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## cnPilot E400 Indoor User Guide

System Release 1.0

- Product Description
- Configuration
- Operation and Troubleshooting

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# Safety and regulatory information

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This section describes important safety and regulatory guidelines that must be observed by personnel installing or operating cnPilot E400 equipment.

## Important safety information

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### Warning

To prevent loss of life or physical injury, observe the safety guidelines in this section.

### ***Power lines***

Exercise extreme care when working near power lines.

### ***Working at heights***

Exercise extreme care when working at heights.

### ***Grounding and protective earth***

Connectorized cnPilot E400 devices must be properly grounded to protect against lightning. It is the user's responsibility to install the equipment in accordance with national regulations. In the USA, follow Section 810 of the *National Electric Code, ANSI/NFPA No.70-1984* (USA). In Canada, follow Section 54 of the *Canadian Electrical Code*. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit, size of grounding conductors and connection requirements for grounding electrodes. Other regulations may apply in different countries and therefore it is recommended that installation be contracted to a professional installer.

### ***Powering down before servicing***

Always power down and unplug the equipment before servicing.

### ***Primary disconnect device***

The ePMP power supply is the primary disconnect device.

### ***External cables***

Safety may be compromised if outdoor rated cables are not used for connections that will be exposed to the outdoor environment.

### ***RF exposure near the antenna***

Strong radio frequency (RF) fields will be present close to the antenna when the transmitter is on. Always turn off the power to the cnPilot E400 device before undertaking maintenance activities in front of the antenna.

## Important regulatory information

The cnPilot E400 product is certified as an unlicensed device in frequency bands where it is not allowed to cause interference to licensed services (called primary users of the bands).

## ***Radar avoidance***

In countries where radar systems are the primary band users, the regulators have mandated special requirements to protect these systems from interference caused by unlicensed devices. Unlicensed devices must detect and avoid co-channel operation with radar systems.

The cnPilot E400 detects and avoids functionality for countries and frequency bands requiring protection for radar systems. The cnPilot E400 is qualified for ETSI/FCC DFS certification for radar detection and avoidance as per the law.

Installers and users must meet all local regulatory requirements for radar detection. To meet these requirements, users must set the correct country code during commissioning of the cnPilot E400 equipment. If this is not done, installers and users may be liable to civil and criminal penalties.

Contact the Cambium helpdesk if more guidance is required.

## ***USA and Canada specific information***

### **Federal Communication Commission Interference Statement**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



### **Caution**

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device and its antennas(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

This device is restricted for indoor use.

**Note****FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **20 cm** between the radiator & your body.

**IC Statement**

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. *L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

*Pour les produits disponibles aux États-Unis / Canada du marché, seul le canal 1 à 11 peuvent être exploités. Sélection d'autres canaux n'est pas possible.*

This device and it's antennas(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with IC multi-transmitter product procedures.

*Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.*

The device for the band 5150-5250 MHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems.

*les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;*

**IC Radiation Exposure Statement:**

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 21 cm between the radiator & your body.

*Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 21 cm de distance entre la source de rayonnement et votre corps.*

**CE Statement:**

This equipment complies with EU radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

***IC Statement:***

Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz, 5470-5600 MHz and 5650-5725 MHz.

Sélection dynamique de fréquences (DFS) pour les dispositifs fonctionnant dans les bandes 5250-5350 MHz, 5470-5600 MHz et 5650-5725 MHz.

Users should also be advised that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

De plus, les utilisateurs devraient aussi être avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) pour les bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

For indoor use only.

Pour une utilisation en intérieur uniquement.

***Avoidance of weather radars***

The installer must be familiar with the requirements in FCC KDB 443999. Essentially, the installer must be able to:

- Access the FCC database of weather radar location and channel frequencies.
- Use this information to correctly configure the product (using the GUI) to avoid operation on channels that must be avoided according to the guidelines that are contained in the KDB and explained in detail in this user guide.

In ETSI regions, the band 5600 MHz to 5650 MHz is reserved for the use of weather radars.

***Ethernet networking skills***

The installer must have the ability to configure IP addressing on a PC and to set up and control products using a web browser interface.

***Lightning protection***

To protect outdoor radio installations from the impact of lightning strikes, the installer must be familiar with the normal procedures for site selection, bonding and grounding.

***Training***

The installer needs to have basic competence in radio and IP network installation. The specific requirements applicable to the cnPilot E400 must be gained by reading this user guide and by performing sample setups at base workshop before live deployments.

## Contents

<b>Safety and regulatory information</b> .....	<b>3</b>
Important safety information.....	3
Important regulatory information.....	3
<b>Contents</b> .....	<b>7</b>
<b>About this User Guide</b> .....	<b>9</b>
Intended Audience .....	9
Version information .....	9
Contacting Cambium Networks.....	9
<b>Problems and warranty</b> .....	<b>11</b>
Security advice .....	12
Warnings, cautions, and notes .....	12
Caring for the environment .....	13
<b>Product description</b> .....	<b>14</b>
Overview of cnPilot E400 .....	14
Purpose .....	14
Key features.....	14
<b>Command Line Interface (CLI)</b> .....	<b>15</b>
Overview .....	15
Example .....	15
<b>System configuration</b> .....	<b>16</b>
System .....	16
Management.....	17
Time settings .....	19
Event logging.....	20
<b>Onboarding to CNS Server NG</b> .....	<b>22</b>
Overview.....	22
Onboarding Steps .....	22
<b>Wireless configuration</b> .....	<b>23</b>
Radio configuration.....	23
Advanced radio settings .....	24
WLAN configuration.....	26
Configuring RADIUS servers .....	28
<b>Guest Access</b> .....	<b>30</b>
Configuring Guest Access.....	30
<b>Network Configuration</b> .....	<b>33</b>
Ethernet Ports .....	33
Switched Virtual Interface (SVI).....	35
DHCP Server .....	35
DHCP Relay .....	37
DNS Proxy.....	37
Management VLAN Access.....	38
NAT and Port Forwarding .....	39
<b>Firewall</b> .....	<b>40</b>
Configuring Firewall.....	40
DNS ACL .....	40
Configuring DNS ACL.....	40
<b>Firmware management</b> .....	<b>42</b>

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<b>Troubleshooting .....</b>	<b>43</b>
<b>Legal and reference information .....</b>	<b>44</b>
<b>Cambium Networks end user license agreement .....</b>	<b>45</b>
Acceptance of this agreement .....	45
Definitions.....	45
Grant of license .....	45
Conditions of use.....	45
Title and restrictions.....	46
Confidentiality .....	47
Right to use Cambium’s name .....	47
Transfer.....	47
Updates.....	47
Maintenance .....	47
Disclaimer .....	48
Limitation of liability .....	48
U.S. government .....	48
Term of license .....	49
Governing law .....	49
Assignment.....	49
Survival of provisions .....	49
Entire agreement.....	49
Third party software.....	49
Preamble.....	53
<b>TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION .....</b>	<b>54</b>
<b>END OF TERMS AND CONDITIONS .....</b>	<b>59</b>



# About this User Guide

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This User Guide describes the features supported by cnPilot E400 and provides detailed instructions for setting up and configuring cnPilot E400.

## Intended Audience

This guide is intended for use by the system designer, system installer and system administrator.

## Version information

The following shows the issue status of this document:

Issue	Date of issue	Remarks
001v000	August 2015	System Release 1.0 (Software Release 1.1.6)

## Contacting Cambium Networks

Support website:	<a href="http://www.cambiumnetworks.com/support">http://www.cambiumnetworks.com/support</a>
Main website:	<a href="http://www.cambiumnetworks.com">http://www.cambiumnetworks.com</a>
Community:	<a href="http://community.cambiumnetworks.com">http://community.cambiumnetworks.com</a>
Sales enquiries:	<a href="mailto:solutions@cambiumnetworks.com">solutions@cambiumnetworks.com</a>
Support enquiries:	<a href="mailto:support@cambiumnetworks.com">support@cambiumnetworks.com</a>
Telephone number list:	<a href="http://www.cambiumnetworks.com/support/contact-support/">http://www.cambiumnetworks.com/support/contact-support/</a>
Address:	Cambium Networks Limited, 3800 Golf Road, Suite 360 Rolling Meadows, IL 60008

## Purpose

Cambium Networks cnPilot E400 documents are intended to instruct and assist personnel in the operation, installation and maintenance of the Cambium cnPilot E400 equipment and ancillary devices. It is recommended that all personnel engaged in such activities be properly trained.

Cambium disclaims all liability whatsoever, implied or expressed, for any risk of damage, loss or reduction in system performance arising directly or indirectly out of the failure of the customer, or anyone acting on the customer's behalf, to abide by the instructions, system parameters, or recommendations made in this document.

## Cross references

References to external publications are shown in *italics*. Other cross references, emphasized in **green text** in electronic versions, are active links to the references.

## Feedback

We appreciate feedback from the users of our documents. This includes feedback on the structure, content, accuracy, or completeness of our documents.

For feedback, e-mail to [support@cambiumnetworks.com](mailto:support@cambiumnetworks.com).

# Problems and warranty

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## Reporting problems

If any problems are encountered when installing or operating this equipment, follow this procedure to investigate and report:

- 1 Search this document and the software release notes of supported releases.
- 2 Visit the support website:  
<http://www.cambiumnetworks.com/support/epmp>
- 3 Ask for assistance from the Cambium product supplier.
- 4 Gather information from affected units, such as any available diagnostic downloads.
- 5 Escalate the problem by emailing or telephoning support:  
<http://www.cambiumnetworks.com/support/contact-support>

## Repair and service

If unit failure is suspected, obtain details of the Return Material Authorization (RMA) process from the support website.

## Warranty

Cambium's standard hardware warranty is for one (1) year from date of shipment from Cambium or a Cambium distributor. Cambium warrants that hardware will conform to the relevant published specifications and will be free from material defects in material and workmanship under normal use and service. Cambium shall within this time, at its own option, either repair or replace the defective product within thirty (30) days of receipt of the defective product. Repaired or replaced product will be subject to the original warranty period but not less than thirty (30) days.

To register PMP products or activate warranties, visit the support website.

For warranty assistance, contact the reseller or distributor.



### Caution

Do not open the radio housing for repair or diagnostics; there are no serviceable parts within the housing.

Portions of Cambium equipment may be damaged from exposure to electrostatic discharge. Use precautions to prevent damage.

## Security advice

Cambium Networks systems and equipment provide security parameters that can be configured by the operator based on their particular operating environment. Cambium recommends setting and using these parameters following industry recognized security practices. Security aspects to be considered are protecting the confidentiality, integrity, and availability of information and assets. Assets include the ability to communicate, information about the nature of the communications, and information about the parties involved.

In certain instances Cambium makes specific recommendations regarding security practices, however the implementation of these recommendations and final responsibility for the security of the system lies with the operator of the system.

Cambium Networks cnPilot E400 equipment is shipped with default web management interface login credentials. It is highly recommended that the following default username and password should be modified prior to system deployment.

Username: admin

Password: admin

## Warnings, cautions, and notes

The following describes how warnings and cautions are used in this document and in all documents of the Cambium Networks document set.

### Warning

Warnings precede instructions that contain potentially hazardous situations. Warnings are used to alert the reader to possible hazards that could cause loss of life or physical injury. A warning has the following format:



Warning

Warning text and consequence for not following the instructions in the warning.

### Caution

Cautions precede instructions and are used when there is a possibility of damage to systems, software, or individual items of equipment within a system. However, this damage presents no danger to personnel. A caution has the following format:



Caution

Caution text and consequence for not following the instructions in the caution.

### Note

A note means that there is a possibility of an undesirable situation or provides additional information to help the reader understand a topic or concept. A note has the following format:



Note

Note text.

## Caring for the environment

The following information describes national or regional requirements for the disposal of Cambium Networks supplied equipment and for the approved disposal of surplus packaging.

### In EU countries

The following information is provided to enable regulatory compliance with the European Union (EU) directives identified and any amendments made to these directives when using Cambium equipment in EU countries.



#### ***Disposal of Cambium equipment***

*European Union (EU) Directive 2002/96/EC Waste Electrical and Electronic Equipment (WEEE)*

Do not dispose of Cambium equipment in landfill sites. For disposal instructions, see <http://www.cambiumnetworks.com/support>

#### ***Disposal of surplus packaging***

Do not dispose of surplus packaging in landfill sites. In the EU, it is the individual recipient's responsibility to ensure that packaging materials are collected and recycled according to the requirements of EU environmental law.

### In non-EU countries

In non-EU countries, dispose of Cambium equipment and all surplus packaging in accordance with national and regional regulations.

# Product description

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This chapter provides a high level description of the cnPilot E400 product. It describes the function of the product and the main hardware components.

The major topics described in this document are:

- Overview of cnPilot E400
- System configuration
- Radio configuration
- WLAN Configuration
- Network Configuration
- Guest Access
- Firewall and ACL
- Firmware Management
- Troubleshooting

## Overview of cnPilot E400

This section introduces the key features, typical use cases, product variants and components of the cnPilot E400.

### PURPOSE

cnPilot E400 is an indoor 802.11ac dual radio concurrent Wi-Fi Access point. It is a 2x2:2 (2 spatial streams) device and supports over 1Gbps of data rate. It has one Gigabit Ethernet port that also provides power over Ethernet.

### KEY FEATURES

This section describes the key features of cnPilot E400:

- Supports upto 16 WLANs each with its own wireless network/SSID, security, and VLAN policy.
- Supports upto 256 wireless clients.
- Can be managed via Cambium Networks CNS-NG cloud-based network manager.
- Supports device configuration by using CLI or UI.
- Can be monitored via SNMP versions v2 and v3.
- A Client traffic can be controlled through rate-limiting policies, configured per-WLAN or per-client.
- Supports Captive Portal redirection (Guest Access) with WISPr functionality
- Supports L3 services such as NAT, port forwarding, DHCP server, and DNS proxy
- Access to the network can be controlled based on traffic type and MAC address using features such as WLAN and Port Access Control (ACL), DNS based whitelist and blacklist, and DoS attack prevention
- Provides several troubleshooting tools such as Packet Capture, WiFi Analyzer, and Connectivity Tests.

# Command Line Interface (CLI)

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## Overview

The cnPilot E400 supports a powerful and structured Command Line Interface (CLI) that can be used for managing the device over SSH or Telnet.

The CLI can be used to configure any system parameter, to view the system status and statistics, and for actions such as reloading the device, or importing and exporting configuration from it. Several troubleshooting tools such as packet-capture and ping are also supported in the CLI.

The CLI is hierarchical, in addition to a global mode for system-wide commands, there are separate modes for Wireless LAN, Radio, Ethernet, VLAN, and DHCP server configuration. These specific modes are entered by specifying the instance of the mode.

Use the following CLI to configure wireless LAN 1 parameters:

```
• cnWest-5ghz(config)#  
• cnWest-5ghz(config)# wireless wlan 1  
• cnWest-5ghz(config-wlan-1)#
```

Use the following CLI to exit from a mode back to the global context type **exit** command:

```
• cnWest-5ghz(config-wlan-1)# exit  
• cnWest-5ghz(config)#
```

The default login and password for the CLI are **admin**. The password can be changed using the **management user admin password** command.

Entering **?** displays the command menu and any context specific help. Pressing **<TAB>** completes a partially typed CLI command wherever possible.

Commands to view system status and statistics begin with **show**. Commands to default or negate a configuration begin with **no**.

## Example

Some of the commonly used CLI commands are:

**Show config** — Displays system configuration

**Save** — Used to apply and save any configuration changes

**Show version** — Displays the basic device information and firmware version

# System configuration

This section describes the System, Management, Time Settings, and Event Logging functionalities of cnPilot E400.

## System

The following table lists the fields that are displayed in the **Configuration > System** page:

**Table 1:** Configuration: **System** parameters

Parameter	Description	Default Value
Name	Hostname of the device. The maximum length of name is 64 characters.	—
Location	The location where the device is placed. The maximum length of location is 64 characters.	—
Country-Code	To be set by the administrator to the country-of-operation of the device. The allowed operating channels and the transmit power levels on those channels depends on the country of operation. Radios remain disabled unless this is set. The list of countries supported depends on the SKU of the device (FCC, ROW etc).	—
PoE Output	Enable to make the AP provide power an auxiliary device connected to its ETH2 interface. Note that the Eth2 interface provides Cambium PoE (not standard 802.3AF) and only supported Cambium devices should be plugged into that port, when POE-Out is enabled (devices such as other ePMPs, PMP450-SM).	—

You can configure the above parameters through the UI or CLI.

### In the UI

1. Navigate to the **Configuration > System** tab. The following fields are displayed in **System**:
  1. Enter the hostname of the device in the **Name** text box.
  2. Enter the location where this device is placed in the **Location** text box.
  3. Select the appropriate country code for the regulatory configuration from the **Country-Code** text box.
  4. Enable the **PoE Output** checkbox to enable Power-over-Ethernet to an auxiliary device connected to ETH2.
2. Click **Save**.



**Figure1:** Configuration: **System** page

**System**

**Name**  *Hostname of the device*

**Location**  *Location where this device is placed*

**Country-Code**  *For appropriate regulatory configuration*

**PoE Output**  *Enable Power-over-Ethernet to an auxiliary device connected to ETH2*

## In the CLI

To change the hostname:

```
(cnPilot E400) (configure)# hostname <name>
```

To change the location:

```
(cnPilot E400) (configure)# location
```

To change the country-code:

```
(cnPilot E400) (configure)# country-code
```

To view the list of all country-codes:

```
(cnPilot E400) # show country-code
```

## Management

The following table lists the fields that are displayed in the **Configuration > System > Management** page:

**Table 2:** Configuration: **System > Management** parameters

Parameter	Description	Default Value
Admin Password	Password for authentication of UI and CLI sessions.	—
Telnet	Enable Telnet access to the device CLI.	—
SSH	Enable SSH access to the device CLI.	—
HTTP	Enable HTTP access to the device UI.	—
HTTPS	Enable HTTPS access to the device UI.	—
Cambium Remote Mgmt	Enable support for Cambium Remote Management of this device.	Disabled
Cambium ID	Cambium-ID used for provisioning CNS-NG (Cambium Remote Management) of this device.	—
Cambium Password	Password used for onboarding the device to CNS-NG.	—

SNMP		
V2 RO Community	SNMP v2c read-only community string	—
V2 RW Community	SNMP v2c read-write community string	—

You can configure the above parameters through the UI or CLI.

### In the UI

1. Navigate to the **Configuration > System** tab. The following fields are displayed in **Management**:
  - a. Enter the admin password of the device in the **Admin Password** text box.
  - b. Enable the **Telnet** checkbox to enable telnet access to the device CLI.
  - c. Enable the **SSH** checkbox to enable ssh access to the device CLI.
  - d. Enable the **HTTP** checkbox to enable HTTP access to the device UI.
  - e. Enable the **HTTPS** checkbox to enable HTTPS access to the device UI.
  - f. Enable the **Cambium Remote Mgmt** to enable support for Cambium Remote Management of this device.
  - g. Enter the Cambium ID of the user in the **Cambium ID** text box.
  - h. Enter the Cambium Password of the user in the **Cambium Password** text box.
  - i. Enter the SNMP v2c read-only community string in the **V2 RO community** text box.
  - j. Enter the SNMP v2c read-write community string in the **V2 RW community** text box.
2. Click **Save**.

**Figure 2:** Configuration: **Management** page

The screenshot shows the 'Management' configuration page. It includes the following fields and options:

- Admin Password:** A text input field with masked characters (.....) and a tooltip: 'Configure password for authentication of GUI and CLI sessions'.
- Telnet:** A checkbox labeled 'Enable Telnet access to the device CLI' which is currently unchecked.
- SSH:** A checkbox labeled 'Enable SSH access to the device CLI' which is checked.
- HTTP:** A checkbox labeled 'Enable HTTP access to the device GUI' which is checked.
- HTTPS:** A checkbox labeled 'Enable HTTPS access to the device GUI' which is checked.
- Cambium Remote Mgmt:** A checkbox labeled 'Enable support for Cambium Remote Management of this device' which is checked.
- Cambium ID:** A text input field containing 'abc@cambiumnetworks.com'.
- Cambium Password:** A text input field with masked characters (.....).
- SNMP Section:** An embedded box containing:
  - V2 RO community:** A text input field containing 'test|' with a tooltip: 'SNMP v2c read-only community string'.
  - V2 RW community:** An empty text input field with a tooltip: 'SNMP v2c read-write community string'.

**In the CLI**

To configure management:

```
(cnPilot E400) (configure)# management {telnet, ssh, http, https}
```

To configure Cambium-ID:

```
(cnPilot E400) (configure)# cambium-id CAMBIUM-ID PASSWORD
```

**Time settings**

The user can configure upto 2 NTP servers. These are used by the AP to set its internal clock to UTC/GMT time. Note that the AP does not have a battery backup, and on power-cycle its clock will reset to default and needs to sync time again. The servers can be specified as IP addresses or as hostname (Eg: pool.ntp.org).

The following table lists the fields that are displayed in the Configuration > System > Time Settings page:

**Table 3:** Configuration: **System > Time Settings** parameters

Parameter	Description	Default Value
NTP Server 1	Name or IP address of a Network Time Protocol server 1.	—
NTP Server 2	Name or IP address of a Network Time Protocol server 2.	—

Timezone	<p>Timezone can be set according to the location where the AP is installed. By selecting the appropriate timezone from the drop-down list, ensures that the device clock is synced with the wall clock time.</p> <p><b>Note:</b> Accurate time on the AP is critical for features such as WLAN Scheduled Access, Syslogs etc</p>	—
----------	--	---

You can configure the above parameters through the UI or CLI.

### In the UI

1. Navigate to the **Configuration > System** tab. The following fields are displayed in **Time Settings**:
  - a. Enter the name or IP address of the NTP server 1 in the **NTP Server 1** text box.
  - b. Enter the name or IP address of the NTP server 2 in the **NTP Server 2** text box.
  - c. Select the time zone settings for the AP from the **Timezone** drop-down list.
2. Click **Save**.

**Figure 3:** Configuration: Time settings page

**Time Settings**

**NTP Server 1**  Name or IP address of a Network Time Protocol server

**NTP Server 2**

**Timezone**  ▾

Current System Time Mon 17 Aug 2015 06:24:07 UTC

### In the CLI

To configure NTP server:

```
(cnPilot E400) (configure)# ntp <server>
```

To configure Timezone:

```
(cnPilot E400) (configure)# timezone
```

To view the current system time:

```
(cnPilot E400) # show clock
```

## Event logging

The user can configure upto 2 Syslog servers on the device. All important events regarding device operation will be logged into these servers as standard RFC5424 compliant syslog messages.

Each message has a mnemonic indicating the type of message, a severity from 0-7 (see the syslog wikipedia page for details of this. 0-emergency, 7-debugging etc), as well as a text indicating details of the event.

**Table 4:** Configuration: System > Event logging parameters

Parameter	Description	Default Value
Syslog Server 1	IP address of syslog server 1.	—
Syslog Server 2	IP address of syslog server 2.	—

You can configure the above parameters through the UI or CLI.

### In the UI

- Navigate to the **Configuration > System** tab. The following fields are displayed in **Event Logging**:
  - Enter the IP address of the syslog server 1 in the **Syslog Server 1** text box.
  - Enter the IP address of the NTP server 2 in the **Syslog Server 2** text box.
- Click **Save**.

**Figure 4:** Configuration: Event logging page

The screenshot shows the 'Event Logging' configuration page. It contains two text input fields. The first field is labeled 'Syslog Server 1' and contains the IP address '192.168.0.10'. A tooltip next to it reads 'IP address of Syslog server'. The second field is labeled 'Syslog Server 2' and contains the IP address '192.168.0.11'.

### In the CLI

To configure Event Logging:

```
(cnPilot E400) (configure)# logging host <ipaddr>
```

To delete a previous entry of the event logging:

```
(cnPilot E400) (configure)# no logging host <ipaddr>
```

To view a previous entry of the event logging:

```
(cnPilot E400) # show logging
```

# Onboarding to CNS Server NG

---

## Overview

CNS Server NG is Cambium's next generation network management platform based on Cloud technologies. It will eventually replace the entire lineup of Network Management Tools. The initial release will include support for ePMP and indoor Wireless LAN devices. Subsequent releases will add the remaining devices in the Cambium portfolio. The legacy and 3rd party devices will be supported by a proxy application.

In addition to the Cloud deployment, the solution will also be able to be deployed as a standalone, redundant server solution for deployments where access to the Internet is restricted or forbidden.

## Onboarding Steps

You can onboard cnPilot E400 to CNS Server NG using the following steps:

1. To enable Cambium Remote Management:

```
(cnPilot E400) # management cambium-remote
```

2. If the device does not have a unique Serial Number (MSN), then set the cambium-id/password obtained from Cambium Support:
3. If the device is claimed and is able to reach the CNS NG, it will get on-boarded. The CNS Server NG connection status can be seen under "Cambium Remote Management Status".

To view the connection status:

```
(cnPilot E400) # cambium-id <cambium-id> <password>  
(cnPilot E400) # management cambium-remote  
url https://cloud.cambiumnetworks.com
```

```
(cnPilot E400) # apply  
(cnPilot E400) # save  
(cnPilot E400) # show management
```

### Remote Management

Config : Enabled  
URL : <https://cloud.cambiumnetworks.com>  
Status: Not Connected

# Wireless configuration

The wireless settings are divided into the following:

- Radio configuration
- WLAN configuration

## Radio configuration

cnPilot E400 is a single radio solution which has two models based on 5GHz and 2.4GHz bands. The dashboard menu in the UI displays the channel and band from the CLI, **show wireless radios** displays the details of the radio.

The following table lists the fields that are displayed in the **Configure > Radio** page:

**Table 5:** Configure: **Radio** parameters

Parameter	Description	Default Value
Enable	Enables operation of this radio.	—
Channel	Primary operating channel.	Auto
Channel Width	Operating width of the channel.	—
Transmit Power	Radio transmit power in dBm (1 to 30)	—
Antenna Gain	Gain of connected antenna, in dBm (1 to 30)	—

The default channel configuration is set to auto, with this the AP sets the radio to best available channel based on the interference and Noise Floor.

The country-code set in **System** page effects channel selection. Only the channels that are allowed in the country code needs to be selected.

You can configure the above parameters through the UI or CLI.

### In the UI

1. Navigate to the **Configure > Radio** tab. The following fields are displayed in **Radio**:
  - a. Select the **Enable** checkbox to enable the operations of this radio.
  - b. Select the primary operating channel from the **Channel** drop-down list.
  - c. Select the operating width (20 MHz or 40 MHz) of the channel from the **Channel Width** drop-down list for 5 GHz only. We do not support 40 MHz in 2.4 GHz.
  - d. Enter the radio transmit power in the **Transmit Power** text box.
  - e. Enter the antenna gain of connected antenna in the **Antenna Gain** text box.
2. Click **Save**.

**Figure 5: Configure: Radio page**

**Radio**

**Enable**  *Enable operation of this radio*

**Channel** 149 *Primary operating channel*

**Channel Width** 20MHz *Operating width of the channel*

**Transmit Power** 40MHz  *Radio transmit power in dBm (1 to 30)*

**Antenna Gain** 5  *Gain of connected antenna, in dBm (1 to 30)*

You can configure the radio parameters through the UI or CLI.

### In the CLI

To configure radio:

```
(cnPilot E400) (configure)# wireless radio 1
```

## Advanced radio settings

You can configure the following advanced radio settings on cnPilot E400:

- **Scheduled ACS (Auto Channel Select)** - When Scheduled ACS is configured, the radio scans all the channels available in the frequency band and selects the best available channel. Scheduled ACS can be configured to scan on-startup or periodic. (Run channel selection on specified days at specified time).

**Table 6: Configure: Radio > Auto Channel Select parameters**

Parameter	Description	Default Value
Candidates Channels	Select available channel.	—
Periodic	Run channel selection on specified days at specified time.	—

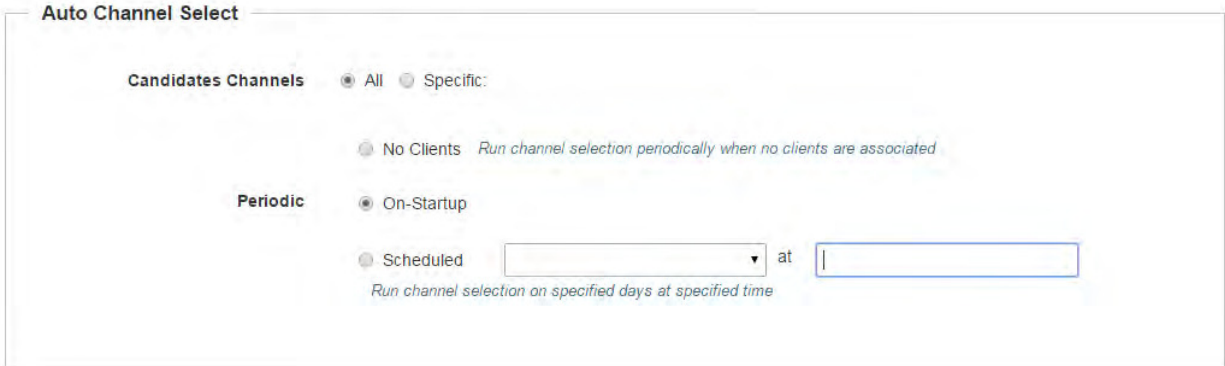
You can configure the above parameters through the UI or CLI.

### In the UI

1. Navigate to the **Configure > Auto Channel Select** tab. The following fields are displayed:
  - a. Select the **Candidate Channel** as **All**, **Specific**, or **No Clients**.
  - b. Select **Periodic** as **On-Startup** or **Scheduled** and select specified day and time.
2. Click **Save**.



**Figure 6:** Configure: Auto Channel Select page



**In the CLI**

To configure Auto Channel Select:

```
(cnPilot E400) (configure)# wireless radio 1
(cnPilot E400) (config-radio-1)# auto-channel select
```

- Enhanced Roaming** - When enhanced roaming is enabled, the clients are forced to roam when the SNR is below the configured value. This is useful when clients are connected to the AP that is far away and stick to that AP. With enhanced roaming, the AP disconnects the client if the SNR is less than the configured which makes client to find the better AP and roam to it. This is useful in a dense environment and multi-AP setup. It is disabled by default and user should understand his deployment topology and then only enable this, user should enable only if he is sure what they want and the threshold should to be set accordingly.

The following table lists the fields that are displayed in the **Configure > Radio > Enhanced Roaming** page:

**Table 7:** Configure: **Radio > Enhanced Roaming** parameters

Parameter	Description	Default Value
Enable	Enable active disconnection of clients with weak signal.	Disabled
Roam SNR Threshold	SNR below which clients will be forced to roam (1-100 dB).	—

You can configure the above parameters through the UI or CLI.

**In the UI**

- Navigate to the **Configure > Enhanced Roaming** tab. The following fields are displayed:
  - Select the **Enable** checkbox to enable active disconnection of clients with weak signal.
  - Enter **Roam SNR Threshold** value between 1-100.

2. Click **Save**.

**Figure 7: Configure: Enhanced Roaming page**

**In the CLI**

To configure Enhanced Roaming:

```
(cnPilot E400) (configure)# wireless radio 1
(cnPilot E400) (config-radio-1)# enhanced-roaming
(cnPilot E400) (config-radio-1)# enhanced-roaming threshold
```

## WLAN configuration

This section provides details on configuring WLAN Configuration parameters. The following table lists the fields that are displayed in the **Configure > WLAN** page:

**Table 8: Configure: WLAN Configuration parameters**

Parameter	Description	Default Value
Enable	To enable a particular WLAN.	Disabled
SSID	The SSID of this WLAN (Upto 32 characters).	—
VLAN	Default VLAN assigned to clients on this WLAN. (1-4094).	—
Security	Displays the security type <ul style="list-style-type: none"> <li>• Open</li> <li>• WPA2 Pre-shared Keys</li> <li>• WPA2 Enterprise</li> </ul>	—
Client Isolation	Prevents wireless clients from communicating with each other. The client devices does not connect with each other.	—
Hide SSID	Prevents broadcasting SSID in beacons.	Disabled
Proxy ARP	Responds to ARP requests automatically on behalf of clients	—

You can configure the above parameters through the UI or CLI.

**In the UI**

1. Navigate to the **Configure > WLAN** tab. The following fields are displayed:
  - a. Select the **Enable** checkbox to enable a particular WLAN.
  - b. Enter the SSID name for this WLAN in the **SSID** textbox.
  - c. Enter the default VLAN assigned to the clients on this WLAN in the **VLAN** textbox.
  - d. Select the security type as Open, WPA2 Pre-shared Keys, or WPA2 Enterprise from the **Security** drop-down list.
  - e. Select the **Client Isolation** checkbox to prevent wireless clients from connecting to each other.
  - f. Select the **Hide SSID** checkbox for not broadcast SSID in beacons.
  - g. Select Proxy ARP checkbox for responding to ARP requests automatically on behalf of clients.
2. Click **Save**.

**Figure 8:** Configure: WLAN Configuration page

The screenshot shows the WLAN Configuration page with the following settings:

- Enable:**
- SSID:** Alethea\_2.4ghz (The SSID of this WLAN (upto 32 characters))
- VLAN:** 1 (Default VLAN assigned to clients on this WLAN. (1-4094))
- Security:** open (dropdown menu)
- Client Isolation:**  Prevent wireless clients from connecting to each other
- Hide SSID:**  Do not broadcast SSID in beacons
- Proxy ARP:**  Respond to ARP requests automatically on behalf of clients

## In the CLI

To configure wlan:

```
(cnPilot E400) (configure)# wireless wlan 1
```

To configure SSID:

```
(cnPilot E400) (config-wlan-1)# ssid<name>
```

To configure security:

```
(cnPilot E400) (config-wlan-1)# security wpa2-psk
```

```
(cnPilot E400) (config-wlan-1)# passphrase <string>
```

To view the client status:

```
(cnPilot E400) (config)#show wireless clients
```

To view the client statistics

```
(cnPilot E400) (config)#show wireless clients statistics
```

## Configuring RADIUS servers

RADIUS accounting allows user activity and statistics to be reported from the device to RADIUS servers.

This section provides details on configuring parameters for RADIUS Servers.

The following table lists the fields that are displayed in the **Configure > WLAN > RADIUS Servers** page:

**Table 9:** Configure: **RADIUS Servers** parameters

Parameter	Description	Default Value
Authentication Server	IP address of the host for the authentication server.	—
Timeout	Timeout in seconds of each request attempt.	—
Attempts	Number of attempts before a request is given up.	—
Accounting Server	IP address of the host for the accounting server.	—
Timeout	Timeout in seconds of each request attempt.	—
Attempts	Number of attempts before a request is given up.	—
Server Pool Mode	<p><b>Load Balance:</b> Load balance requests equally among configured servers.</p> <p><b>Failover:</b> Move down server list when earlier servers are unreachable.</p>	—
NAS Identifier	NAS-Identifier attribute to use in request packets. Defaults to system name.	—

You can configure the above parameters through the UI or CLI.

### In the UI

1. Navigate to the **Configure > WLAN > RADIUS Servers** tab. The following fields are displayed:
  - a. Enter the IP address of the host for the authentication server in the **host** textbox.
  - b. Enter the shared key for this host in the **Shared** textbox.
  - c. Enter the Port in the **Port** textbox.
  - d. Enter the time in seconds of each request attempt in **Timeout** textbox.
  - e. Enter the number of attempts before a request is given up in the **Attempts** textbox.
  - f. Enter the IP address of the host for the accounting server in the **host** textbox.
  - g. Enter the shared key for this host in the **Shared** textbox.
  - h. Enter the Port in the **Port** textbox.
  - i. Enter the time in seconds of each request attempt in **Timeout** textbox.
  - j. Enter the number of attempts before a request is given up in the **Attempts** textbox.
  - k. Select any one of the Server Pool Mode:
    - Load Balance

- Failover
  1. Enter the NAS identifier in the **NAS Identifier** textbox.
  2. Click **Save**.

**Figure 9:** Configure: RADIUS Servers page

**RADIUS Servers**

**Authentication Server 1** Host:  Secret:  Port: 1812 Realm:

2 Host:  Secret:  Port: 1812 Realm:

3 Host:  Secret:  Port: 1812 Realm:

**Timeout** 3 Timeout in seconds of each request attempt

**Attempts** 3 Number of attempts before a request is given up

**Accounting Server 1** Host:  Secret:  Port: 1813

2 Host:  Secret:  Port: 1813

3 Host:  Secret:  Port: 1813

**Timeout** 3 Timeout in seconds of each request attempt

**Attempts** 3 Number of attempts before a request is given up

**Server Pool Mode**

Load Balance Load balance requests equally among configured servers

Failover Move down server list when earlier servers are unreachable

**NAS Identifier**  NAS-Identifier attribute for use in Request packets. Defaults to system name

## In the CLI

To configure RADIUS server:

```
(cnPilot E400) (configure)# wireless wlan 1
(cnPilot E400) (config)#wireless wlan <WLAN_IDX>
(cnPilot E400) (config-wlan)#radius-server authentication host <1-3> <HOSTIP>
(cnPilot E400) (config-wlan)#radius-server authentication port <1-3>
<1-65535>
(cnPilot E400) (config-wlan)#radius-server authentication secret <1-3> <WORD>
(cnPilot E400) (config-wlan)#radius-server authentication realm <1-3> <WORD>
(cnPilot E400) (config-wlan)#radius-server authentication timeout <1-30>
(cnPilot E400) (config-wlan)#radius-server authentication attempts <1-3>
(cnPilot E400) (config-wlan)#radius-server accounting host <1-3> <HOST-IP>
(cnPilot E400) (config-wlan)#radius-server accounting port <1-3> <1-65535>
(cnPilot E400) (config-wlan)#radius-server accounting secret <1-3> <WORD>
(cnPilot E400) (config-wlan)#radius-server accounting realm <1-3> <WORD>
(cnPilot E400) (config-wlan)#radius-server accounting timeout <1-30>
(cnPilot E400) (config-wlan)#radius-server accounting attempts <1-3>
(cnPilot E400) (config-wlan)#radius-server accounting interim-update-interval
<60-65535>
(cnPilot E400) (config-wlan)#radius-server accounting mode <start-stop|startinterim-
stop|none>
```

## Guest Access

Guest access feature is used to provide a web-based network access control process where a client is redirected to a login page to gain network access. The clients can have a simple click-through login process or a RADIUS authentication based access mode. Without a login no network traffic is allowed from the client apart from DHCP and DNS packets. Traffic to specific IP addresses can be allowed using the whitelist configuration for the un-authenticated clients.

### Configuring Guest Access

Administrator can configure a set of whitelist IP address which guest access clients can access without doing a login. This configuration also becomes handy when an external web portal is being used for providing the login/welcome pages. Administrator can give a secured http connection for the login where the communication between the access point and the client will be secured. Administrator can also configure the page title and welcome message as per his own requirements.

The following table lists the fields that are displayed in the **Configure > WLAN > Guest Access** page:

**Table 10:** Configure: **Guest Access** parameters

Parameter	Description	Default Value
Enable	Enables the Guest Access feature.	Disable
Access Policy	There are two types of access types provided for the end user, click-through and another being the RADIUS authentication mode. The click-through can also be combined with additional terms and condition content which can tell end users the terms of the network usage.	—
Redirect Mode	You can use http or https URLs for redirection.	—
Title	Title text in splash page.	—
Contents	Main contents of the splash page.	—
Terms	The admin can configure his own text for the terms and condition in the CLI/UI or he can load terms and condition content file from CLI using a service command. If a terms and condition content file is loaded then it will be common across all WLAN configuration if guest access is enabled on them.	—
Success message	The message to be displayed in the login page after successful authentication.	—
Session Timeout	Administrator can configure a limited session time for each session after which a re-login will be enforced.	—

Inactivity Timeout	Administrator can also configure an inactivity time for deleting those clients which went away without doing a proper guest access logout and free up the consumed resources by that client. Such a configuration is very helpful for public hotspots where free network is provided and clients go away without doing a logout.	—
--------------------	--	---

The RADIUS server configuration is used for RADIUS access type guest access and one can also enable RADIUS accounting for the guest access clients.

You can configure the above parameters through the UI or CLI.

### In the UI

1. Navigate to the **Configure > WLAN > Guest Access** tab. The following fields are displayed:
  - a. Select **Enable** checkbox to enable guest access feature.
  - b. Choose the Access Policy as **Click through** or **Radius**.
  - c. Choose the Redirect Mode as **HTTP** or **HTTPS**.
  - d. Choose the login page to be on device login page or an external URL.
  - e. Enter the title to appear in the splash page in the **Title** textbox.
  - f. Enter the content to appear in the splash page in the **Contents** textbox.
  - g. Enter the terms and conditions to appear in the splash page in the **Terms** textbox.
  - h. Enter the success message to appear in the **Success Message** textbox.
  - i. Enter the session timeout in seconds in the **Session Timeout** textbox.
  - j. Enter the inactivity timeout in seconds in the **Inactivity Timeout** textbox.
2. Click **Save**.

**Figure 10:** Configure: **Guest Access** page

**Guest Access**

**Enable**

**Access Policy**  Click through *Splash-page where users accept terms & conditions to get on the network*  
 Radius *Splash-page with username & password, authenticated with a RADIUS server*

**Redirect Mode**  HTTP *Use HTTP URLs for redirection*  
 HTTPS *Use HTTPS URLs for redirection*

**Splash Page**  On Device  URL

**Title**   
*Title text in splash page*

**Contents**   
*Main contents of the splash page*

**Terms**   
*Terms & conditions displayed in the splash page*

**Success Action**  Internal Logout Page  Redirect user to External URL

**Success message**

**Session Timeout**  *Session time in seconds (60 to 86400)*

**Inactivity Timeout**  *Inactivity time in seconds (60 to 28800)*

## In the CLI

To configure Guest Access:

```
(cnPilot E400) (configure)# wireless wlan 1
(cnPilot E400) (config)#wireless wlan <WLAN_IDX>
(cnPilot E400) (config-wlan)#guest-access access-type <click-through|radius>
(cnPilot E400) (config-wlan)#guest-access connection-mode <http|https>
(cnPilot E400) (config-wlan)#guest-access splash-page terms-message <TEXT>
(cnPilot E400) (config-wlan)#guest-access splash-page text <TEXT>
(cnPilot E400) (config-wlan)#guest-access splash-page title <TITLE>
(cnPilot E400) (config-wlan)#guest-access splash-page URL <URL>
(cnPilot E400) (config-wlan)#guest-access success-action <redirect-url|
logout-page>
(cnPilot E400) (config-wlan)#guest-access success-action logout-page text
<TEXT>
(cnPilot E400) (config-wlan)#guest-access session-time <60-86400>
(cnPilot E400) (config-wlan)#guest-access inactivity-time <60-28800>
(cnPilot E400) (config-wlan)#guest-access whitelist <IP_ADDRESS>
```



# Network Configuration

This section introduces the configuration of various network elements such as Ethernet ports, SVIs, DHCP servers, DNS proxy, management VLAN access, NAT, and port forwarding. Depending of the use case, the required elements can be configured.

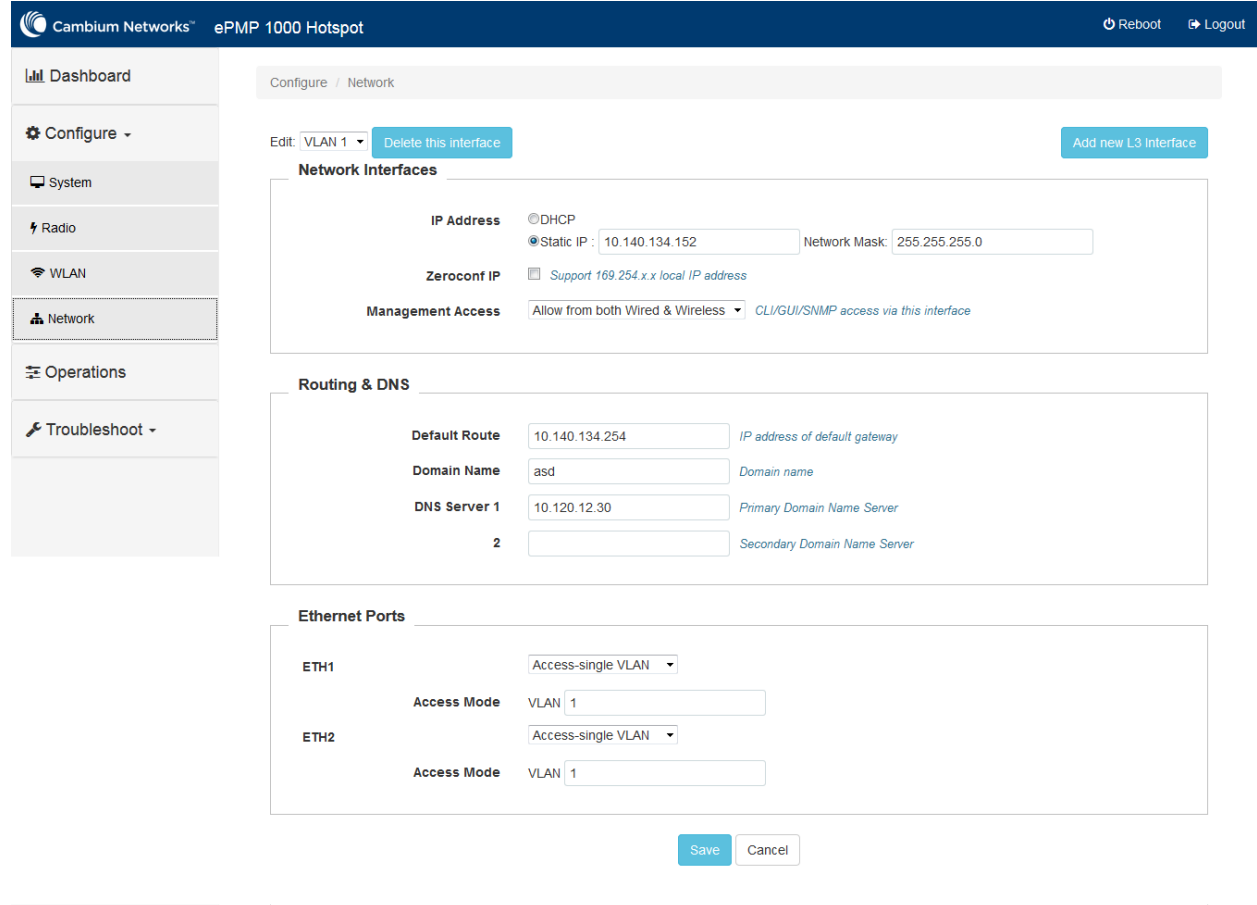
## Ethernet Ports

The following table describes the parameters displayed in the **Network Configuration > Ethernet Configuration** page.

**Table 11:** Configure: **Ethernet Ports** parameters

Parameter	Description	Values
Mode	Configure Ethernet port in either trunk or access mode. <b>Trunk Mode:</b> Allows traffic with different user defined VLANs (refer allowed VLANs list) to egress & ingress. One of these VLANs can be defined as native VLAN. Traffic with native VLAN will map to untagged traffic based on whether native VLAN is tagged or untagged. <b>Access Mode:</b> Allows traffic with specific user defined VLAN (called access VLAN) to egress as untagged and allowed only untagged traffic to ingress and map to access VLAN.	trunk/access Default mode for Eth1 and Eth2 is access.
Access VLAN*	Untagged traffic on access port will map to the access VLAN inside the device.	1 - 4094
Allowed VLANs^	List of all VLANs which are allowed to ingress and egress from the trunk port and are separated by commas. E.g. 1,14,100,200-567	VLAN List
Native VLAN^	Marks one of the VLANs from allowed VLAN list as native VLAN.	1-4094
Native Tagged^	Maps native VLAN traffic of device to untagged traffic on Ethernet (when enabled) otherwise keep it tagged on Ethernet side.	Enable/Disable
*: valid only in access mode		
^: valid only in trunk mode		

**Figure 11: Configure: Network Configuration page**



### In the CLI

To switch from configuration context to interface context:  
 (cnPilot E400) (configure)# interface eth port-num

To configure port mode (default is trunk mode):  
 (cnPilot E400) (configure)# switchport mode *access/trunk*

To configure default VLAN of access port (default 1):  
 (cnPilot E400) (configure)# switchport access vlan *vlan-id*

To configure allowed VLAN range for trunk port (defaults 1 to 4094):  
 (cnPilot E400) (configure)# switchport trunk allowed vlan *vlan-range*

To specify native VLAN for the trunk port (default 1):  
 (cnPilot E400) (configure)# switchport trunk native vlan *vlan-id*

To enable native VLAN tagging:  
 (cnPilot E400) (configure)# switchport trunk native tagged

To disable native VLAN tagging:  
 (cnPilot E400) (configure)# no switchport trunk native tagged

To display L2 parameters of the ports:

(cnPilot E400) (configure)# show interface brief

## Switched Virtual Interface (SVI)

SVI represents virtual interfaces each mapped to a specific VLAN. Each SVI can have static IP or assigned from external DHCP server.

**Table 12:** Configure: SVI parameters

Parameter	Description	Values
IP Mode / Address	Configures either IP mode to DHCP or static IP to the SVI. Note: Each SVI should have IP in unique subnet.	dhcp or ip-addr/mask
zeroconf	Creates additional zeroconf IP (169.254.x.y) on the interface alias. Only valid for SVI with VLAN 1.	Enable/Disable

You can configure the above parameters through the CLI.

### In the CLI

To switch from configuration context to SVI context:

(cnPilot E400) (configure)# interface vlan *vlan-id*

To configure IP address mode to DHCP client:

(cnPilot E400) (configure)# ip address dhcp

To configures static IP address with a network mask of x bits:

(cnPilot E400) (configure)# ip address *a.b.c.d /x*

To configures zeroconf (169.254.x.y) IP on SVI:

(cnPilot E400) (configure)# ip address zeroconf

To disable zeroconf IP on an interface:

(cnPilot E400) (configure)# no ip address zeroconf

To display all the created SVIs along with their VLAN and IP address information:

(cnPilot E400) (configure)# show ip interface brief

## DHCP Server

Configures on board DHCP server on a particular SVI. User can configure different DHCP servers on up to 16 SVIs. Mapping between DHCP server and SVI is done through SVI IP address & network parameter of DHCP server configuration.

**Table 12:** Configure: DHCP Server parameters

Parameter	Description	Values
-----------	-------------	--------

IP Address Range	Specifies the range of IP address to be used for assigning to the clients.	start-ip-address to end-ip-address
Default Router IP	Specifies IP address of the default gateway to be assigned to the clients	ip-addr
Primary & Secondary DNS Server IP	Specifies IP address of the domain name servers. Default values: 8.8.8.8 & 8.8.4.4 (when dns proxy is configured at device) SVI IP & none (when dns proxy is not configured on device)	ip-addr1 ip-addr2 (optional)
Domain Name	Specifies the domain name to be assigned to clients.	string
Lease Time	Specifies the lease time.	days – hours - minutes
network	Specifies subnet of SVI to which this DHCP server should attach.	ip-addr/mask
MAC-IP Bindings	Specifies specific binding between MAC address and IP address.	mac-addr ip-addr

You can configure the above parameters through the CLI.

### In the CLI

To switch from configuration context to DHCP pool context:  
(cnPilot E400) (configure)# ip dhcp pool *pool-num*

To configure IP address range to be assigned to the clients:  
(cnPilot E400) (configure)# address-range *a.b.c.d A.B.C.D*

To configure default router IP to be assigned to clients. Default router, if present in address range is excluded.  
(cnPilot E400) (configure)# default-router *a.b.c.d*

To configure primary and secondary DNS server IP to be assigned to clients. Default Value: 8.8.8.8 for primary & 208.67.222.222 for secondary:  
(cnPilot E400) (configure)# dns-server *primary-server-ip secondary-server-ip*

To configure domain name to be assigned to clients:  
(cnPilot E400) (configure)# domain-name

To configure lease time:  
(cnPilot E400) (configure)# lease *days hrs min*

To specify subnet (SVI) to attach with DHCP server:  
(cnPilot E400) (configure)# network *a.b.c.d /x*

To bind IP address with MAC address. Up to 32 bindings can be specified:  
(cnPilot E400) (configure)# bind *xx:xx:xx:xx:xx:xx a.b.c.d*

To destroy the specified DHCP pool:  
 (cnPilot E400) (configure)# *no ip dhcp pool pool-num*

To display the pool status, SVI on which DHCP pool is attached & assigned leases to all client from this pool:  
 (cnPilot E400) (configure)# *show dhcp-pool pool-num*

## DHCP Relay

DHCP relay allows DHCP server in one subnet to be shared by clients in other subnet by relaying DHCP requests. Relay agent configuration is specific to SVI. i.e. any SVI / subnet looking for DHCP server in different subnet needs to have relay agent configured for it.

**Table 12:** Configure: **DHCP Relay** parameters

Parameter	Description	Value
DHCP Server IP	Specifies the IP address of the DHCP server which should be used of the given subnet.  <b>Note:</b> It automatically enables relay w/o any additional command.	ip-address

You can configure the above parameters through the CLI.

### In the CLI

To switch from configuration context to SVI context.  
 (cnPilot E400) (configure)# *interface vlan vlan-id*

To configure DHCP relay for the SVI with *a.b.c.d* as the DHCP server IP address.  
 (cnPilot E400) (configure)# *ip dhcp relay server a.b.c.d*

To display relay:  
 (cnPilot E400) (configure)# *no ip dhcp relay*

## DNS Proxy

DNS proxy enables local caching of DNS entries from all the interfaces configured on the device. For the queries which cannot be answered from the local cache, external servers are referred.

**Table 12:** Configure: **DNS Proxy** Parameters

Parameter	Description	Value
State	Configures the state of DNS proxy on the device.	Enable/Disable

External name server	IP address of external name server to be referred by DNS proxy. Up to two name server can be defined. Additionally, any name servers passed by external DHCP servers will also be used as external DHCP server.	Ip-address
----------------------	---	------------

You can configure the above parameters through CLI.

### In the CLI

To enable DNS server / proxy:  
(cnPilot E400) (configure)# ip dns server

To disable DNS server / proxy:  
(cnPilot E400) (configure)# no ip dns server

To configure single external name server:  
(cnPilot E400) (configure)# ip name-server *a.b.c.d*

## Management VLAN Access

The management VLAN access allows to restrict device access using a given set (one or more) VLANs. Additionally, access using a given VLAN can be allowed only from wired connection.

**Table 13:** Configure: Management VLAN Access Parameters

Parameter	Description	Values
state	Management VLAN access is per SVI configuration. Disabled: No access of device using this SVI's VLAN Allow-from-wired: Access of device is allowed from wired side using this SVI's VLAN Allow-from-both-wired-wireless: Access of device is allowed from both wired & wireless side using this SVI's VLAN	Disable / allow-from-wired / allow-from-both-wired-wireless

You can configure the above parameters through the CLI.

### In the CLI

To switch from configuration context to SVI context:  
(cnPilot E400) (configure)# interface vlan *vlan-id*

To enable management access through given SVI. Access from both wired and wireless is allowed:  
(cnPilot E400) (configure)# management-access all

To enable management access through given SVI. Access from only wired side is permitted:  
(cnPilot E400) (configure)# management-access wired

To disable management access through given SVI:  
(cnPilot E400) (configure)# no management-access

## NAT and Port Forwarding

NAT allows to hide IP addresses of a subnet while accessing IP addresses in another subnet. Each SVI / Subnet needs to be individually configured for NAT.

You can configure NAT using CLI:

### In the CLI

To switch from configuration context to SVI context:

```
(cnPilot E400) (configure)# interface vlan vlan-id
```

To enable NAT for the SVI:

```
(cnPilot E400) (configure)# ip nat inside
```

To disable NAT for the SVI:

```
(cnPilot E400) (configure)# no ip nat
```

**Port Forwarding** allows to forward traffic with specific TCP / UDP ports to specific server in NAT enabled subnet. As oppose to NAT which is SVI specific, port forwarding is a global configuration.

You can configure NAT using CLI:

### In the CLI

To forward TCP port-num to a.b.c.d server:

```
(cnPilot E400) (configure)# ip port-forward tcp port-num a.b.c.d
```

To forward UDP port-num to a.b.c.d server:

```
(cnPilot E400) (configure)# ip port-forward udp port-num a.b.c.d
```

To disable forwarding of TCP port-num to a.b.c.d server:

```
(cnPilot E400) (configure)# no ip port-forward tcp port-num a.b.c.d
```

To disable forwarding of UDP port-num to a.b.c.d server

```
(cnPilot E400) (configure)# no ip port-forward udp port-num a.b.c.d
```

# Firewall

---

Firewall options are used to configure options to protect from denial of service (DoS) attacks. By configuring these options AP prevents attacks on its Ethernet and wireless interface so that it does not enter in DoS state for its wireless clients.

## Configuring Firewall

You can use the following command to configure Firewall:

```
(cnPilot E400) (configure)# firewall dos-protection {icmp-frag, ip-spoof, ip-spoof-log, smurf-attack}
```

## DNS ACL

DNS ACL gives URL filtering based on the domain name in DNS Requests. User can configure allow or deny list based on the requirements. If a domain has been configured as **allow** then the wireless clients can load that URL. If a domain has been kept as **deny** then those URLs will be blocked by AP Wildcards as domain names are supported (Eg: \*.google.com). You can configure upto 256 entries per WLAN.

## Configuring DNS ACL

You can use the following command to configure DNS ACL:

```
(cnPilot E400) (config-wlan-1# dns-acl {deny, permit}
```

## ACL

ACL provides basic traffic filtering capabilities based on selected type of ACL, for example if user Configures an IP ACL then from A.B.C.D. IP address to M.N.O.P IP address traffic will be dropped. The AP examines each packet to determine whether to forward or drop the packet, on the basis of the criteria such as:

- Allow or Deny criterion
- Source or Destination IP address of the traffic
- Source or Destination MAC address of the traffic
- Upper-layer protocol types
- Source or destination port information.

A maximum of 256 rules per network interface and rules are processed in the order of precedence (1=high; 256=low).



## Configuring ACL

You can use the following command to configure ACL:

```
(cnPilot E400) (config-wlan-1# acl {deny, permit}
```

```
(cnPilot E400) (config-wlan-1# acl deny {ip, mac, proto}
```

# Firmware management

The running software on the cnPilot E400 can be upgraded to newer firmware from either the CLI or the UI. When upgrading from the CLI the user must specify a TFTP or FTP server from where the firmware file would be downloaded by the Access Point. When upgrading from the UI the user can upload the firmware file from the browser. The same process can be followed to downgrade the Access Point to a previous firmware version if required. Configuration is maintained across the firmware upgrade process.



## Note

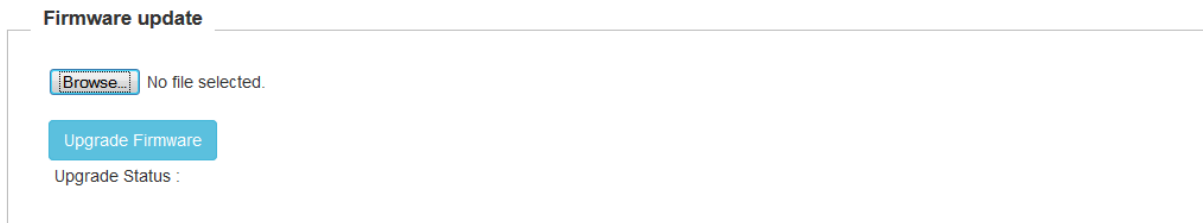
Once a firmware upgrade has been initiated, the Access Point should not be rebooted or power cycled until the process completes, as this might leave the Access Point inoperable.

You can configure the above parameters through the UI or CLI.

## In the UI

1. Navigate to the **Operation > Firmware Upgrade** tab. The following fields are displayed:
2. To upgrade the firmware manually:  
Click **Browse** and select the downloaded image file.
3. To upgrade the firmware automatically:  
Click Upgrade Firmware.
4. You can view the status of upgrade in the **Upgrade Status** field.
5. Click **Save**.

**Figure 12:** Operations: Firmware Upgrade page



## In the CLI

To upgrade firmware:

```
(cnPilot E400) (configure)# upgrade
```

# Troubleshooting

---

The following types of troubleshooting tools are supported:

1. **Packet Capture:** Allows the administrator to capture all packets on a specified interface. A decode of the packet indicating the network addresses, protocol types etc is displayed. The administrator can filter the packets being captured by specifying a particular MAC address, IP address, port number etc. The number of packets that are captured can also be capped, so the console or system is not overwhelmed. Packets captured on the ETH interfaces are packets that are being transmitted or received on the physical interface of the device. Packets captures on the WLAN interfaces are data packets on a particular WLAN as they are bridged on the radio interface of the device.
2. **Logs and Events:** The system generates event-messages for any notable activity on the device from client associations and authentications to system configuration changes. These logs are:
  1. Forwarded to CNS-NG for later viewing and filtering
  2. Buffered on the device and can be viewed using 'show logging' in the CLI
  3. Transmitted to any configured syslog servers.
3. **Configuration Import, Export, Delete:** The device configuration can either be exported from the device as a text file of CLI commands, or imported into the device from a previous backup. The delete configuration option will factory-reset the device. All configuration, configured onboarding parameters are reset to default when the configuration is deleted and the device rebooted. Note that when a configuration file is imported onto the device, a reboot is necessary to activate that new configuration.
4. **Factory Default:** There are three ways a device can be reset back to factory default:
  1. Using the 'Delete Configuration' option in the Operations panel of the GUI or by using the 'delete config' CLI command.
  2. By pressing and holding down the reset button on the ePMP 1000 hardware. Note that this is a recessed button between the Main (ETH1) and Aux (ETH2) Ethernet ports on the device.

By power cycling the device four times in a row, each time allowing it to boot up only between 4-6 seconds before cutting power.

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```
/*
 * Driver for keys on GPIO lines capable of generating interrupts.
 *
 * Copyright 2005 Phil Blundell
 *
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 */
```

*uboot*

```
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