Atom ID0406-6.5 Indoor CPE

User Manual

BaiCE_AP_2.4.7_NA
BaiCE_BG_1.6.20

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Version 1.14

About This Document

This document is intended for installers and subscribers setting up and operating the Baicells Atom ID0406-6.5* Customer Premise Equipment (CPE), *aka* User Equipment (UE). This Atom unit provides a way for users to connect to the Internet through broadband wireless access to Long-Term Evolution (LTE) backhaul networks. The information covers how to install, configure basic settings, monitor, and perform basic maintenance and troubleshooting for the indoor CPE. If you are using a Baicells *out*door CPE, please refer to the *Atom OD0406 Outdoor Low-Gain & High-Gain CPE User Manual*.

> *NOTE: "ID" stands for indoor. The "04" designation stands for CAT4, and "06" stands for CAT6. These categories are related to the LTE standards requirements for user equipment. Model numbers are shown in the product datasheets, which can be found at Baicells.com > Resources > *Documents*.

Terms used in this document or related to LTE are listed in alphabetical order and described in *Acronyms and Abbreviations*, which can be found at Baicells.com > Resources > *Documents*.

New in This Release

The following updates have been provided in this release:

- Updates reflect changes to new software BG 1.6.20.
- Added NAT mode configuration option in *section 6.3.2*.
- Added WLAN description and steps in *section 6.4*.
- Added Wifidog description and steps in *section 6.5*.
- Updated MTU range in *section 6.8.2, step 4*.
- Updated the Spectrum Access System (SAS) information in *section 6.9*.

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Revision Record

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1 Introduction

The Baicells Atom ID0406-6.5 indoor Customer Premise Equipment (CPE), *aka* User Equipment (UE), is part of the Baicells broadband wireless access system that integrates with Long-Term Evolution (LTE) backhaul networks to provide subscribers with Internet access. The CPE communicates through a wireless connection to the operator's eNodeBs (eNBs) at cell sites located in the region. The eNBs communicate with the backhaul network (Figure 1).

Figure 1: LTE Network Architecture
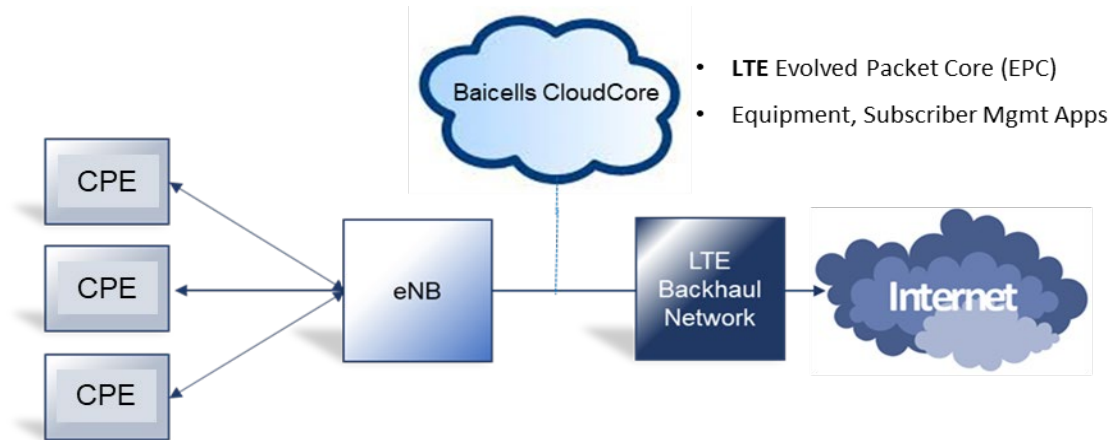
The Indoor Unit (INU) CPE comes preloaded with a Graphical User Interface (GUI) application to configure the device. The GUI screens for CAT4 and CAT6/7 look different, though both contain many of the same types of settings. This document covers both GUIs and points out where there are differences.

2 Features

Some of the key features and attributes of the Atom indoor CPE are listed below. Exact specifications vary by model; please refer to the datasheets found at Baicells.com > Resources > *Documents*.

- Standard LTE TDD bands 40, 41, 42, 43, and 48
- Complies with 3GPP standards for Release 9 CAT4 and Release 10 CAT6/7
- IEEE 802.11b/g/n Wi-Fi 2.4 GHz supported
- 2.5 GHz or 3.5 GHz models
- Small footprint
- Local and remote GUI with flexible feature configuration options
- The CAT6/7 Atom ID06-6.5 provides Voice Over IP (VoIP) communications to support fax and Point-of-Sale (POS) equipment connectivity using an RJ-11 interface

- Easy to read LED status indicators on the unit to quickly identify the power status, LTE signal strength, and WLAN (Wireless Local Area Network) status. The Atom ID06-6.5 also includes an LED for the voice connection.
- 100 Mbps Ethernet interface (CAT4)
- 1000 Mbps Ethernet interface (CAT6/7)
- Cell lock, SIM lock, and Pin lock
- TR-069 management protocol support

3 Parts & Materials

Table 1 lists the primary components in the packout. You will need a computer to configure the device.

Table 1: Parts

Item	Quantity	Picture
Atom ID04/06-6.5 unit	1	
DC-5V Power Adaptor	1	
RJ-45 Ethernet Cable	1	

4 Description

The Baicells Atom indoor CPE is a small, compact unit that sits on a desktop, bookshelf, or other flat surface inside the building (Figure 2).

Figure 2: Dimensions
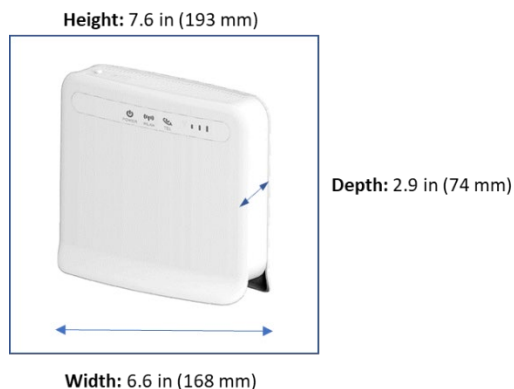
On the top of the unit is a card slot for the Baicells Universal Subscriber Identity Module (USIM) card provided through the operator or distributor. A USIM contains equipment and subscriber identification numbers (IMEI and IMSI) and uniquely identifies your CPE so it can access the provider's network.

The LED indicators on the front provide operational status information (Figure 3). Refer to Table 2 for a description of the LEDs. Various connection interfaces are on the back of the unit, as well as a small LED for the Local Area Network (LAN) connection. For a description of the interfaces, refer to Table 3.

Figure 3: LEDs & Interfaces

Front   Back
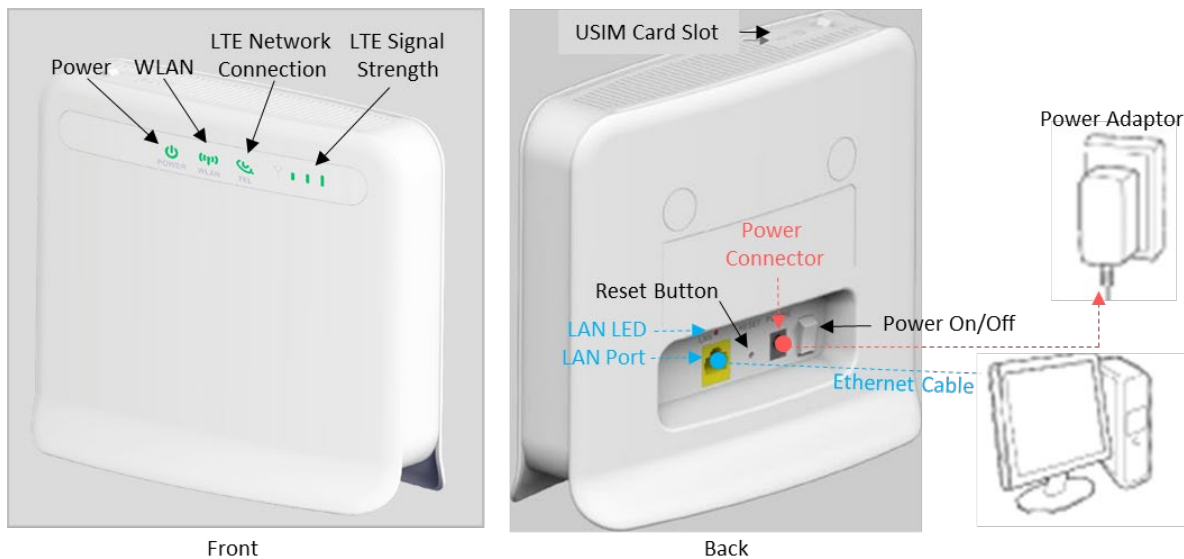
Table 2: LED Descriptions

LEDs vary by model; not all models will have all of the LEDs listed.

LED	Description	Status	Meaning
Power	Power indicator	OFF	No power supply
		Steady On	Power is on
Wi-Fi or WLAN	Wireless LAN (Wi-Fi) status indicator	Steady On	Wi-Fi function is enabled
		Blinking	Data is being transmitted or received through using Wi-Fi
		OFF	Wi-Fi function is disabled
SYS or LTE Network	LTE network status indicator	OFF	No LTE internet connection
		Steady On	LTE network connection established
LTE Signal Strength	1, 2, 3, or 4 bars show wireless connection status and signal strength. The more bars, the stronger the signal.	All OFF	Signal is too weak to connect to the LTE network
		Steady On	The unit is connected to the LTE network. Bars will light steadily according to signal strength.
		Blinking	The unit is scanning the LTE network.
			The unit is authenticating.
			Software upgrade or restore to factory settings
Tel (Atom ID06-6.5 only)	Voice telephone interface indicator	Off	VoIP not registered with the voice server
		Steady on	VoIP registered with a voice server

LED	Description	Status	Meaning
LAN (on back)	Ethernet indicator	Off	No Ethernet connection
		Steady on	Ethernet connection is normal
		Blinking	Ethernet data is being transmitted

Table 3: Interfaces

Interfaces vary by model; not all models will have all of the interfaces listed.

Interfaces	Description
USIM	Universal Subscriber Identity Module card slot. 1.8 V/3.0 V USIM 2FF
LAN	One to four RJ-45 ports, LAN, 10/100 (CAT4) or 10/100/100 (CAT6/7) auto-sensing, auto-MDX interface to connect to computer or other network devices (e.g., hub or switch). Compatible with IEEE 802.3/802.3u standards.
RESET	Press the reset button for one second to reset the unit. Press the reset button for 10 seconds to restore the unit to its factory settings.
DC-5V Power Connector	Port to attach the power adaptor provided with the unit
Power Switch	Power on/off
POTS-RJ11 (Atom ID06-6.5 only)	RJ-11 telephone port(s). Used for phone/fax/POS, providing VoIP functions under conditions of software support.

5 Installation

The steps for installing the unit are provided below.

> **ATTENTION:** Never power on the unit while installing or uninstalling the USIM card. Doing so could damage the card and the unit.

1. Insert the USIM card: Open the protective cover of the USIM card slot on the top of the Atom unit and insert the USIM card into the slot (Figure 4). Close the cover.

   Figure 4: Insert USIM Card

2. Connect the cables (per previous Figure 3), and power on:

    a. LAN: Connect one end of the RJ-45 Ethernet cable to the LAN interface on the back of the unit. Connect the other end to a computer or other LAN device.

    b. Power: Connect the DC-5V power adaptor to the power connector on the back of the unit. Plug the other end into an electrical outlet.

    c. Turn the power switch to *ON*.

6 Basic Configuration

Reference: *CPE Configuration Guide*

The CPE comes preloaded with a Graphical User Interface (GUI) to configure the device. The GUI screens for CAT4 and CAT6/7 CPEs look different, though both contain many of the same types of settings. This manual covers both GUIs and points out where there are differences.

The basic configuration settings allow you to get the CPE up and running, i.e., connected to the Internet, in order to verify operation. Other features as well as more in-depth information about the CPE GUIs are covered in the document referenced above.

6.1 Log in & Change Password

With your computer connected through Ethernet to the CPE:

1. Open a Web browser, and enter *http://192.168.150.1*.

    NOTE: If the address does not open the GUI, try *http://192.168.254.1* or *http://192.168.1.1*. These were used for older generation UEs.

2. Upon first login, you may be prompted to change your password (Figure 5).

Figure 5: First Login
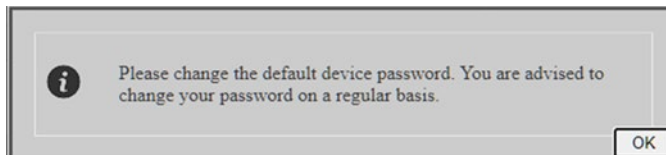
When you click on *OK*, you will be taken to the *System > Account* window (Figure 6). Enter a password using 5 to 16 characters (upper/lower case letters, numbers, and special characters). For CAT4, click on *SAVE & APPLY*. For CAT6/7, click *Apply*.

For CAT6/7, in the *System > Account* window you can change the lockout time, i.e., if there is no activity on the CPE for this amount of time, users will be logged off. The default is 300 seconds (five minutes), and the maximum is 65535 seconds (~18 hrs). Click on *Apply* to save.
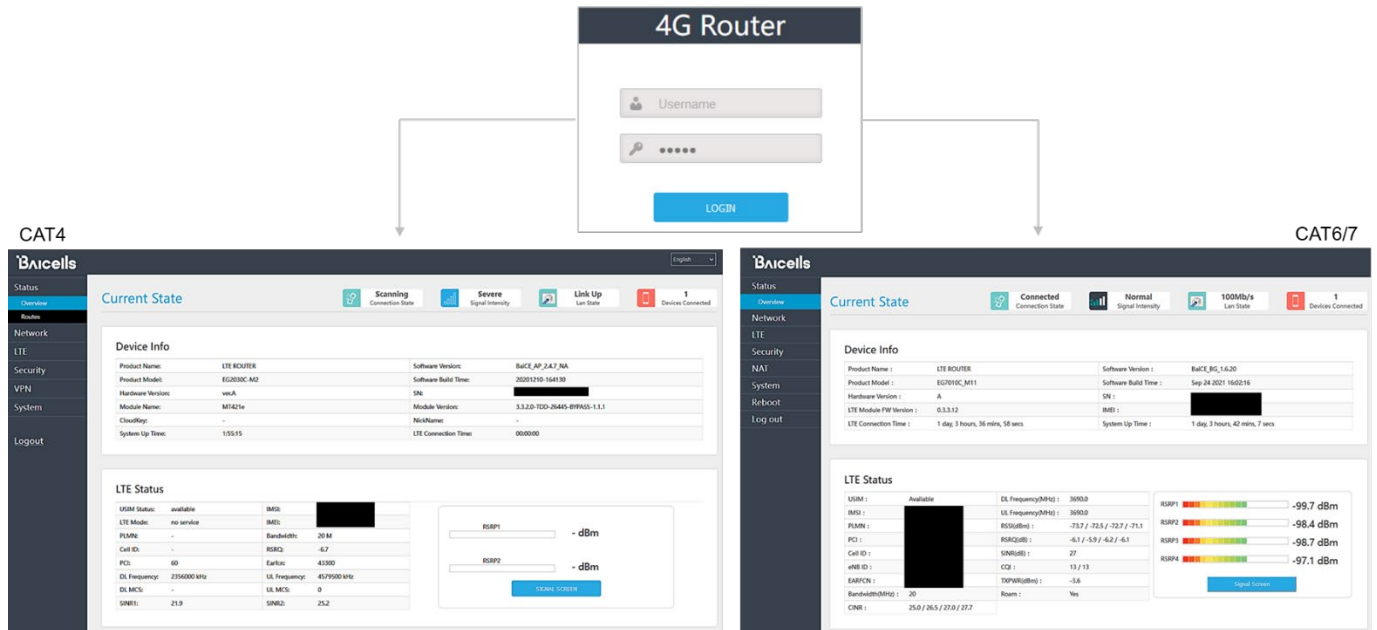
Figure 6: Change Password

CAT4

CAT6/7/15

3. At the *4G Router* login window (Figure 7), enter the default user name (*admin*) and your password. If you were not prompted to change the password upon initial login, enter the default password (also *admin*). Click on *LOGIN*. This will take you to the GUI home page, which is the *Status > Overview* window.
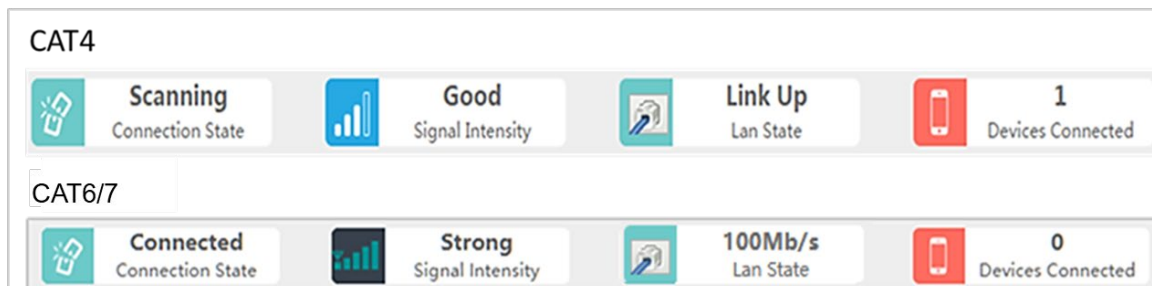
Figure 7: Login

6.2 Check Current Status Icons

As shown in Figure 7 above, the GUI home page is the *Status > Overview* window. This page displays the at-a-glance CPE *Current State* icons at the top of the window, as shown in Figure 8. These fields give a quick indication if anything is wrong with basic CPE operation.

Figure 8: Status Icons

- Connection State - The possible connection states are *Checking SIM, Scanning, Registering, Acquiring IP, Connected,* or *Disconnected*. If the CPE is *checking SIM, scanning, registering,* or *acquiring an IP address*, it means the CPE is in the process of establishing a connection. Give it a few moments to finish its connection process, and then check if the status is *Connected*. Otherwise, make sure the CPE is installed properly and powered on.

- Signal Intensity - The possible states are *No Signal, Severe, Bad, Good*, or *Excellent* (CAT4)/*Strong* (CAT6/7). Check that the signal is indicated as either *Good* or *Excellent/Strong*. If the Atom unit cannot detect a wireless signal, or if the signal is very weak, try moving the unit closer to a window, higher up, and away from any other devices using radio frequency, or away from objects that may be blocking the signal between the CPE and the eNB. Otherwise, contact your service provider for assistance.

- Lan State - The CPE connection to the Local Area Network will be either *Link Up* or *Link Down*. If the link is down, recheck the installation steps, make sure the CPE is powered on, and check the router or other LAN device operation.

- Devices Connected - A count of the number of different smart devices using the CPE

4. Connect Wi-Fi:

    a. Ensure that the computer or other smart device has Wi-Fi (WLAN) enabled.

    b. When the Wi-Fi LED on the unit shows "steady on", per Table 2, it is functional. The Wi-Fi function can be *enabled* or *disabled* through the GUI.

    c. Looking at the label on the back of the Atom unit, record the WLAN Name and WLAN Key (WPA/WPA2) values (Figure 9).

Figure 9: Label
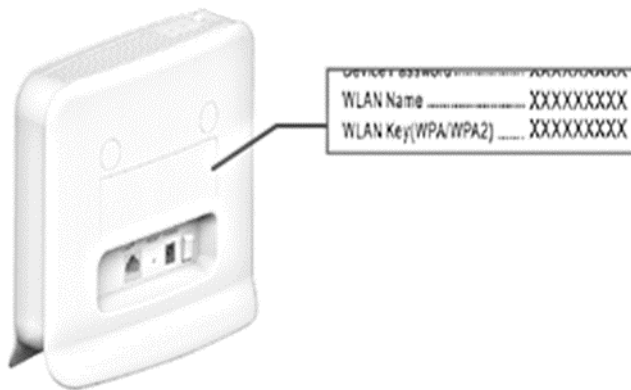
To avoid unauthorized use of the Wi-Fi/WLAN, go to the GUI and modify the WLAN Name and Key (WPA/WPA2) information from your service provider. These fields are case-sensitive. On your Wi-Fi enabled computer and other smart devices, you can then look for the new Wi-Fi/WLAN network name.

6.3 Configure WAN Settings

The *Network > WAN Settings* pertain to:

- How the CPE interfaces with the Wide Area Network (WAN) - typically the Internet;

- The network or operation mode, which determines how IP addressing is handled; and

- The Domain Name System (DNS) to be used.

Because the GUI screens for the WAN settings are laid out differently between CAT4 and CAT6/7, each is described separately in the sections below. Refer to Table 4 for a description of all fields in both GUIs.

6.3.1 CAT4

To configure the *WAN Settings* on a CAT4 CPE (Figure 10, Table 4):

1. Check that the *WAN Interface* is set to *LTE*, the default and only selection for this field.

2. For *Network Mode*, you can configure the CAT4 CPE in either Network Address Translation (NAT) or Bridge mode, depending on your network topology.

   NAT mode allows multiple hosts on a private network to access the Internet using a single public IP address. Bridge mode disables NAT mode and allows the CPE to create a Layer 2 (L2) link and function as a Dynamic Host Configuration Protocol (DHCP) server without IP address confliction.

   NOTE 1: If L2 has been enabled in the *VPN > L2* menu, the system will prompt you to disable those L2 settings first before changing the network mode to Bridge. When you get this prompt, click *OK,* go to the *VPN > L2* menu, and select *Destroy*.
   NOTE 2: Changing the Network Mode requires rebooting the CPE for the change to take effect.

3. Configure one or more DNS servers. The DNS translates domain names such as *www.na.baicells.com* into their underlying IP addresses. The service provider may use DNS servers to cache domain names frequented by its users so the sites load more quickly in a browser.

   If you leave the *Manually DNS* checkbox unchecked, the CPE will check the first available DNS in the network to resolve the domain name to IP address translation. If you select this checkbox, you can specify a Primary DNS IP address and a Secondary DNS IP address.

Figure 10: WAN Settings (CAT4)

6.3.2 CAT6/7

To configure the *WAN Settings* on a CAT6/7 CPE (Figure 11, Figure 12, and Table 4):

1. Select one of the following for the *Operation Mode*:

   - NAT - Allows multiple hosts on a private network to access the Internet using a single public IP address. When *NAT* is selected, all eight Access Point Name (APN) gateways can be configured for either *Default Router, Data, Mgmt*, *Voip*, or *Reserve*.

   - Router - The CPE will dynamically update the router tables.

   - Tunnel - The CPE will support Layer 2 Tunneling Protocol (L2TP) or Generic Routing Encapsulation (GRE) VPN mode. You can set the *Default Route* to *VPN* or *WAN*.

   - Bridge - The WAN port addresses will bridge to the LAN port; the LAN port will work in trunking mode.

   - Mixed Mode - Each Access Point Name, or external gateway, can be configured with a different mode, either *NAT* or *Bridge*, and a different bearer type.

   Figure 12 shows how the settings will appear for each operation mode.

2. In the *Profile List* you will see up to eight APNs. You must have at least one APN configured for the CPE TR-069 connection to the Baicells CloudCore, Local OMC (Operations Management Console), or other Network Management System (NMS). Therefore, *APN1* is the default router *Bear Type*. When using more than one APN, for example if you have a different route and Quality of Service (QoS) or other treatment for voice traffic than for data, you can edit the *Bear Type* by selecting the radio button under *Edit* and in *Profile Setting* choose the *Bear Type*.

3. For *DNS Mode*, you can select either *Automatic* or *Manually*. The DNS server translates domain names such as www.na.baicells.com into their underlying IP addresses. The service provider may use DNS servers to cache domain names frequented by its users so the sites load more quickly in a browser.

   If you select *Automatic*, the CPE will check the first available DNS in the network to resolve the domain name to IP address translation. If you select *Manually*, specify a *Primary DNS* IP address and a *Secondary DNS* IP address.

Figure 11: WAN Settings (CAT6/7) (1 of 2)

Figure 12: WAN Settings (CAT6/7) (2 of 2)

Table 4: WAN Settings

Field Name	Description
Network or Operation Mode	
WAN Interface	CAT4 only. LTE is the only option.
Network Mode or Operation Mode	CAT4: • NAT - Network Address Translation. Allows multiple hosts on a private network to access the Internet using a single public IP address. • Bridge - The WAN port addresses will bridge to the LAN port, and the LAN port will work in trunking mode. If you select *Bridge mode*, the system will prompt you to disable L2 in the *VPN > L2* menu. CAT6/7: • NAT - Allows multiple hosts on a private network to access the Internet using a single public IP address. • Router - The CPE will dynamically update the router tables. • Tunnel - The CPE will support Layer 2 Tunneling Protocol (L2TP) or Generic Routing Encapsulation VPN mode. See field descriptions below*. • Bridge - The WAN port addresses will bridge to the LAN port, and the LAN port will work in trunking mode. If you select *Bridge mode*, the system will prompt you to disable L2 in the *VPN > L2* menu. • Mixed Mode - Each APN gateway can be configured with a different mode, either *NAT* or *Bridge*, and a different bearer type.
Manually DNS	CAT4 only. If left unchecked, the CPE will automatically search the domain name on the first available DNS server. If checked, enter the primary and secondary DNS server IP addresses.
Primary DNS	CAT4 only. If *Manually DNS* checkbox was checked, enter the primary DNS server's IP address for the CPE to check first for domain name resolution.
Secondary DNS	CAT4 only. If *Manually DNS* checkbox was checked, enter the *secondary DNS* server's IP address for the CPE to check after the *primary DNS* if the domain name was not resolved.
*Tunnel Mode (CAT6/7 Only)	
VPN Type	L2TP or GRE
NAT Support	Enable/Disable NAT on the VPN
Default Route	VPN or WAN
Host name	Optional - enter the default route name

Field Name	Description
*L2TP (CAT6/7 Only)	
BCP Support	*Enable/Disable Bridge Control Protocol for L2TP tunneling. If enabled, must be set up on both ends, the CPE/router acting as Point-to-Point Protocol (PPP) client and the PPP server.*
L2TP Server IP	IP address of the L2TP server
L2TP User	L2TP server user name
L2TP Password	L2TP server password
DNS Mode (CAT6/7 Only)	
DNS Mode	Automatic or Manually. If you select *Automatic*, the CPE will automatically search the domain name on the first available DNS server. If you select *Manually*, enter the primary and secondary DNS server IP addresses.
Primary DNS	If DNS Mode was set to *Manually*, enter the primary DNS server's IP address for the CPE to check first for domain name resolution.
Secondary DNS	If DNS Mode was set to *Manually*, enter the secondary DNS server's IP address for the CPE to check after the primary DNS if the domain name was not resolved.

6.4 Configure WLAN Settings

The Baicells Atom indoor CPEs have an embedded Wi-Fi access point, providing converged Wireless LAN (WLAN) and LAN interfaces into one integrated LTE service. The Wi-Fi uses 2.4 GHz unlicensed spectrum and is compliant with IEEE 802.11b/g/n.

You can enable WLAN and configure up to four independent Service Set Identifiers (SSIDs) on the local network. This allows you to customize the settings for each SSID.

To set up WLAN for CAT4:

1. Ensure that the computer or other smart device connecting to the CPE has WLAN/Wi-Fi enabled. When the Wi-Fi LED on the unit shows "steady on", per Table 2 LEDs, it is functional.

2. In the GUI, go to *Network > WLAN Settings* to the *Wireless Overview* page. Then click *SETTINGS* to open the *Wlan 2.4G* page (Figure 13).

3. To avoid unauthorized use of the Wi-Fi/WLAN, enter a unique access password. Refer to the *CPE Configuration Guide* for a description of all the settings.

To set up WLAN for CAT6/7:

1. Ensure that the computer or other smart device connecting to the CPE has WLAN/Wi-Fi enabled. When the Wi-Fi LED on the unit shows "steady on", per Table 2 LEDs, it is functional.

2. In the GUI, go to *Network > WLAN Settings* to enable the *WiFi* setting (Figure 14).

3. To avoid unauthorized use of the Wi-Fi/WLAN, enter a unique access password. Refer to the *CPE Configuration Guide* for a description of all the settings.

Figure 13: CAT4 WLAN Settings

Figure 14: CAT6/7 WLAN Settings

6.5 Wifidog

The feature, Wifidog, is available on indoor Atom CPEs and is used to build wireless hotspots. The feature works in cooperation with a remote authentication server. When Wifidog is enabled, Wi-Fi devices such as guest users will have to be authenticated through the remote authentication server.

> NOTE 1: The feature requires a connection to an authentication server to function.
>
> NOTE 2: Wifidog is not recommended for Baicells CPEs using Power over Ethernet (PoE).
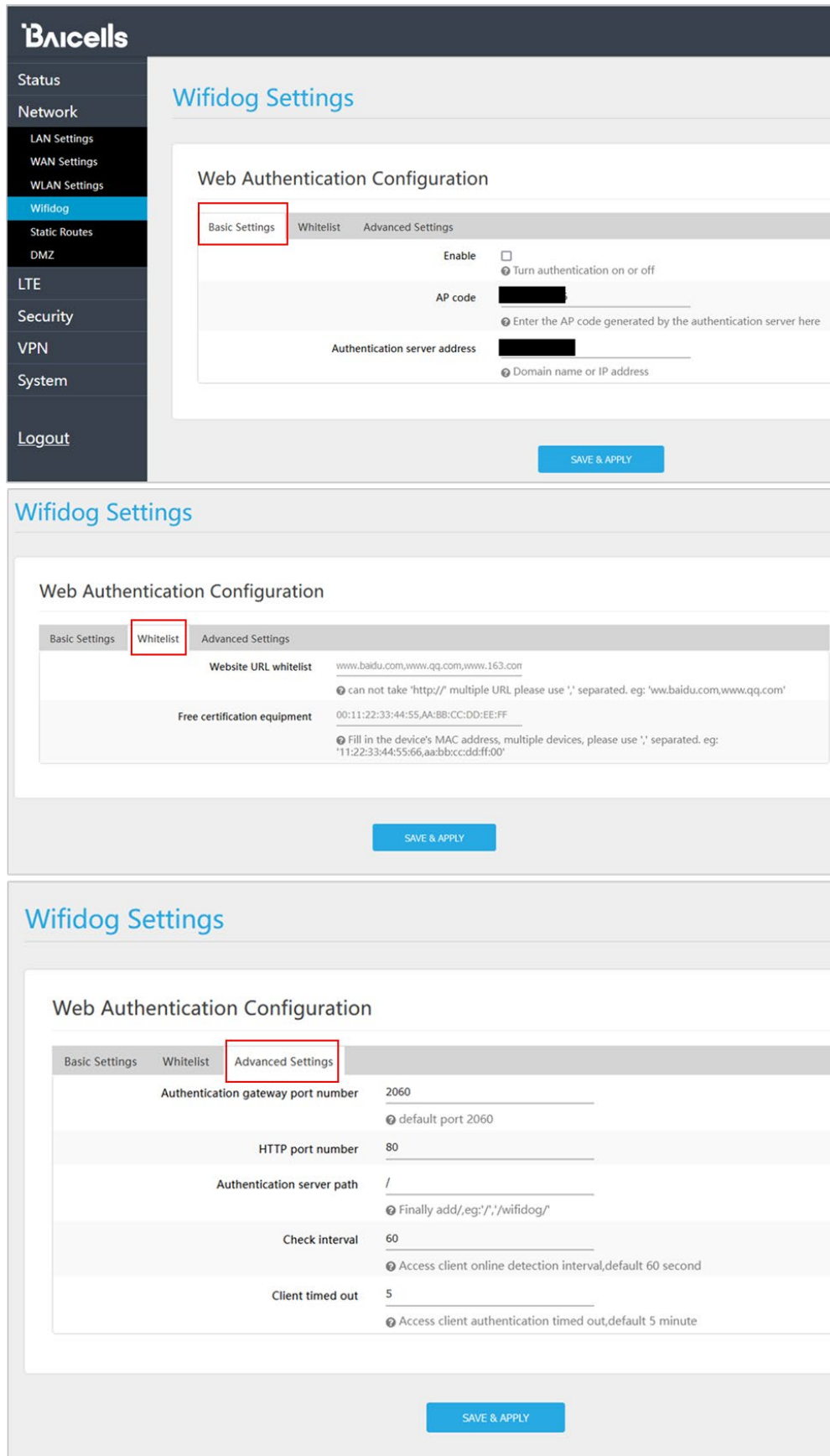
You can create a whitelist to identify which website addresses or URLs users are allowed to reach. You can also limit the number of times that a user attempts to log in within a configured time period before failure to authenticate times out. These settings help to avoid unauthorized use of the network.

In the GUI, go to *Network > Wifidog* (Figure 15 and Figure 16). For CAT4, notice the three tabs under *Web Authentication Configuration - Basic Settings*, *Whitelist*, and *Advanced Settings*. For CAT6/7 notice the three panes in the *Wifidog Settings* window - *Basic Settings*, *Whitelist*, and *Advanced Settings*. In the *Basic Settings* pane, click on the checkbox next to *Enable* to initiate Wifidog, and enter the *AP code* and the *Authentication Server Address*. If you don't want to create a whitelist or configure advanced settings, for CAT4, click on *SAVE & APPLY*. For CAT6/7, click on *Apply*. Otherwise, continue to the additional procedures for these settings.

In the *Whitelist* pane you can add URL addresses to be whitelisted – that is, allowed – without the user having to authenticate. Separate each URL with a comma (,). For the *Free certification equipment* field, enter the hotspot users' device MAC addresses. Use a comma (,) to separate each one. If you don't want to configure advanced settings, then click on *SAVE & APPLY* (CAT4) or *Apply (CAT6/7)*. Otherwise, continue to the additional procedures for these settings.

In the *Advanced Settings* pane, if you want all hotspot users to use the same authentication server and login requirements, enter the server path information and set the *Check interval* field (maximum time, in seconds), for logging in and the *Client timed out* field (maximum amount of time before failure to authenticate times out, in minutes). Click on *SAVE & APPLY* (CAT4) or *Apply (CAT6)*.

Figure 15: CAT4 Wifidog Settings

Figure 16: CAT6/7 Wifidog Settings

6.6 Configure Connection Mode / Connection Settings

You can set the CPE to connect to the default network automatically or you can connect manually, where you have to select the network you want to connect to each time.

1. In the CAT4 GUI, go to *LTE > Connection Mode*, and in the CAT6/7 GUI, go to *LTE > Connection Settings* to choose *Automatic* (CAT4)/*Always On* (CAT6/7) or *Manual* (Figure 17). If you choose *Automatic* (CAT4) or *Always On* (CAT6/7), click on *SAVE/APPLY* (CAT4) or *Apply* (CAT6) to save your selection. If you choose *Manual*, go to *step 2*.

Figure 17: Connection Mode

CAT4

CAT6/7

2. Manual: Click on *PLMN* for Public Land Mobile Network to scan all available networks and to select a specific LTE network with which to connect. Select *Connect* to connect to the network. Use the *Disconnect* button to disconnect from the selected network.

NOTE: The other configuration options shown are covered in the *CPE Configuration Guide*.

6.7 Configure Scan Mode / Cell Selection

6.7.1 Overview

The *Scan Mode / Cell Selection* setting has to do with how the CPE selects the best wireless signal between it and an eNB for its connection to the LTE network. The setting determines which frequencies the CPE's routine scan of available frequencies will cover.

Scanning is a process of tuning to specific frequencies and using a simple measure of signal quality to select the best cell (eNB) with which to communicate. It is a routine background function that occurs regularly to ensure the CPE is using the best available signal. There are four different scanning options, as shown in Figure 18 and described below.

Figure 18: Scan Mode/Cell Selection
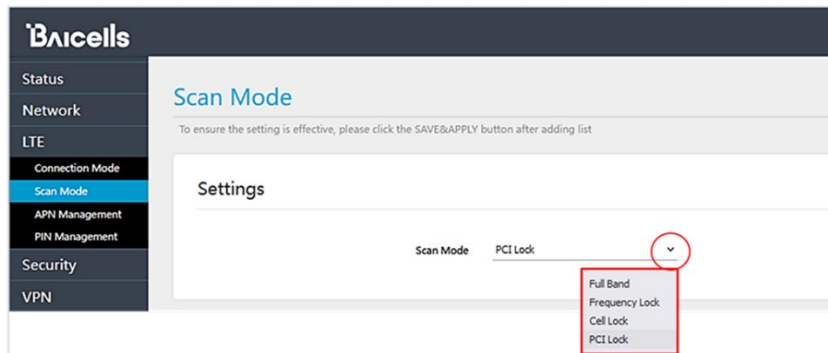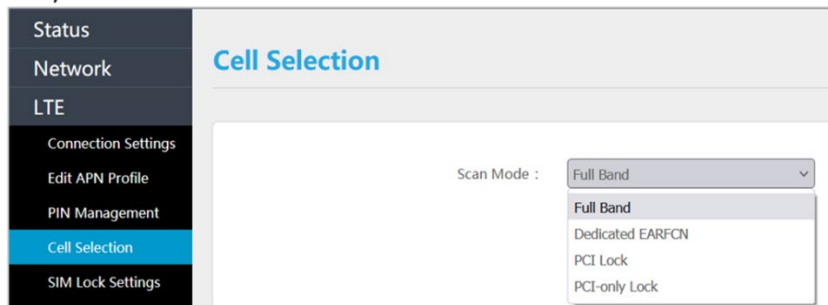
- **Full Band** – Default setting. The CPE will routinely scan all channels in the band, which can make the time it takes to connect to the network longer than the other modes. The band is dependent on the CPE model.

- **Frequency Lock / Dedicated EARFCN** – You can specify up to nine frequencies or E-UTRA Absolute Radio Frequency Channel Numbers (EARFCNs) the CPE will scan during its routine signal scan. The frequency/EARFCN information will come from the service provider.

- **Cell Lock / PCI Lock** - A combination of Physical Cell Identifier (PCI) + EARFCN or frequency. The CPE will scan only the list of eNBs with the PCI and EARFCN combination, which accelerates network access time.

- **PCI-only Lock** – You can lock the CPE to a designated PCI or PCI range.

If you wish to leave the scan mode as *Full Band*, you do not need to make any configuration changes for the mode. The procedures for configuring the other three modes are described for CAT4 and for CAT6/7 in the sections that follow.

6.7.2 CAT4

Following are the procedures for configuring *Frequency Lock, Cell Lock,* and *PCI Lock* on a CAT4 CPE.

- Frequency Lock (Figure 19)

  1. For *Scan Mode*, select *Frequency Lock* from the pull-down menu.
  2. Click on *ADD LIST* to open the *Frequency Lock Setting* pane.
  3. Select the *Band* number, and enter the *Earfcn*.
  4. Click on *ADD*. Then click *SAVE & APPLY*.

Figure 19: Frequency Lock (CAT4)

- Cell Lock (Figure 20)

    1. For *Scan Mode*, select *Cell Lock* from the pull-down menu.

    2. Click on *ADD LIST* to open the *Cell Lock Setting* pane.

    3. Select the *Band* number, and enter the *Earfcn* and *PCI* number combination.

    4. Click on *ADD*. Then click *SAVE & APPLY*.

Figure 20: Cell Lock (CAT4)

- PCI Lock (Figure 21)
    1. For *Scan Mode*, select *PCI Lock* from the pull-down menu.

    2. Click on *ADD LIST* to open the *PCI Lock Setting* pane.

    3. Enter the *PCI* number.

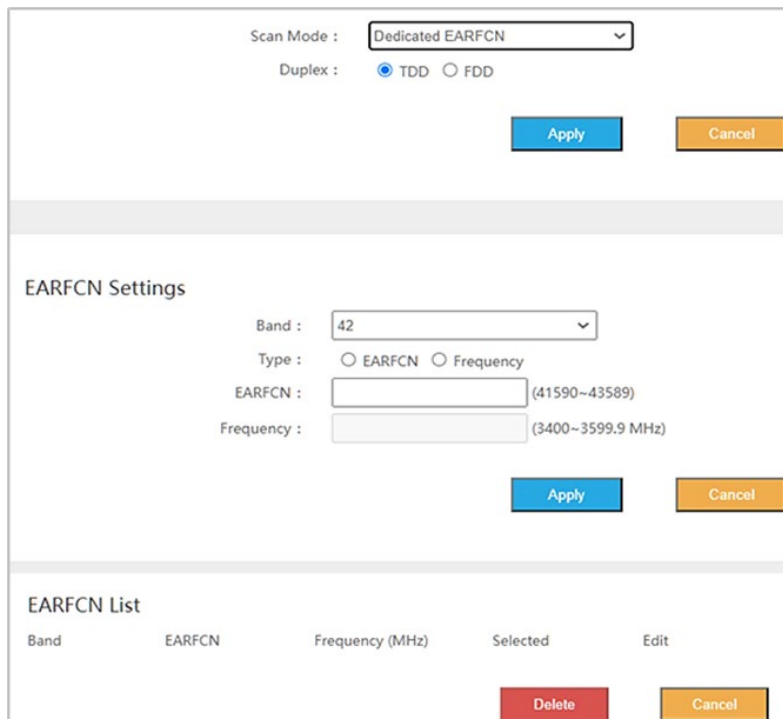   4. Click on *ADD*. Then click *SAVE & APPLY*.

Figure 21: PCI Lock (CAT4)

6.7.3 CAT6/7

Following are the procedures for configuring *Dedicated EARFCN, PCI Lock*, and *PCI-only Lock* on a CAT6/7 CPE.

- Dedicated EARFCN (Figure 22)

    1. For *Scan Mode*, select *Dedicated EARFCN* from the pull-down menu.

    2. Identify the CPE LTE duplexing mode, *TDD* or *FDD*, and then select *Apply*.

    3. In the *EARFCN Settings* pane, choose the *Band* number.

    4. Select either *EARFCN* or *Frequency*, and enter the associated number to identify the EARFCN or frequency.

    5. Click on *Apply*.

Figure 22: Dedicated EARFCN (CAT6/7)

- PCI Lock (Figure 23)

    1. For *Scan Mode*, select *PCI Lock* from the pull-down menu, and click on *Apply*.

    2. In the *PCI Setting* pane, select the *Band* number.

    3. For *Type*, choose either *EARFCN* or *Frequency,* and enter the associated number.

    4. Enter a *PCI ID* number, (0-503) and click on *Apply*. The configuration will appear in the *PCI List* in the bottom pane.

Figure 23: PCI Lock (CAT6/7)

- PCI-only Lock (Figure 24)

    1. For *Scan Mode*, select *PCI-only Lock* from the pull-down menu, and click on *Apply*.

    2. In the *PCI Setting* pane, enter the *PCI Start* and *PCI End* numbers.

    3. Click on *Apply*. The configuration will appear in the *PCI List* in the bottom pane.

Figure 24: PCI-only Lock (CAT6/7)

6.8 Configure APN Management / Edit APN Profile

6.8.1 Overview

An Access Point Name (APN) is the name of a gateway between a device and another computer network, frequently the public Internet. In a Baicells system where the operator uses the Baicells CloudCore to connect to the backhaul, the APN establishes one connection between the CPE and the EPC (Evolved Packet Core) via the eNB. The Baicells CloudCore EPC, as well as eNBs operating in HaloB mode, support only one APN, which is configured by default. Therefore, when the service provider is using the Baicells CloudCore, there is no need to change this setting.

When using a Local EPC (private network EPC), more than one APN can be established for connections to multiple gateways. In this case, the CAT4 CPEs support up to four APN gateway configuration profiles, and the CAT6/7 CPEs support up to eight.

6.8.2 Configure Local EPC APN

In a Local EPC network setup, follow the steps below to configure an APN on a CAT4 or CAT6/7 CPE.

1. In the CAT4 GUI go to *LTE > APN Management*, and in the CAT6/7 GUI go to *LTE > Edit APN Profile* (Figure 25).

Figure 25: APN Management / Edit APN Profile

2. Select an APN number, which is just an index to separate the different APN profiles.

3. *Enable* the APN profile, and give it a name.

4. In CAT4, enter the Maximum Transmission Unit (MTU) packet size that can be sent on this APN. The range is 576-1500 bytes.

   NOTE: For CAT6/7, the MTU setting is in the *LTE > MTU* menu and the MTU range is 1280-1500 bytes.

5. In CAT4, if you want this APN profile to be the default gateway, select the *Default* checkbox.

6. In CAT4, you can select a protocol to use: *No Specified, TR069, SNMP, SNMP+TR069*.*

7. In CAT6/7, for security you can enter a username and password, and set the *Auth Type*. The choices for the authorization/encryption protocol are *NULL, AUTO, CHAP*, or *PAP*.

8. *SAVE & APPLY* (CAT4) or *Apply* (CAT6) the settings.

6.9 Configure SAS

References: *CPE Configuration Guide* and *SAS Deployment Guide.*

The Citizens Broadband Radio Service (CBRS) covers the once-regulated 3.55-3.7 GHz band. What makes CBRS especially different is the way the 3.55-3.7 GHz band may be accessed as a "shared" spectrum, where spectrum resources are dynamically assigned and released on an as-needed basis. Shared spectrum assignment is handled by approved Spectrum Access System (SAS) vendors. The CBRS equipment is configured to connect to a SAS vendor for band assignment. When the assigned band is no longer needed, SAS can free it up so that other users can operate in that band.

The SAS feature is available to operators who have acquired the appropriate software license to operate certified network elements in SAS mode. The CBRS Service Devices (CBSDs), such as the Baicells eNBs and CPEs, must also go through certification, and must be installed by a Certified Professional Installer (CPI) in order to lawfully operate within the designated spectrum of CBRS. The CBSDs are identified by categories based on output power, Effective Isotropic Radiated Power (EIRP), and Power Spectral Density (PSD). Under these guidelines, the Baicells indoor CPEs are classified as Category A.

The *CPE Configuration Guide* describes basic configuration procedures for CPE SAS setup. The *SAS Deployment Guide* provides a full overview and procedures for implementing SAS operation across all of the Baicells components. Refer to these documents when you are ready to implement SAS.

> NOTE 1: The first generation (Gen 1) Baicells CPEs do not support SAS.
> NOTE 2: If you are not sure if the CPE you are working with is certified, please check with your Baicells sales representative.
> NOTE 3: Before implementing SAS, verify basic CPE operation, i.e., it can connect to the network (see *section 6.10*).

6.10 Verify Network Connection

Reference: *CPE Configuration Guide*

The minimal, basic configuration settings for the CPE are now complete. With the CPE powered on, you should be able to connect to the Internet. If you have trouble connecting, go through this sequence of actions:

1. Retrace and verify the installation and basic configuration steps.

2. Refer to *section 7* below.

3. Contact your support team for assistance.

For configuration of additional features as well as more in-depth information about the CPE GUI, refer to the document referenced above.

7 Basic Troubleshooting

Reference: *CPE Configuration Guide*

Some of the common GUI menus and fields used for monitoring and troubleshooting the CPE are covered in this section. Features and GUI navigation may vary by CPE model and software version.

7.1 Device Information

To find basic information about the CPE you are using, in the GUI go to *Status > Overview* (Figure 26). At the top of the window, you can easily observe the network *connection state, signal intensity, LAN state*, and number of *devices connected*. The *Device Info* section gives the "look up" type of information such as *product model, hardware version, software version*, etc.

Figure 26: Device Info
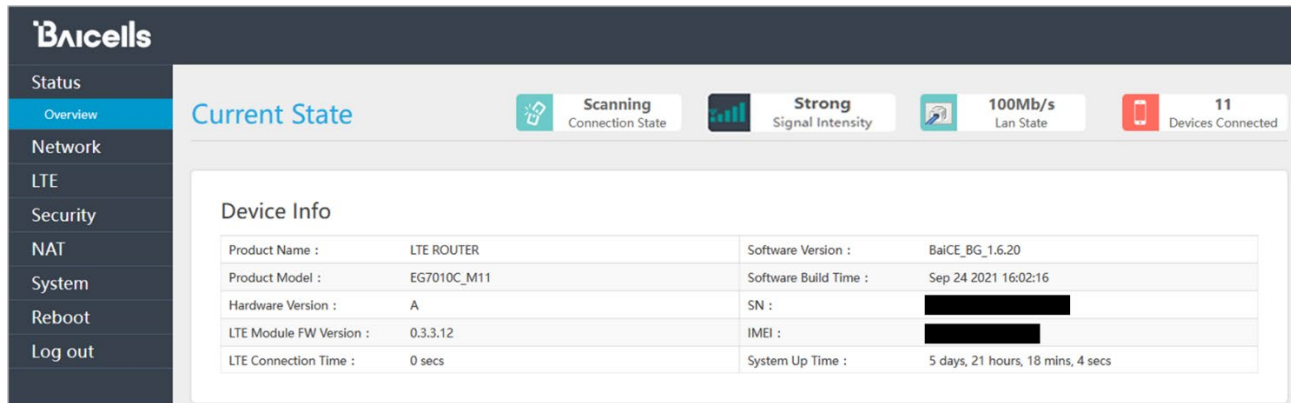
7.2 LTE Status

The *LTE Status* section of the *Status > Overview* window offers USIM card status, IMSI, and IMEI numbers, as well as real-time LTE signal information (Figure 27). The data provides a more granular level of detail that pertains to signal strength, signal quality, the eNB connection, which frequencies are being used, and other wireless metrics.

This information typically is used by the service provider when troubleshooting an issue such as not being able to connect or stay connected to the network, dropped sessions, reboots, etc. Resolving such problems requires isolating whether the problem is caused by the device setup, the LAN/WAN network connection, or a wireless signal problem.

Figure 27: LTE Status
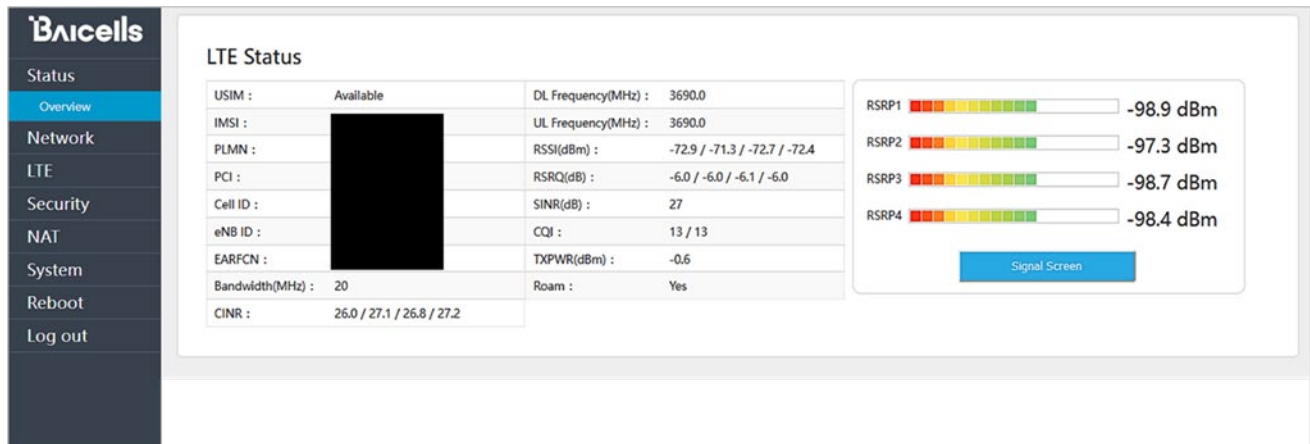
7.3 Throughput Statistics

To see how much data is flowing through the CPE, and to see how fast the traffic is moving uplink (to the eNB) and downlink (from the eNB), scroll down the *Status > Overview* window to the *Throughput Statistics* (Figure 28). The uplink/downlink data is in Kbps, showing the average, the peak, and the Sum (total) CPE throughput for all connected devices.

Figure 28: Throughput Statistics
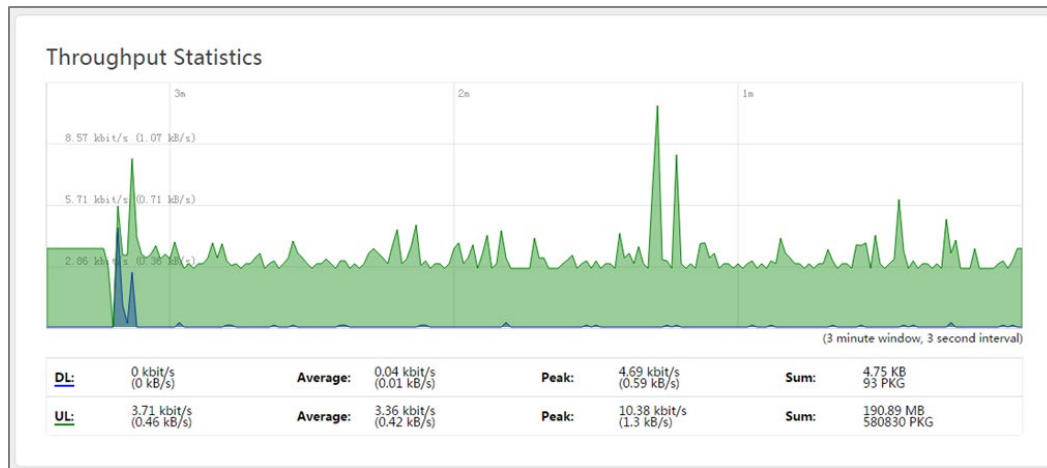
7.4 APN Status / Internet Status

For background, refer to *section 6.8.*

As you scroll down the *Status > Overview* window, the *APN Status* section (it is called *Internet Status* in CAT6/7) displays each configured APN gateway (Figure 29). At least one APN (APN1) is by default configured for the TR-069 connection to the Baicells CloudCore. If the service provider's network uses a Local EPC (private network EPC), there may be up to four (CAT4) or eight (CAT6/7) APNs.

Mainly you want to check that any gateways you are using show as *enabled*. On a CAT4 CPE, you can see the gateway's *MAC address*, *IP address*, *connection type*, and *DNS server* being used. On a CAT6/7 CPE, you will see the *APN Profile Name*, *IPv4/v6 Address*, and the *primary* and *secondary DNS.*

Figure 29: APN Status

7.5 LAN Status

The *LAN Status* part of the *Overview* window displays the Local Area Network *MAC address*, *IP address*, and *Netmask* (Figure 30). If you are having issues connecting to the LAN/WAN, check this window for the basic IP networking status information.

Figure 30: LAN Status

7.6 Devices List

To check how many devices are connected to the CPE, scroll down the *Status > Overview* window to the *Devices List* (Figure 31). If too many users are accessing the Internet through the CPE at the same time, on a CAT6/7 CPE you may consider limiting the IP address range and number of devices connected in the *Security > Connect Limit* menu.

Figure 31: Devices List