM format

**encryptedPassword**: If the private key is encrypted, this field is encrypted password. Password can be encrypted using Canopy Encryption tool located on **Configuration -> Unit Settings**. encryptedPrivateKey: Private Key.

### SSHv2

This release introduces SSHv2 support and once the user is logged in via SSH, the Command Line Interface (CLI) which is the same as Telnet will be presented to the user.

SSH is enabled by default and four user sessions are allowed. To turn enable or disable SSH, go to **Configuration -> Security Mode -> SSH Server.** 

Security Mode	Ξ.
Web Access :	HTTP and HTTPs V
SNMP :	SNMPv2c Only
Telnet :	€ Enabled ⊃ Disabled
FTP :	€ Enabled ⊃ Disabled
TFTP :	€ Enabled ⊃ Disabled
NTP server :	€ Enabled ○ Disabled
SSH Server :	● Enabled ○ Disabled

### Supported algorithms:

- | ssh2-enum-algos:
- | kex\_algorithms: (2)
- | diffie-hellman-group1-sha1
- | diffie-hellman-group14-sha1
- | server\_host\_key\_algorithms: (2)
- | ssh-dss
- |ssh-rsa
- | encryption\_algorithms: (1)
- | aes128-ctr
- | mac\_algorithms: (1)
- | hmac-sha1
- | compression\_algorithms: (1)
- |\_ none

Table 2:SSH SNMP Object

Name	OID	МІВ	Access	Syntax
sshStatus	.1.3.6.1.4.1.161.19.3.3.2.292	WHISP-BOX- MIB	read- write	INTEGER { disable (0), enable (1) }

# **SNMPv3 Security Protocol**

### SNMPv3 Authentication Protocol: SHA-1 and SHA-256

#### SHA-1

This release introduces SHA-1 (Secure Hash Algorithm 1), is a cryptographic hash function which takes an input and produces a 160-bit (20-byte) hash value known as a message digest.

#### SHA-256

This release introduces SHA-256 (Secure Hash Algorithm 2) is a cryptographic hash functions designed by the United States National Security Agency (NSA). SHA-2 includes significant changes from its predecessor, SHA-1. The SHA-256 hash function is implemented in some widely used security applications and protocols, including TLS and SSL, PGP, SSH, S/MIME, and IPsec.

To enable this feature:

Go to **Configuration -> SNMP page -> SNMPv3 Settings**.

SNMPv3 Settings		8
Engine ID :	800000a1030a003e458d62	Use Default Engine ID
SNMPv3 Security Level :	auth,priv •	
SNMPv3 Authentication Protocol :	SHA-256 *	
SNMPv3 Privacy Protocol :	MD5	
SNMPv3 Read-Only User :	SHA 250 Danopyro Authorization Key	
	Privacy Key	
SNMPv3 Read/Write User :	Enable R/W User     Disable R/W User Username User1 Authorization Key     Privacy Key	

### SNMPv3 Privacy Protocol: AES CFB (128)

This release introduces AES encryption (Advanced Encryption Standard), is a symmetric block cipher chosen by the U.S. government to protect classified information and is implemented in software and hardware throughout the world to encrypt sensitive data. The algorithm described by AES is a symmetric-key algorithm, meaning the same key is used for both encrypting and decrypting the data.

To enable this feature:

#### Go to Configuration -> SNMP page -> SNMPv3 Settings.

SNMPv3 Settings		
Engine ID :	800000a1030a003e458d62	Use Default Engine ID
SNMPv3 Security Level :	auth,priv •	
SNMPv3 Authentication Protocol :	SHA-256 •	
SNMPv3 Privacy Protocol :	CFB-AES V	
SNMPv3 Read-Only User :	CBC-DES anopyro CFB-AES Automization Key Privacy Key	

Table 3: SNMPv3 security Protocol SNMP Object

Name	OID	MIB	Access	Syntax
snmpv3AuthProt	.1.3.6.1.4.1.161.19.3.3.2.292	WHISP-BOX-MIB	read- write	INTEGER { disable (0), enable (1) }
snmpv3PrivProt	.1.3.6.1.4.1.161.19.3.3.14.5	WHISP-BOX- MIBV2-MIB	read- write	INTEGER {cbc- des(0), cfb-aes(1)}

## **Reconfigure without Reboot**

This release avoids device reboot for the following configuration parameters:

- Sector ID on AP
- Transmit Power on AP
- Site Name
- Site Contact
- Site Location

## Point to Point Target Receive Power Level on BHM

This feature allows the Backhaul Master to control the transmit power of the Backhaul Slave. To enable this feature:

Go to Configuration -> Radio page,

- 1. Under Power Control section, enable BHS TX Power Control
- 2. Configure BHS Receive Target Level

Power Control		
Transmit Power :		dBm (Range: -30 — +19 dBm) (2 dBm ∨ / 2 dBm H)
External Gain :		dBi (Range: 0 — +70 dBi)
BHS TX Power Control :	<ul> <li>Ena</li> <li>Disa</li> </ul>	bled (BHM Controls) abled
BHS Receive Target Level :	-52	dBm (Range : -80 — -40 dBm)

# **Enhanced Frame Utilization Statistics**

This release introduces an enhanced Frame Utilization Statistics on GUI (not available on 450m). In addition to reorganization of information, it provides useful Spectral Efficiency information. Following figure dispays the new layout.

Frame Utilization Interval
Statistics Display Interval : 1 minute 🗸
Next Update : 40 seconds
Frame Utilization Summary
Ullization
Uniccuson Percentage
DOWININ 04-19
obert of the second
Spectral Efficiency (user data bits per second per hertz)
Direction Extrapolated 8X Max 7X Max 6X Max 5X Max 4X Max 3X Max 2X Max 1X Max
Downlink 4.52 5.18 4.53 3.89 3.24 2.59 1.94 1.30 0.65
Uplink 2.54 2.56 2.26 1.94 1.61 1.29 0.97 0.65 0.32
Data to Overhead Percentage
Direction Data Overnead (Ack)
OWNER 95.75 0.475
Opinik 30.4% 1.5%
Data Per Modulation Percentage
Direction 1X 2X 3X 4X 5X 6X 7X 8X
Downlink 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 99.8% 0.1%
Uplink 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 0.0% 100.0%
Data Per QoS Percentage
Direction BCast Low Medium High Ultra High AAA Cti
Downink 0.0% 0.4% 0.5% 23.2% 75.5% 0.0% 0.0%
איז פרט.ט פרו.פט פרט.ן פרו.ו פרט. איז אווויעט איז אוויעט איז אוויעט איז אוויעט איז אוויעט איז אוויעט איז אוויע
Bandwidth Request Receive Efficiency
Percentage Received Received Missed Urgent
100.0% 4132 0 0

Interval Slot	Count Sur	nmary	1								
Used											
Direction	Total	Data		Ack	now	ledg	eme	nts Fr	ame /	Averag	e
Downlink	1653255	1646	014	72	41			1	38		
Uplink	845154	8318	33	13	321			7	0		
Modulation	(1X : coun	t of sl	ots c	onta	inin	g 1 f	ragr	nent	of us	er data	1. 2X : C
Direction	Total	1X	2X	3X 4	X S	X 6	X 7.	X		X	Aver
Downlink	1646014	218	0	0	0	0	0	16427	72	3024	7.0
Uplink	831833	0	0	0	0	0	0 0	0		83183	3 8.0
Quality of S	ervice	-	_			_	_	_			
Direction	Total	BCas	Low		Medi	um	High		Ultra	High	AAA
Downlink	1646014	218	812	21	107	24	383	259	124	3692	0 0
Uplink	831833	NA_	870	03	925	8	139	55	799	917	0 1
Astronuted											
Acknowled	Total	adial									
Direction	TOTAL P	arual									
Downlink	7241 0	_									
Uplink	13321 0										
Contention											
Total	verane Der	Eram									
702846	fo	riank	5								
102040	59		_								
Dasket Disc	and County										
Packet Disc	ard Counts										0
Ethernet ind	rscards :										- 0
Dadio indico	ande :										0
Padio outdis	arua :										- 0
reauto outors	carus :										0

The layout is broken into several major sections:

- Frame Utilization Interval
- Frame Utilization Summary
- Interval Slot Count Summary
- Packet Discard Counts

Frame Utilization Interval is unchanged from previous releases. This is a great place to start when determining how fully utilized a sector is running.

Frame Utilization Summary contains much of the previous release's information in a new tabular form. It also contains some entirely new information, specifically Spectral Efficiency. This is included to provide an actual measure of how many bits per hertz per second we achieved for user data in the most recent frame utilization interval. A useful table of maximum spectral efficiencies achievable versus modulation is included.

Note that in the above figure, the sector was achieving a downlink spectral efficiency of 4.52 and an uplink spectral efficiency of 2.54. This shows that the sector downlink is operating at nearly 7x downlink efficiency and nearly 8x uplink efficiency. It does vary slightly based on channel bandwidth. The **Tools -> OFDM Frame Calculator** can be used to see the impact of channel bandwidth on spectral efficiency. Below figure displays 40 MHz channel bandwidth (used for capture of frame utilization screenshot) and 5 MHz channel bandwidth. This difference can be traced back to differences in the ratio of how many slots are available for user data versus overhead (beacons, MAC level acknowledgements, scheduling maps).

OFDM Frame Calculator Parameters						
Link Mode :	O Point-To-Point Link					
	Multipoint Link					
Platform Type AP/BHM :	PMP/PTP 450/450i/450m ✓					
Platform Type SM/BHS :	PMP/PTP 450/450b/450i 🗸					
Channel Bandwidth :	5.0 MHz 🗸					
Cyclic Prefix :	One Sixteenth 🗸					
Frame Period :	● 5.0 ms					
	02.5 ms					
Max Range :	1 (Range: 1 — 40 miles / 64 km)					
Downlink Data :	67 %					
Contention Slots :	3 (Range: 0 — 15)					
SM/BHS One Way Air Delay :	0 ns					
	Calculate					

Calculated Frame Results

CANOPY 20.0 AP

Modulation:OFDM Total Frame Bits : 50000 Frame Period : 5.0 ms AP Details : Data Slots (Down/Up) : 26 /13

#### Maximum Spectral Efficiency (user data bits per second per hertz) and Throughput

Frags Per Slot	Spectral Efficiency(Total)	Throughput(Total)	Spectral Efficiency(DL)	Throughput(DL)	Spectral Efficiency(UL)	Throughput(UL)
8X	6.38	31.94 Mbps	4.25	21.29 Mbps	2.12	10.64 Mbps
7X	5.59	27.95 Mbps	3.72	18.63 Mbps	1.86	9.31 Mbps
6X	4.79	23.95 Mbps	3.19	15.97 Mbps	1.59	7.98 Mbps
5X	3.99	19.96 Mbps	2.66	13.31 Mbps	1.33	6.65 Mbps
4X	3.19	15.96 Mbps	2.12	10.64 Mbps	1.06	5.32 Mbps
3X	2.39	11.97 Mbps	1.59	7.98 Mbps	0.79	3.99 Mbps
2X	1.59	7.98 Mbps	1.06	5.32 Mbps	0.53	2.66 Mbps
1X	0.79	3.99 Mbps	0.53	2.66 Mbps	0.26	1.33 Mbps

Contention Slots: 3 Air Delay for Max Range: 5400 ns, 54 bits Approximate distance for Max Range: 1617 meters AP Antenna Transmit End : 29859, 2.985973 ms AP Antenna Receive Start : 31522, 3.152205 ms AP Antenna Receive End : 49103 SM Details : SM Receive End : 30388 SM Transmit Start : 30640

SM One Way Air Delay : 0 ns SM Approximate distance : 0 meters

There is a new Data to Overhead Percentage table that provides a breakdown of user data to overhead data. Overhead data is made up of slots used by transmissions like beacons, scheduling maps, and MAC level acknowledgement slots.

The Data Per Modulation Percentage table provides a breakdown of data slots used per modulation. The Frame Utilization screenshot shows that the Data Per Modulation table confirms what the Spectral Efficiency table showed (7x downlink and 8x uplink).

The Data Per QoS Percentage table breaks down what percentage of used slots were due to which QoS levels.



# Note

The AAA QoS refers to slots used for authentication/authorization/accounting and Ctl QoS refers to slots used for system level messages (registration, encryption).

Interval Slot Count Summary provides a summary of actual slot counts rather than the percentages provided in the Frame Utilization Summary.

The Used table provides a breakdown of total slots used in each direction. It further breaks down the total between data and acks. Finally, it provides an average slots used per TDD frame.

- The Modulation table provides a breakdown of the number of slots used at each modulation.
- The Quality of Service table provides a breakdown of the number of slots used at each QoS level.

The Acknowledgements table provides the number of slots used for acks. It also provides a new count called "Partial". For all previous releases, acknowledgements were always sent QPSK MIMO-A modulation. This meant that the "payload" of an ack only had 64 bytes for information. Depending on the quality of a users link, it was possible that the 64 byte payload was not sufficient to "fully" acknowledge the data that was just received. When this happened, we described this as a "Partial" ack. Beginning with this new release, if a user link can support modulations higher than QPSK MIMO-A, acknowledgements can now take advantage of these higher modulations. This increases the available payload size for acknowledgements and therefore will reduce (if not eliminate) the occurrence of partial acks.

## **DSCP Stream Prioritization**

The configuration of this feature, is on the PMP SM and PTP BHS with a minor difference being that the PTP has an additional option called "Role" for the BHM device to play.

#### PMP Configuration:

DSCP Stream Priority Settings								
Prioritize DSCP Streams :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>							
DSCP Stream Identifier :	45 (0-63)							
DSCP Stream Priority :	High 🗸							
DSCP Stream Priority Description :	Zoom QoS							
Add/Modify DSCP Stream Prior	Remove DSCP Stream Priority     Clear DSCP Stream Priorities							
DSCP Stream Prioritization: Disabled								

The PMP Configuration is available on the SM's Configuration -> DlffServ page.

The first option is the enable/disable the feature for this SM's link. This option is controlled by the overall DiffServ page's "Save Changes" button. To configure specific mappings, the next 3 entries are used as well as the associated buttons.

To add a new, or modify an existing, mapping, enter the values in the boxes and click the Add/Modify DSCP Stream Priority button. Adding DSCP 45, for High, for "Zoom Meetings" is shown in the below figure:

DSCP Stream Priority Settings								
Prioritize DSCP Streams :			<ul> <li>Enabled</li> <li>Disabled</li> </ul>					
DSCP Stream Identifier	45	(0-63)						
DSCP Stream Priority :			High 🗸					
DSCP Stream Priority Description :			Zoom QoS					
Add/M	Add/Modify DSCP Stream Priority				Remove DSCP Stream Priority Clear DSCP Stream Priorities			
DSCP Stream Prioritizat DSCP: 45, Priority: Hi	tion: Disabled igh (4), Description: Zoor	m QoS						

To modify this to change the priority or the description, make the change and use the Add/Modify DSCP Stream Priority button again:

DSCP Stream Priority Settings		E	
Prioritize DSCP Streams :	<ul> <li>Enabled</li> <li>Disabled</li> </ul>		
DSCP Stream Identifier :	45 (0-63)		
DSCP Stream Priority :	High 🗸		
DSCP Stream Priority Description :	Teams Meetings		
Add/Modify DSCP Stream Priority	Remove DSCP Stream Priority Clear DSCP Stream Priorities		
DSCP Stream Prioritization: Disabled DSCP: 45, Priority: High (4), Description: Teams Meetings			



Up to 10 entries can be configured per SM and the description field can be up to 32 characters long.

In order to remove a mapping:

Note

• Enter the DSCP and click the Remove DSCP Stream Priority button.

To clear all entries:

• Press the Clear DSCP Stream Priorities button.

The SM's configuration is sent to the AP at registration time as well as any time that there is a change made to the configuration. There is no Reboot Required when making changes to this configuration.

The configuration will be seen on the AP's DiffServ page, grouped per SM, to note that there is an overlay being used for a particular SM link:

DiffServ Confi	iguration						
CodePoints (	00) — (07):						
CP00:0	CP01:0	CP02:1	CP03:1	CP04:1	CP05:1	CP06:1	CP07:1
CodePoints (	08) — (15):						
CP08 : 1	CP09:1	CP10:1	CP11 : 1	CP12 : 1	CP13 : 1	CP14 : 1	CP15 : 1
CodePoints (	16) — (23):						
CP16 : 2	CP17:1	CP18 : 2	CP19:1	CP20:2	CP21:1	CP22 : 2	CP23 : 1
CodePoints (	24) — (31):						
CP24 : 3	CP25 : 1	CP26:3	CP27 : 1	CP28 : 3	CP29:1	CP30:3	CP31 : 1
CodePoints (	32) — (39):						
CP32 : 4	CP33 : 1	CP34 : 4	CP35 : 1	CP36:4	CP37:1	CP38 : 4	CP39 : 1
CodePoints (	40) — (47):						
CP40 : 5	CP41:1	CP42 : 1	CP43 : 1	CP44 : 1	CP45 : 1	CP46 : 5	CP47 : 1
CodePoints (	48) — (55):						
CP48 : 6	CP49:1	CP50 : 1	CP51:1	CP52 : 1	CP53 : 1	CP54 : 1	CP55 : 1
CodePoints (	56) — (63):						
CP56 : 7	CP57:1	CP58 : 1	CP59 : 1	CP60:1	CP61:1	CP62 : 1	CP63 : 1
DSCP Stream	Prioritizatio	n: Enabled					

LUID 3:

DSCP: 45, Priority: High (4), Description: Teams Meetings

If there were multiple SMs with this feature enabled, each of them would show up on this page. And you can have different Priorities for each SM even on the same DSCP.

Also, on the PMP AP, since it is the Upstream Device, you can see the captured Tuples of a tracked stream. This can be found on the new **Logs -> DSCP Priority Streams** page. Here is an example of a Zoom Meeting being tracked and prioritized:

DSCP Pr	riority Stream M	Aappings						
Note: Re	d text in the Str	eam Priority colur	nn means the stream	is configured for a particular	priority level wh	hich is not active	for the link, so the	ne traffic
will be ma	apped to the cit	sest enabled pric	nty. Display format is	Active (Conligured)		D		
DSCP	Source LUID	Stream Priority	<ul> <li>Stream Description</li> </ul>	Source IP	Source Port	Remote IP	Remote Port	Protocol
45	3	High	Zoom Meetings	192.168.128.180	52389	52.202.62.254	443	TCP
45	3	High	Zoom Meetings	192.168.128.180	52388	52.202.62.254	443	TCP
45	3	High	Zoom Meetings	192.168.128.180	52387	3.235.73.94	443	TCP
45	3	High	Zoom Meetings	192.168.128.180	52386	18.205.93.211	443	TCP
used 4 fr	ee 8188							

As seen in the above figure, all of the data is for LUID 3 DSCP 45, for "Zoom Meetings" stream. All of this is from the same Source IP, but using different source ports and remote IPs, and a mixture of TCP and UDP traffic.

By default, each entry will timeout after 5 minutes of inactivity at which point, it will need to be relearned in the uplink to be properly handled in the downlink.

The easiest way to track this feature working is to use the **Statistics -> Data Channels** page to see traffic on the desired priority level in both directions, and then changing the configuration on the fly to watch the traffic move to different priority levels. With this method, it is very easy to see the priority channel change as the configuration changes with constant DSCP uplink marked traffic.

### **PTP Configuration**

For PTP mode, the operation and GUI is the same except that the Configuration is on the PTP BHM always and has an extra configuration item called "Role". The DSCP Streams Priority Mappings Log page will be on the "Upstream" Role Device; Think of the PTP "Upstream" Role Device as acting like the PMP AP and the PTP "Downstream" Role Device acting as the PMP SM as far as the feature operation is concerned. The configuration for this will be found on the PTP BHM **Configuration -> DiffServ** page.

In the example below, the BHM is the "Downstream" device.

DSCP Stream Priority Settings						Ξ
Prioritize DSCP Streams :		<ul> <li>Ena</li> <li>Disa</li> </ul>	abled			
DSCP Stream Role :		○ Upstream ● Downstream				
DSCP Stream Identifier :		45	(0-63)			
DSCP Stream Prior	ity :	High	~			
DSCP Stream Prior	ity Description :	Zoom M	Neetings			
Add/Modify DSCP Stream Priority		Remo	ve DSCP Stream Priority	Clear	DSCP Stream Priorities	
DSCP Stream Prioritization: Enabled Role: Downstream DSCP: 45, Priority: High (4), Description: Zoom M			js			

# **Release 20.0.1 System Documentation**

Provided with this release are several documents for your reference:

- <u>PMP 450 Series Specification Sheets</u>: Includes up-to-date specifications for the 450 Series product line.
- <u>PMP 450i Series Specification Sheets</u>: Includes up-to-date specifications for the 450i Series product line.
- PMP 450b Specification Sheets: Includes up-to-date specifications for the 450b.
- <u>PMP 450m Series Specification Sheets</u>: Includes up-to-date specifications for the 450m Series product line.

<u>PMP 450 MicroPoP Specification Sheets:</u> Includes up-to-date specifications for the 450 MicroPoP Series product line.

• LINKPlanner: Includes up-to-date information about Cambium product performance.

# **Embedded Software**

Prior to upgrading, please read section Upgrading Software. System Release 20.0.1 may be installed via CNUT (Canopy Network Updater Tool) using the following software package:

- CANOPY20\_0\_1BUILDOFFICIAL\_PXP45x\_S.pkg3
- Or via cnMaestro: CANOPY\_20.0.1.tar.gz

# **Upgrading Software**

Use version 4.13.3 of the Canopy Network Updater Tool (CNUT) to upgrade to Release 20.0.1.

CNUT 4.13.3 supports legacy Cambium products.

CNUT and its release notes can be downloaded from the Cambium support web site: <a href="https://support.cambiumnetworks.com/files/cnut/">https://support.cambiumnetworks.com/files/cnut/</a>



## Note

As of Software Release 16.2 and later, CNUT AutoUpdate using PMP 450 AP as the File Server no longer supports update of 450b and 450i SMs. Use cnMaestro or CNUT HTTP File Server option to upgrade these SMs.

The below 3 tables describes the compatibility between AP and SM versions.

PMP 450/450b/450i/450m Compatibility					
AP Version	SM Version				
	20.0+	16.2.X - 15.2	15.1.5 & earlier		
20.0+	Y	2X MIMO-B	Ν		
16.2.X - 16.1	Y	Y	Ν		
16.0.1.1 & earlier	Y	Y	Y		

PMP 430 SM Compatibility						
AP Version		430 SM Version				
	16.0.1.1 - 14.2	14.1.2 - 14.0	13.4.1 - 12.2	12.1.3 & earlier		
16.1+	N	N	N	Ν		
16.0.1.1 - 14.2	450 mode	450 mode	450 mode	Ν		
14.1.2 - 14.0	450 mode	450 mode	450 mode	Ν		
13.4.1 & earlier	430/450 mode	430/450 mode	430/450 mode	430 mode		

CI	CBRS 450/450b/450i/450m Compatibility						
AP Version	SM Version						
	20.0+	20.0+ 16.2.X - 16.2 16.1.1.1 - 15.2 15.1.5 & earlier					
20.0+	Y	2X MIMO-B	2X MIMO-B*	N			
16.2.X - 16.2	Y	Y	N*	N			
16.1.1.1 & earlier	N*	N*	N*	N*			
	*Y if CBRS Disabled on AP						
	N* indicates	compatibility	y for non CBR	S sectors.`			

Release	Feature or Hardware First Supported
20.0	Addition of Intermediate Modulation Modes (3X/5X/7X MIMO-B). Upgrade SM first when upgrading to 20.0+. Otherwise, the link will connect at 2X MIMO-B until the SM is upgraded to 20.0.
16.2.3	PMP 450m 3 GHz P4.4
16.2.1	PMP 450 MicroPoP 5 GHz , PMP 450b 3 GHz High Gain, PMP 450b 5 GHz Retro
16.2	CBRS
16.2 BETA	CBRS -If running pre 16.2 BETA-5: Upgrade both SM and AP from the older software first to 16.2 BETA-5; After reconnect, upgrade the AP to 16.2 official or later; Upgrade the SMs to 16.2 official or later.
16.1	PTP 450b
16.1	PMP 430 SM no longer supported. Also if AP is on 16.1, SMs need to be on 15.2 or later to connect to AP on 16.1 or later.
16.0.1.1	Last PMP 430 SM release load; Recommended upgrade release stepping stone from earlier releases
16.0	PMP 450m 3 GHz, Uplink MU-MIMO
15.2.1	PMP 450i 5 GHz P6 SMs previously configured for DES will register to APs configured to AES

	(assuming correct encryption key config) and also to APs with encryption disabled.
15.2	AES-256 added and DES no longer supported. SMs configured for DES will not register to AP with encryption enabled. AP will need to disable encryption for SMs configured to DES to register.
15.1.5	PMP 450b High Gain 5 GHz
15.1.2	PMP 450b Mid-Gain 5 GHz
15.1	40 MHz and PMP 450i 3 GHz
15.0	PMP 450m 5 GHz
14.2	cnMaestro, 15 and 30 MHz Channel Bandwidths
14.1.2	PMP 430 SM last release line in with support for ability to reboot and switch to/from "PMP 430 mode" / "PMP 450 mode". All PMP 430 radios first need to be upgrade to this release, "450 mode" selected and rebooted before able to be upgraded to a later release.
14.1	PMP 450i 5.1 and 5.2 GHz band support
14.0	PMP 450i 5 GHz
13.4.1	Last release line for PMP 100, PMP 430 AP
13.3	5 ms frame, 7 MHz Channel Bandwidth
13.0	PMP 450 3 GHz
12.1.1	5 MHz Channel Bandwidth
12.1	PMP 450 2.4 GHz
12.0	PMP 450 5 GHz

# **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

cnMaestro may also be used to manage Cambium devices. Additionally, cnMaestro is required if using the CBRS feature. See the cnMaestro release notes for more information. 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:

- 1. First, load the standard MIB files
- 2. 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 System Release 20.0.1**

Problems and limitations, which have been corrected in System release 20.0.1 are listed below.

Table 4 :System Release 20.0.1 problems and limitations corrected

Products Affected	Tracking	Description
All	CPY-17041	Actual UL Modulation rate was much higher than the expected UL Modulation rate.
All SM & BHS	CPY-17011	Reset during DFS event
All	CPY-17009	Unstable sessions in system release 20.0
450b	CPY-17006	Bandwidth PLL lock lost on some 450b running system release 20.0 causes SM not to come into session.
All SM	CPY-17002	SM resetting due to out of buffers in System release 20.0
450/450i/450b	CPY-17001	Rate Adapt can switch from MIMO-A to MIMO-B incorrectly in system release 20.0.
450m	CPY-16995	CBRS service rebooting radio after setting time from NTP after a reboot.
ETSI 5.4 GHz	CPY-16989	Alternate Frequency options are not available
450i/450b	CPY-16943	Allow 450i/450b operation at 15 MHz in DFS regions
450 AP	CPY-16937	PMP 450 failing to resolve URLs correctly when DNS Response contains Message Compression.
внм	CPY-16826	BHM does not show CBSD logs for BHS in engineering.cgi

# Problems and Limitations Corrected in System Release 20.0

Problems and limitations, which have been corrected in System release 20.0 are listed below. These issues have been corrected since System release 16.2.3.

Products Affected	Tracking	Description
PMP 450	CPY-16936	SM Watchdog reset due to "Misaligned Data Access associated with MPU violation"
MicroPoP	CPY-16776	SNMP Sync Loss Trap indicated wrong sync source
PMP 450	CPY-16976	PMP 450 AP having MPU violation reset in GPSI Task
All CBRS	CPY-16961	SM does not adjust power after enabling CBRS
450i AP	CPY-16932	Software watchdog reset due to "Data Abort exception"
PTP 450i BHS	CPY-16919	PTP 450i BHS crashes with "No NiBufs, buffer stack exhausted" with DHCPv6 packets on network
All CBRS	CPY-16918	CBRS Device statistics count values are wrong
PMP 450b Hig	CPY-16818	PMP 450b High Gain SM is not displayed in AP session->Link Quality tab when Link Quality Metric=Rate
450m	CPY-16594	CBRS enabled running into repeatedly RFLinkSyncQueue failure and repeatedly FatalError reset
MicroPoP	CPY-16776	SNMP Sync Loss Trap Indicates Wrong Sync Source on a MicroPoP AP
All SM	CPY-16972	Add support to "rfScanList" OID to accept keywords "allwhole" and "allhalf"
PTP 450	CPY-15852	PTP 450 BHM does not recover, if a packet with BHS MAC address as source address, enters BHM's Ethernet port.

Table 5 :System Release 20.0 problems and limitations corrected

# **Known Problems or Limitations in System Release 20.0**

Known open issues in System release 20.0 are listed in following table:

Table 6 :System Release 20.0 known problems and limitations

Products Affected	Tracking	Description
450 AP with CBRS	CPY-16748	Occasionally with CBRS enabled the AP resets due to "Invalid NiBuf".
All	CPY-15912	When Link Test is performed with Bridging and MIR, while there is significant user traffic, Link Test throughput results are low, when compared to Link Test results with Bridging.
450m	CPY-16975	3 GHz 450m looses connection to main Ethernet port and requires a pwer-cycle
450b	CPY-16965	450b SM in NAT mode, with VPN end point on it's LAN, stops passing traffic when NAT table entry > 1500
450m	CPY-16820	5 GHz 450m locks up until it is recovered by a power-cycle

# Additional Enhancements in System Release 20.0

Additional enhancements in system release 20.0 are listed in following table:

Table 7: Additional enhancements in system release 20.0

Products Affected	Tracking	Description
450i	CPY-16891	Several Packet Per Second improvements
All	CPY-16209	Support 5600-5650 MHz licensed band for Australia
450m	CPY-16929	Added support to send LLDP packets on boot up before it consumes full power, on 450m AP.
All SM	CPY-16972	Added support to "rfScanList" OID to accept keywords "allwhole" and "allhalf"
All SM	CPY-16958	Added new OIDs to add and remove frequencies from SM scan list
All 3 GHz AP/BHM	CPY-16642	In System Release 20.0, two new CoExistence related parameters have been added to the CBRS configuration section of the AP/BHM. For now-for this initial System Release 20.0, Cambium advises customers to leave these at their default values, which is MAC address for AP/BHM, and blank for Resuse ID. Cambium will provide additional Guidance on these parameters and CBRS CoExistence in the near future.

# **Reference Information**

# **Specifications**

Refer 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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