





System Release 1.5



#### **Reservation of Rights**

Cambium reserves the right to make changes to any products described herein to improve reliability, function, or design, and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Cambium recommends reviewing the Cambium Networks website for the latest changes and updates to products. Cambium does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey a license under its patent rights or the rights of others. This publication may contain references to, or information about Cambium products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Cambium intends to announce such Cambium products, programming, or services in your country.

#### Copyrights

This document, Cambium products, and 3rd Party software products described in this document may include or describe copyrighted Cambium and other 3rd Party supplied computer programs stored in semiconductor memories or other media. Laws in the United States and other countries preserve for Cambium, its licensors, and other 3rd Party supplied software certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted material of Cambium, its licensors, or the 3rd Party software supplied material contained in the Cambium products described in this document may not be copied, reproduced, reverse engineered, distributed, merged, or modified in any manner without the express written permission of Cambium. Furthermore, the purchase of Cambium products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents, or patent applications of Cambium or other 3rd Party supplied software, except for the normal non-exclusive, royalty-free license to use that arises by operation of law in the sale of a product.

#### Restrictions

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Cambium. License Agreements The software described in this document is the property of Cambium and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

#### License Agreements

The software described in this document is the property of Cambium and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

#### **High Risk Materials**

Cambium and its supplier(s) specifically disclaim any express or implied warranty of fitness for any highrisk activities or uses of its products including, but not limited to, the operation of nuclear facilities, aircraft navigation or aircraft communication systems, air traffic control, life support, or weapons systems ("High-Risk Use"). This product is not restricted in the EU. Any High Risk is unauthorized, is made at your own risk and you shall be responsible for any losses, damage, or claims arising out of any High-Risk Use.

#### Trademark

AeroScout is a trademark of Stanley Black & Decker, Inc. or its affiliates. Other brand products and service names are trademarks or registered trademarks of their respective holders.

© 2022 Cambium Networks Limited. All rights reserved

# Contents

Contents	
Abbreviations and Terms	
Revision History	6
Introduction	7
Solution Overview	
Cambium Networks Enterprise Wi-Fi Access Points	
XV3-8-Indoor Wi-Fi 6 Access Point	
XV2-2-Indoor Wi-Fi 6 Access Point	
XMS-Cloud Management System	9
cnMaestro X Management System	
Active RFID tags	
AeroScout Location Engine	
Configuration – Cambium and AeroScout	
Configuring the AeroScout server in XMS-Cloud	10
Configuring the AeroScout server in cnMaestro X	11
Configuring the Cambium AP Using the Command Line Interface (CLI)	12
Configuring AeroScout Engine Manager	13
Version Compatibility and Configuration Suggestion	
Firmware Version details	
Supported TAG formats	
Supported AP Models	
Cambium AP configuration suggestions	
Cambium AP deployment suggestions	
Troubleshooting	
General	
Resolution:	
Show/Debug commands on the AP	

Verification on the AES server	
Cambium Networks	

# Abbreviations and Terms

Terms	Description	
AES	AeroScout Engine Server	
AEM	AeroScout Engine Manager	
AP	Access Point	
WLAN	Wireless Local Area Network	
UDP	User Datagram Protocol	
CLI	Command line Interface	
IP	Internet Protocol	
MAC	Media Access Control (Hardware Address)	
RFID	Radio Frequency Identification	
RTLS	Real Time Location System	
Тад	AeroScout Tag	

# Revision History

Date	Version #	Author(s)
19/03/2021	1.0	Anandakrishnan V
04/08/2021	1.1	Marc H
10/08/2021	1.2	Marc H
25/08/21	1.3	Marc H
01/09/2021	1.4	Marc H
21/9/2021	1.5	Marc H

# Introduction

STANLEY Healthcare provides a Unified Visibility solution that utilizes the power of Cambium Networks Enterprise Wi-Fi 6 access points to provide significant business and patient experience benefits through Real-time Location, Active RFID, sensors, and telemetry. Cambium Networks Wi-Fi 6 access points provide the network bandwidth necessary for STANLEY Healthcare solutions to accurately track the realtime location and status of valuable assets such as equipment or people. Cambium Networks Wi-Fi products provide a single, unified wireless network throughout the healthcare facility. STANLEY Healthcare's solutions leverage the Wi-Fi network to enable customers to accurately track and monitor valuable assets ultimately using this visibility information to make everyday decisions, improve operational efficiency and provide security for patients and staff.

Cambium Networks empowers millions of people with wireless connectivity worldwide. Our wireless portfolio is used by commercial and government network operators as well as broadband service providers to connect people, places, and things. With a single network architecture spanning fixed wireless and Wi-Fi, Cambium Networks enables operators to achieve maximum performance with minimal spectrum. End-to-end cloud management transforms networks into dynamic environments that evolve to meet changing needs with minimal physical human intervention. Cambium Networks empowers a growing ecosystem of partners who design and deliver gigabit wireless solutions that just work.

Cambium Networks provides industry-leading solutions used in many areas such as:

- Education
- Enterprise
- Federal Government
- Healthcare
- Hospitality
- Industrial
- Oil and Gas
- Public Wi-Fi
- Retail
- Service Providers
- Smart Cities

# Solution Overview

STANLEY AeroScout systems use Cambium Wi-Fi networks as core infrastructure. All wireless visibility solutions require Wi-Fi infrastructure devices to pass wireless signals from tags or sensors to the network. AeroScout enhances this capability by enabling real-time tracking of thousands of tagged devices and people, e.g., staff and at-risk patients.

Using Cambium Networks wireless access points as wireless readers, organizations can locate and track their assets and people with AeroScout tags and software using a single unified wireless network for data, voice, and location services.

## **Cambium Networks Enterprise Wi-Fi Access Points**

Cambium Networks XV access points, cnMaestro X, and XMS-Cloud management systems deliver Enterprise grade Wi-Fi with Single Pane of Glass visibility to manage 802.11 Wi-Fi. Edge intelligent 802.11 access points are RF aware, provide seamless roaming and make intelligent decisions at the most impacted access point. Edge intelligent networks support more devices and more content, at higher bit rates.

Cambium Networks Wi-Fi 6 access points, the XV3-8 and XV2-2 deliver all the features available in the 802.11ax specification such as:

- Multi-user OFDMA more efficient for small to large packet sizes
- 8x8 MU-MIMO offer targeted beam steering and 2x capacity
- Spectrum reuse allows multiple networks to overlap
- Target Wait Time schedules sleep and wake uptime
- Preamble 3dB and longer OFDM symbol extend the outdoor range
- 1024 QAM and 2.4GHz band operation

# XV3-8-Indoor Wi-Fi 6 Access Point

The XV3-8 features a total of five radios to deliver a next-generation network with edge services with high capacity and high density. Three data radios can be configured as two 5GHz 4x4 plus one 2.4GHz 4x4, or the two 5GHz radios can be combined into a single 5GHz 8x8 radio with the maximum power and performance of the 802.11ax standard. A dedicated network scanning radio provides continuous network monitoring to enhance security protocols, detailed network reports, and automatic RF optimizations. Add the Bluetooth Smart 4.1 IoT radio for BLE-based location services and you get a multi-radio, high-capacity Wi-Fi 6 AP designed for the most demanding networks in the enterprise, healthcare, education, retail, and public venues.

# XV2-2-Indoor Wi-Fi 6 Access Point

The XV2-2 is a dual-radio Wi-Fi 6 access point designed to deliver next generation networks with edge services at a value-based price. While delivering all the features available in the 802.11ax specification, the XV2-2 is fully backward compatible with existing Wi-Fi technology and enables a massive growth of low power, low-bitrate IoT devices to add infrastructure intelligence into any market.

# **XMS-Cloud Management System**

XMS-Cloud is a powerful management solution for deploying and managing Cambium Networks Wi-Fi and Switching portfolios with complete control and visibility. It provides zero-touch activation to automate software upgrades, patches, and licenses. IT enjoys the benefits of a superior console interface where all services are integrated at no extra cost. The system supports Wi-Fi devices, including IoT endpoints, regardless of the operating system. DPI technology lets network administrators control more than 2,400 applications at the network's edge where they can be allowed, blocked, or throttled to achieve predictable performance, even under heavy network load. Integrated into the system is EasyPass, a suite of 8 different access portals which include Microsoft and Google portals, On-boarding, Guest, and Personal Wi-Fi portals.

## cnMaestro X Management System

cnMaestro X is a simple, yet sophisticated cloud-first, next-generation network management solution for Cambium Networks wireless and wired solutions. The system can run in the cloud, or onsite, in your existing VM environment. cnMaestro X offers single-pane-of-glass management to deliver secure, end-toend network and wireless lifecycle management with zero-touch provisioning, monitoring, and troubleshooting capabilities. Advanced features include an MSP Dashboard, Restful APIs, Webhooks, Support for Software Defined Radios, Support for 1,024 Enterprise Wi-Fi PSKs, and Advanced Captive Portal capabilities including paid gateways. The powerful set of tools simplifies operations, troubleshooting, and ongoing maintenance.

# **Active RFID tags**

Active RFID tags contain their batteries and transmit their ID signal at regular intervals, without requiring an external trigger. Tags send a periodic beacon that is used to identify their location.

# **AeroScout Location Engine**

AeroScout utilizes a Location Engine to determine the position of Wi-Fi tags. The Location Engine delivers accurate and reliable location data for assets and people with STANLEY Healthcare Wi-Fi tags. The AeroScout Location Engine determines location using signal strength measurements (RSSI) collected by the Cambium Wi-Fi APs, which can simultaneously serve location sensors and provide network access. It is an integral component of STANLEY Healthcare's AeroScout RTLS solutions.

# Configuration – Cambium and AeroScout

# **Configuring the AeroScout server in XMS-Cloud**

• Open a **Profile** and go to the **Access Points** page and click the **Show Advanced** link.



• Go to AeroScout, select Yes, and enter the Server IP address and Port for your AeroScout server. (Port 12092 is the default).

	Deres 200 States table	Configuration" Activ
Access Points @		( decision)
20 kee	Brightenhammenammen 5,40 toolind brankant Schelan	Access Control
Ethernet		
When you is to have an anni registrate?	ue su	
wa la	Would you like to condincation data to an external condica?	1
Gigabit Ethernet Port 2	Young you nice to send to date to an external service? Yes No	
Wantil pain the encourt of Mill to Opela Dimension Party 27 Anny Pyras and the features, tight and Digit parts, must be convected in efforts Ann Physical and their features, tight periods until periods to the Oper	AeroScout	
LACP Support for Access Paints	Would you like to enable AeroScout service? Yes O No	
The strain of the last state of the second second second	- ••	
LEDs	Server IP: 10.100.200.190	
Want parties in the desire of the second second	Rott 13003 A	
Location Reporting (1)	FOR 12092	1
Which plot the to send moment data to an enternal service"		1
Aarstona		
Ways pay he is each destination of	NB N	-
Server (H 19,100,200,10)	Contact Support or Give us Feedback	
Pers. 10360 C	contact support of circus recovery	



Note

BLE tags are currently not supported in XMS-Cloud with the XV access points. Support for BLE will be available in an upcoming release update.

# Configuring the AeroScout server in cnMaestro X

• On the cnMaestro X Home page, go to Shared Settings > AP Groups and WLANs

Cambium Networks	cnMaestro <sup>™</sup> X		a 🦻 🚅 💣	Administrator -
÷	Welcome, Administrator	(Super Administrator)		Cambium ID: cnmaestro_on_premises
🔒 Home	Devices	Devices By Type Total: 3	Connection Health (Last 24 Hrs) Resolution: 1hr	Get Started
Monitor and Manage	3 0 1	Enterprise Wi-Fi		Onboard Devices
E Inventory	Total Offline Onboarding		2	Generate Reports
Onboard	Alarms		1	Create inventory, performance, E
Managed Services 37	0 0 0		17.00 23.00 05.00 11.00	Wi-Fi Guest Portal Configure guest portals, splash
🔅 Shared Settings 🗸 🗸	Critical Mejor Minor		Offline      Total Devices	pages and access policies
Association ACL		Top Networks ~	Last 5 mins	Quick Links
Auto-Provisioning 2	0	Name Total Down Devices By Type	Alarms	Overview of cnMaestro
Switch Groups	Last 24 Hours	eEnterprise Wi-Pi	3 0	<u>Quick Start Guide</u> Device Onboarding
Templates	Metrics			I Troubleshooting Wi-Fi
AP Groups and WLANs	Account Capacity 25,000			
Network Services	Managed      Onboarding	2 Add Towner		Q Q &
Administration	Recommended Software 0%			

• Open an existing AP Group

Cambium Networks	cnMaestro <sup>™</sup> X			(	ر 📌 ۵	🥐 💰 📌	د e Adminis	trator ← _on_premises
÷	Shared Settings > AP	Groups and WLANs						c
숨 Home	AP Groups WLANs							
Monitor and Manage	Q, Search	Device Type: All -	WLAN: All -				New	Sync
_	Name =	Туре	AP Status	Clients Now	Clients 24 HR	Throughput (DL/UL)	WLANs	Auto :
Inventory	AeroScout_IoT Group	<ol> <li>Enterprise Wi-Fi</li> </ol>	0 of 0 offline	0	0	0 Kbps / 0 Kbps	AeroScout IoT	ON
Onboard	Default Enterprise	() e brise Wi-Fi	0 of 0 offline	0	0	0 Kbps / 0 Kbps	Default Enterprise	ON
Managed Services 2	Default Home	C cnPilot Home (R-Series)	0 of 0 offline	0	0	0 Kbps / 0 Kbps	Default Home	OFF
🔅 Shared Settings 🛛 🗸					Show	ving 1 - 3 Total: 3 10	✓ ← Previous 1	Noxt >
Association ACL								
Auto-Provisioning 2								
Switch Groups								
Templates								
AP Groups and WLANs								
Network Services								
🔁 Administration								

• On the Services tab, locate and expand the Stanley-AeroScout section

Cambium Networks	cnMaestro <sup>™</sup> X			∞ ا	<b>P</b> 🕈	<u>وب</u>	Administrator -     cnmaestro_on_premises
÷	AP Groups > Add New	1					
Home     Monitor and Manage	Basic Management Radio	Network  LDAP  NAT Logging DUCB Option 22					
Onboard Managed Services X	Network Security	Speed Test      RTLS (Real-Time Location Sy	stem)				
Shared Settings >	Services User-Defined Overrides	WI-Fi API     Bluetooth API     Stanley - AeroScout x	stellij				
G Administration →		Enable Wi-Fi ③     Enable Bluetooth ④ Host Enter a valid <= Address/Hostname>	Port 12092				
		Bonjour Enable Bonjour Gateway Name	Protocol	From VLAN	То	VLAN	Delete

• Select Enable Wi-Fi, Enable Bluetooth, and enter the IP address of the AeroScout server.

🌔 Ca	mbium Networks   cnMaestro	тм <b>X</b>			6	₩	P	6	<b>_</b>	çı <mark>9</mark>	Administrator -     cnmaestro_on_premises
÷	AP Groups > Add New										
A	Basic	Network									
<b>F</b>	Management	LDAP     NAT Logging									
e	Radio	DHCP Option 82									
٥	Network	Speed Test									
٩	Security	RTLS (Real-Time Locatio	on System)								
<b>\$</b> >	Services	Wi-Fi API									
	User-Defined Overrides	Bluetooth API									
		E Stanley - AeroScout x									
œ ′		Enable Bluetooth									
		Host		Port							
		https://192.168.1.55		12092							
		Bonjour	Y.								
		Name	Protocol	From VLAN			To V	LAN			Delete

# Configuring the Cambium AP Using the Command Line Interface (CLI)

- AeroScout commands available on the AP
  - **ble-tag**: Run the command to send the RFID tag information to the AeroScout RTLS Engine via BLE.
  - **wifi-tag**: Run the command to send the RFID tag information to the AeroScout RTLS Engine via Wi-Fi.
  - **server**: IP address of the AeroScout Location Engine.

 server-port: Port the Location Engine will listen to incoming location reports default UDP port is 12092.

```
XV2-2-1(config)#
XV2-2-1(config)#
XV2-2-1(config)#
XV2-2-1(config)#
XV2-2-1(config)#
XV2-2-1(config)# rtls aeroscout
ble-tag : Enable Aeroscout BLE Tag
server = configure Aeroscout Server IP or FQDN
server-port : Configure Aeroscout Server Port (Default port:12092)
wifi-tag : Enable Aeroscout WiFi Tag
XV2-2-1(config)# rtls aeroscout
XV2-2-1(config)# rtls aeroscout
```

• AeroScout sample configuration.

```
XV2-2-1(config)#
```

• Run the SAVE command to apply the configuration.

#### **Configuring AeroScout Engine Manager**

**Prerequisites** 

- Aeroscout Engine Server (AES) is installed and running
- Aeroscout Engine Manager (AEM) is installed

#### **Connect to the AES server**

- Open AeroScout Engine Manager (AES).
- In AeroScout Engine Manager go to File > Connect to AeroScout Engine Server.

1 and 1			0
AeroScout Engine Manager	11.5		
File Contiguration when actions looks		(Dec	
Connect to Aeroscout Engine server			
Development of the second s	lot connected		
Download Loas			
Backup Configuration			
Restore Configuration			
Exit			
	-r <sup>2</sup>		

• Enter the login credentials and AeroScout Engine Server IP address and click OK.



• On the Browse tab, AEM will display the default Site. You will now add a Campus, a building, a

floor, and a map to the default site.

1	AeroScout Engine Manager     File Configuration View Actions Tools Hi	to
	Templates Data Info	Connected to 127.0.0.1
(	Ste	

#### Add a Campus

• Right-click on the Site, and click on Add Campus



• On the Campus Properties page, give the Campus a name and click OK.



• The **Site**, "Alamo" has been created..

Alamo	

### Add a Building

• Right-click on the Alamo Campus, and click on Add Building



• Give the new building a name. In this example, the name is **Bldg A** 

Alamo	
	Building Properties
	Name: Bidg A
	OK Cancel

Campus = Alamo, Building = Bldg A

C course	

#### Add a Floor

• Right-click on Bldg A, and click on Add Floor



Enter a name for the **Floor** and a **Floor Number**.



Campus = Alamo, Building = Bldg A, Floor = Ground Level

#### Add a Map

Note

Maps are scaled drawings that show the physical layout between rooms, spaces, and other features. Maps are used to display where the devices are installed or located.



Create image map files for all floors. Map image files must be saved as BMP, jpeg, gif, or png format files.

• Right-click on the floor, Ground Level, and click on Add Map



Enter a descriptive name for the map that will make it easy to identify and click **OK**. You will then browse out to your local system and select a map to **import** into **AEM**.

Browse Y	Repository	
Browse V Site Alarno Bidg A Gro	Repository	
		Add Map X Name: West Wing OK Cancel

Campus = Alamo, Building = Bldg A, Floor = Ground Level, Map = West Wing



#### **Calibrating Map**

After importing a map, the next step is to calibrate the map to identify the Tags and the location of the Tags using RSSI levels.

Right-click on the map, **West Wing**, and place your mouse over the location where you want to set the reference point, and click the **Mark (0,0)** menu item.



Next, right-click on the West Wing map, and click Calibration > Calibrate Distance



Left-click on a location on the map (the pointer will turn into a cross), and click and drag the mouse from one point to another to draw a line between the two endpoints.

The Distance Calibration dialog box opens. Enter the distance (meters) in the field and click OK.

File Configuration View Actions Teels Help		
4 4 4 2 6 2 1 2 2 2 6 7 6 7 6 6 6 6 6 6 6 6 6		STARLEY
Templetes Data Info Committee 14/12/201	WestWing	-
Browsk 9 Repository		
Prestory * Disc * Disc * Disc * Disc * Disc Disc Disc * Disc *	Difice Patient Room Patient Room Office Patient Room Office Patient Room Office Patient Room Too Too Too Too Too Too Too Too Too	
Bystem Castgaration     Contrange Autoper	Patient Room 100 Wating Area Patient Room Patient Room Patient Room 100	

Right-click on the map and click Apply Calibration.



#### **Define a Cell**

Cells are used to break the map into smaller sections to help understand the Access Points location and coverage. Up to 35 devices can be attached to a Cell.

• To define a Cell, **right-click** on the map and select the **Add Cell** option.



- Draw a Cell by clicking on an area on the map and drag your mouse and continue to click the next points to define the cell endpoints. A Cell Properties box opens when you finalize the outlining of the Cell.
- Enter a name for the new Cell.
- Click OK.



#### Adding Access Points to the Map

The next step is to place access points on the map.

• On the map, right-click the physical location of the AP and select Add > Add Access Point.



The Access Point Properties dialog window opens.

AP Name	
Vendor:	Cambium Networks ~
IP Address:	
Port:	1144
MAC Address:	
Coordinates (meters	s): X 17.56 Y -8.82 Z 3.00
Map ID:	17_1_0
Map Name:	Floor Map
Access Point Mode	· · · · · · · · · · · · · · · · · · ·
RSSI Location Calcul	ation Options
Cells	
Cell Selection	Cells
Comment	

• Enter the following information

- Name: Give the AP a recognizable name
- Vendor: Select Cambium Networks from the drop-down menu
- IP Address: Enter the AP's IP address
- MAC: Enter the AP's MAC address
- Coordinates: In Z Coordinates, enter the height at which the AP is mounted in meters
- Assign the AP to a Cell
- Check and confirm the RSSI parameters. In this example, we are using AeroSocut's default RSSI parameters settings. However, you can define the Path Loss Exponent and Attenuation Factor parameters to override the global values set in Map Properties.
- Click OK
- Check and confirm RSSI parameters. On the Access Point Properties page, under Access Point Mode, click Options.

AP Name	
Vendor:	Cambium Networks ~
IP Address:	· · · · · · ·
Port:	1144
MAC Address:	
Coordinates (meters):	X 17.56 Y -8.82 Z 3.00
Map ID:	17_1_0
Map Name:	Floor Map
Access Point Mode	
RSSI Location Calculat	ion Options
Cells	
Cell Selection	Cells
Comment	

Verify the RSSI parameters. In this example, we are using Aeroscout's default RSSI parameter settings. You can define the Path Loss Exponent and Attenuation Factor parameters to override the global values set in Map Properties.

RSSI Calculation Parameters		
Use the Global RSSI Parameters	for this Map	
O Use specific RSSI Parameters for	this Device:	
Path Loss Exponent [1-5]:	3.5	
Attenuation Factor [-50-50]:	0	
Antenna Type		
Omni Directional		
<ul> <li>Directional</li> </ul>		
Antenna's Direction Coordinates:	X 16.32 Y -4.33	
	15	
Antenna Front Gain (dBm):	15	

- Select the **Antenna Type**. Refer to the access point's user guide for antenna type details. Note: Antenna patterns can be obtained from the Cambium Networks Support site. (support.cambiumnetworks.com).
- Click **OK** to continue.
- Initially, the AP will be offline. After a moment or two, the AP will appear on the map as online and available.



- Repeat these steps for all other access points that will be placed on this map
- To confirm the status of an AP, right-click on the AP icon and select the **Status** option from the popup menu





# Version Compatibility and Configuration Suggestion

# **Firmware Version details**

AeroScout Engine Manager	55 MR2
Cambium Access Point	6.3-r10 for Wi-Fi Support
	6.4-rx for BLE support (Coming soon)
cnMaestro X (On-Premises)	3.0.4
cnMaestro X Cloud	Updated by Cambium
XMS-Cloud	Updated by Cambium

### **Supported TAG formats**

Cambium and AeroScout joint solutions work with both IBSS and WDS tag formats.



The CCX format is not supported.

## **Supported AP Models**

Note

Cambium Networks XV2-2 and XV3-8.

## **Cambium AP configuration suggestions**

- OCS scan should be disabled
- A minimum of one WLAN should be enabled for AP to listen to TAGs
- Tags will work only on 2.4 GHz
- Schedule Access and Monitor Host features should be disabled if a single WLAN profile is configured
- When using Packet Capture on the home channel, Wi-Fi Tag messages may be dropped
- Wi-Fi Tag messages can be lost while using Spectrum Analyzer and Wi-Fi Analyzer

# **Cambium AP deployment suggestions**

When mounting APs to the ceiling or walls, ensure that all the APs throughout the building are mounted at approximately the same height, and within the range of 2.5 - 3.5 meters off the ground. Since RTLS works by measuring the received strength of packets, APs should not be placed inside of ceiling tiles or in/behind solid objects. The physical orientation of the APs does not affect the accuracy, so they can be mounted in whichever way is the easiest.

Once the APs have been deployed, wireless coverage will need to be validated, which can be done by using a site survey tool such as Ekahau. For Wi-Fi location, the survey needs to confirm that there is at least an RSSI >=-67dBm and a Signal Noise Ratio (SNR) of 25 or higher to three APs at any point throughout the floorplan. Client devices that do not meet these guidelines may be difficult to locate accurately inside the network perimeter.

# Troubleshooting

# General

Problem: The AP shows the status of Offline.



## **Resolution:**

Verify that the AP IP address and MAC address are entered correctly in the Engine Manager.

Go to Monitor and Manage and hover your mouse over the offline **AP**. A **popup window** will display various information about the AP including the **IP and MAC address**.

	Networks Wi-Fi AP Groups	Dashboard Notifications Configuration Details Performance
	V 🚱 System	Status Debug Remote CLI Packet Capture Network Co
		Command
E	.↓• detault	Type CLI command
0	<ul> <li>✓ ♣ AeroScout IoT</li> <li>✓ ∳ AeroScout Demo</li> </ul>	Run
<u>e</u>	😹 XV2-2-1	Name: XV3-8-2
	🔀 XV3-8-1	Type: YV0 0
•••	₽ XV3-8-2	MAC: BC:E6:7C:44:1B:AC
<b>**</b> >	> 💸 cnMaestro 3.0.4 New Feature	SW Version: 6.4-a14 Site: AeroScout Demo Network: AeroScout IoT
<b>i</b> >		

Or use the CLI to verify the AP IP address and MAC address. Go to **Monitor and Manage** and select the AP. Then go to **Tools > Remote CLI**.

• To verify the IP address, run the CLI command: show ip interface brief

🜔 Ca	mbium Networks   cnMaestro <sup>114</sup> X	🚳 🕨 🧬 🔊 🖓 🗩 🛤	Accounts -   O
	Search	IC Wi-Fi > XV3-8-2	C
<b>A</b>	Networks Wi-Fi AP Groups	Dashboard Notifications Configuration Details Performance Software Update Tools	Clients Mesh Pee
ш.	<ul> <li>✓ System</li> <li>✓ D Base Infrastructure</li> </ul>	Status Debug Remote CLI Packet Capture Network Connectivity Wi-Fi Analyzer	Wi-Fi Performance
٦	<ul> <li>♣• default</li> <li>▲• AeroScout IoT</li> </ul>	Command show ip interface brief	
, 🖸	✓ ♦ AeroScout Demo	Run	
۶	XV2-2-1	Output	⊛ ×
۰.	₹ XV3-8-2	Complete Device > show ip interface brief	
<b>*</b>	> 🎝 cnMaestro 3.0.4 New Features	DEVICE ADDRESS RX-PTKS TX-PTKS RX-BYTES TX-BYTES TX-PTK-DROPS	RX-PTK-DROP: 0
0 >		VLAHI         192.168.1.42         4464956         688515         835203623         5766261         0           VCMM6         0.0.0.0         0         105985         0         36246870         0           ETH1         0.0.0.0         4523831         798631         93563395         101671129         0           ETH2         0.0.0.0         0         0         0         0         0         0	e e e

• To verify the MAC address, run the CLI command: show version

Camb	ium Networks   cnMaestro <sup>™</sup> X	🐟 🕨 🧬 🗗 📌 🗩	ISP View
	Networks Wi-Fi AP Groups	Image: Wi-Fi > XV3-8-2           Dashboard Notifications Configuration Details Performance Software Update Tools	Clients Mesh Pe
i i i i i i i i i i i i i i i i i i i	<ul> <li>System</li> <li>→ Base Infrastructure</li> </ul>	Status Debug Remote CLI Packet Capture Network Connectivity Wi-Fi Analyzer	Wi-Fi Performanc
٥	<ul><li>♣ default</li><li>▲ AeroScout IoT</li></ul>	Command show version	
•	✓ ♦ AeroScout Demo	Run Output	⊕ ×
¢ ،	∑ XV3-8-1 2 XV3-8-2	<sup>1</sup> Complete Device > show version XV3-8-2 XV3-8 802.11ax Three Radio Dual Band Indoor Wi-Fi 6 Access Point	
• • •	Ar cnMaestro 3.0.4 New Features	Regulatory domain FCC Software version 6.4-814 Build date 2021-07-26T15:23:51-05:00 Device-Agent version 4.28 Serial number WBMC029537QP Copyrégnt (c) 2021-2021 Cambium Natworks, Inc. Surtem 15 up 11 days, 22 hours 48 minutes	
		Device MAC address is BC-E6-7C-44-1B-AC	

## Show/Debug commands on the AP

Problem: The AP does not appear to be passing Aeroscout tags

#### **Resolution:**

Verify that Aeroscout Wi-Fi tags and/or BLE tags are enabled on the AP.

• To verify the MAC address, run the CLI command: show rtls aeroscout configuration

🕐 Ca	ambium Networks   cnMaestro <sup>™</sup> X	🚳 🕨 😰 🔂 🖢 🕅	SP View
	Search Networks WILELAD Groups	Wi-Fi > XV3-8-2      Dashboard Notifications Configuration Details Performance Software Update Tools	Clients Mesh Pee
•	System     Base Infrastructure	Status Debug Remote CLI Packet Capture Network Connectivity Wi-Fi Analyzer	WI-FI Performance
8	↓ default ↓ AeroScout IoT	Command show rtls aeroscout configuration	
•	V AeroScout Demo	Run Output	۰ ×
••	∑ ×V3-8-1 ∑ xV3-8-2	Complete Device > show rele seroscout configuration WEFI-TAG BLE-TAG SERVER-IP SERVER-PORT	
	> ↓ CnMaestro 3.0.4 New Features	Enabled Enabled 192.158.1.55 12092	

Verify that Aeroscout Wi-Fi tags and BLE tags are sent from the AP to the Aeroscout server.

• To verify Wi-Fi tags are sent to the Aeroscout server, run the CLI command: show rtls aeroscout wifi-tag-summary

Cambium Networks	cn <b>Maestro</b> ™ X		<b>⊳?</b> ∉	<b>8</b>	ני <mark>9</mark>	MSP Vie All Accourt	ew nts 🗸	<b>0</b> -
Wi-Fi > XV3-8-2								c
Dashboard Notif	ications Configuration	Details Performance	e Software Up	date Tools	Clients M	lesh Peers X	WLANs	WIDS
Status Debug Command	Remote CLI Packet	Capture Network C	Connectivity V	Vi-Fi Analyzer	Wi-Fi Perf	formance F	Flash LEDs	
Type CLI command								
Run								
Output							٩	×
Complete								
Device > show rt	ls aeroscout wifi-tag-sur	mary						
WiFi-Tag : 2232	2232 0	Wed Sep 1	10:21:52 2021					
>								
<b>1</b>								

• To verify BLE tags are sent to the Aeroscout server, run the CLI command: **show rtls aeroscout ble-tag-summary** 

🜔 Ca	mbium Networks   cnMaestro <sup>™</sup> X 💿 🙌 😰 🔛 🔊 🔊 MSP View	θ-
	Wi-Fi > XV3-8-2	C
*	Dashboard Notifications Configuration Details Performance Software Update Tools Clients Mesh Peers X WLAN	s WIDS
	Status Debug Remote CLI Packet Capture Network Connectivity Wi-Fi Analyzer Wi-Fi Performance Flash LED	Ds
<b></b>	Command	
0	Run	
8	Output	×
-	Complete	
*>	Device > show rtls aeroscout ble-tag-summary ON-AIR TO-AES DROPPED LAST-SEEN BLE-Tag : 96 96 0	
¢ ,		

Verify the **Tag message** is seen on AP and sent to the AES server, and verify the format.

 To verify Tag message is seen on AP and sent to the AES server run the CLI commands: service debug rfmd logging-level trace

Save

	Wi-Fi > XV3-8-2		C
	Dashboard Notifications Configuration Details Performance Software Update Tools Clients Mesh Peers X	WLANs	WIDS
•••	Status Debug Remote CLI Packet Capture Network Connectivity Wi-Fi Analyzer Wi-Fi Performance Command	Flash LEDs	
	Type CLI command		
	Run		
	Output	۲	×
	Complete		
¢:> ≌:>	Device > service debug rfmd logging-level trace Device > save [Config Save OK]		
<b>@</b> >			

• Once the configuration is saved run this CLI command to view the tag messages

#### service show debug-logs rfmd

() c	ambium Networks   cnMaestro™X 🚯 📌 🏚 🗊 💬 🖓 📮 All Accounts 🗸   €	9-
	Wi-Fi > XV3-8-2	c
	Dashboard Notifications Configuration Details Performance Software Update Tools Clients Mesh Peers X WLANs W	
Line State	Status Debug Remote CLI Packet Capture Network Connectivity Wi-Fi Analyzer Wi-Fi Performance Flash LEDs Command	
	Type CLI command	
	Run	
	Output ( ) ×	:
2	Initiated	
•	Device > service show debug-logs rfmd	
<b>D</b> :	×	

## Verification on the AES server

Run Wireshark on the AES server to verify the d5 message (tag report) received on the AES server.

udp.port == 1144									-
Packet list ~	Narrow & Wide	Case sensitiv	Display filter	~			Find	G	ncel
o. Time	Source	Destination	Protoco I	Lenat	Info				
36602 12727.444253	10.110.200.9	10.110.200.42	UDP	66	12092 → 1144	Len=24			
36603 12727.453558	10.110.200.42	10.110.200.9	UDP	94	1144 + 12092	Len=52			
36630 12750.106874	10.110.200.42	10.110.200.9	UDP	113	1144 - 12092	Len=71			
36631 12750.845005	10.110.200.9	172.16.200.20	UDP	66	12092 + 1144	Len=24			
Data: 7c830000d50 [Length: 71]	0003fbce67c4846860	0400000ce67c48498	~		D5- indicate	s TAG report			
Data: 7c830000d50 [Length: 71]	0003fbce67c4846860	0440000bce67c48498		_	D5- indicate	s TAG report			
Data: 7c330000d50 [Length: 71]	0003fbce67c4846860	86 98 99 45 00			D5- indicate	s TAG report			
Data: 7c830000450 [Length: 71]	e0003fbce67c4846860 = bc e6 7c 48 466 = bc 9 7c 48 46	86 08 00 45 0	р		D5- indicate	s TAG report			
Data: 7c830000450 [Length: 71]	e bc e6 7c 48 46 5 40 11 2a 47 0a c 00 4f ac bc 7c	86 08 00 45 00	IHF E	n	D5- indicate	s TAG report			
Data: 7c830000450 [Length: 71]	e bc e6 7c 48 4686 a 40 11 2a 47 0a c 00 4f ae b6 7c	86 08 00 45 01 6e c3 2a 0 63 00 00 65 00	а (HF ··· Е ск3@-@- *G·n.* ··х/<0 · [1000	- -	D5- indicate	s TAG report			
Data: 7c830000d50 [Length: 71]	e bc e6 7c 48 46860 9 40 11 2a 47 0a c 00 4f ae b6 7c 8 46 85 00 40 00	86 08 00 45 0 6e c3 2a 0 63 00 00 45 00 00 bc c6 7c 48 1	۵ـــ  HFE (K3@-@-*6-n-*		D5- indicate	s TAG report			
Data: 7c830000450 [Length: 71]	e bc e6 7c 48 46 b 40 11 2a 47 0a c 00 4f ac b6 7c 1 46 86 00 40 00 c 3e 31 06 00 47 2 b b c 66 00 00 2	86 08 00 45 0 6e c3 2a 0 50 bc 66 7c 48 5 00 bc 66 7c 48 5 00 00 00 00 00 7 10 00 00 00 00 7	HF ··· E (k3@ ⊕ * 6 · n * ··· x/< 0 · 1 (H10 · 0 ··· 1 · 0 ··· ·· 1 · 0 ··· 1 ·	- -	D5- indicate	s TAG report			
Data: 7c830000d50 [Length: 71] 000 d4 81 d7 cd 1b b 010 00 63 6b 33 40 90 020 c8 09 04 78 2f 3- 020 03 <b>f bc e6 7c</b> 41 040 49 80 00 0b 43 50 050 02 00 00 0c cc 44	e bc e6 7c 4846860 e bc e6 7c 48 46 a 40 11 2a 47 0a c 00 4f ae b6 7c s 46 86 00 40 00 c 3e 31 06 00 f2 b bc a6 00 08 20 b c a6 00 00 07	86 08 00 45 0 66 03 20 0 83 00 00 35 0 80 bc 65 7c 48 2 00 00 00 0 15 00 1 10 00 00 0 15 00 0 10 0 1	B=  HF ··· E ck3@		D5- indicate	s TAG report			

#### Stanley BLE tag advertisement packet.

and the raw lines					8
o. Tre	Source	Destnation	Protocol	Length Snfa	
296 58,476781	192.168.0.1	192.168.0.10	UDP	108 1144 - 12092 Len-66	
351 65.390656	192.168.0.10	192.168.0.1	UDP	66 12092 + 1144 Len=24	
352 65.391477	192.168.0.1	192.168.0.10	UDP	94 1144 + 12092 Len-52	
366 78.368156	192.168.0.1	192.168.0.10	UDP	108 1144 + 12092 Len=66	
367 78.488712	192.168.0.1	192.168.0.10	UDP	108 1144 + 12092 Len=66	
445 95.395083	192.168.0.10	192.168.0.1	UDP	66 12092 - 1144 Len-24	
446 95.395845	192.168.0.1	192.168.0.10	UDP	94 1144 - 12092 Len-52	
477 98.371837	192.168.0.1	192.168.0.10	UDP	108 1144 + 12092 Len=66	
478 98.485843	192.168.0.1	192.168.0.10	UDP	108 1144 + 12092 Len=66	
Data: 7c830000 [Length: 66]	(500003a5ca99387945	400000000000000000000000000000000000000			
Data: 7(830000 [Length: 66]	800003abca9938734b	400000000000000000000000000000000000000		DB indicates BLE Tog Report	
Data 7c330000 [Length: 66]	0 be bc a9 93 07 94 0 be bc a9 93 07 9 0 00 40 11 66 b2 ci 9 cc 40 11 66 b2 ci 9 cc 40 51 66 00 00 0 00 00 00 00 00 00 00			DB indicates BLE Tag Report	
Data 7c330000 [Length: 66] 0000 d4 81 47 cd 11 000 d9 5e d5 84 40 000 60 0s 47 75 2 0000 00 50 00 60 0 0000 00 50 00 00 00 0 0000 00 00 00 00 00 0 0000 00	0 be bc a9 93 07 95 0 be bc a9 93 07 95 0 00 40 11 66 b2 ci 1 5 00 40 11 66 b2 ci 1 5 00 40 10 60 80 0 00 60 10 60 80 1 60 60 00 60 80 1 60 60 50 70 80 80 1 60 60 50 70 80 1 60 50 70 10 10 10 10 10 10 10 10 10 10 10 10 10		×××××××××××××××××××××××××××××××××××××	DB indicates BLE Tag Report	

# Cambium Networks

Cambium Networks delivers wireless communications that work for businesses, communities, and cities worldwide. Millions of our radios are deployed to connect people, places and things with a unified wireless fabric that spans multiple standards and frequencies of fixed wireless and Wi-Fi, all managed centrally via the cloud. Our multi-gigabit wireless fabric offers a compelling value proposition over traditional fiber and alternative wireless solutions. We work with our Cambium certified ConnectedPartners to deliver purposebuilt networks for service provider, enterprise, industrial, and government connectivity solutions in urban, suburban, and rural environments, with wireless that just works.

Support website	https://support.cambiumnetworks.com
Support enquiries	
Technical training	https://learning.cambiumnetworks.com/learn
Main website	http://www.cambiumnetworks.com
Sales enquiries	solutions@cambiumnetworks.com
Warranty	https://www.cambiumnetworks.com/support/standard-warranty/
Telephone number list	http://www.cambiumnetworks.com/contact-us/
User Guides	http://www.cambiumnetworks.com/guides
Address	Cambium Networks Limited,
	Unit B2, Linhay Business Park, Eastern Road, Ashburton,
	Devon, TQ13 7UP
	United Kingdom



#### www.cambiumnetworks.com

Cambium Networks and the stylized circular logo are trademarks of Cambium Networks, Ltd. All other trademarks are the property of their respective owners.

Copyright  $\ensuremath{\textcircled{C}}$  2022 Cambium Networks, Ltd. All rights reserved.