LWA Base Station Configuration Guide for pBS31480W7

Document Version: 01

About This Document

This document describes the configuration of the LWA Base Station WiFi section for software version BaiCE_QECB_1.0.X, as well as the eNB section configuration for software version BaiBLQ_5.0.7.x.It is a guide that how to configure the device after its installation completes.

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Revision Record

Date	Version	Description
17 May, 2024	01	Initial released.

Menu

1. Configuration Overview

The Baicells LWA BS is loaded with its own GUI for configuring its operating parameters. You can log in to the GUI either locally through the Local Maintenance Terminal (LMT), which is an Ethernet port, or remotely via IP address. You can also use the Baicells Operations Management Console (OMC) to configure the eNB; this document, however, focuses only on using the GUI.

After the LWA Base Station is powered on, it is necessary to configure the base station to access the user and provide data service.

NOTE: Before configuring the BS's data, data planning needs to be done first. The data to configure includes local parameters and connecting parameters. These parameters are either provided by the user or determined after negotiation with the customers. The data to prepare include IP address, wifi parameters, software version, and so on.

The LWA base station needs to configure at least the wifi name, password, and working frequency.

2. Installation

2.1   Part & Materials

Item	Qty	Picture

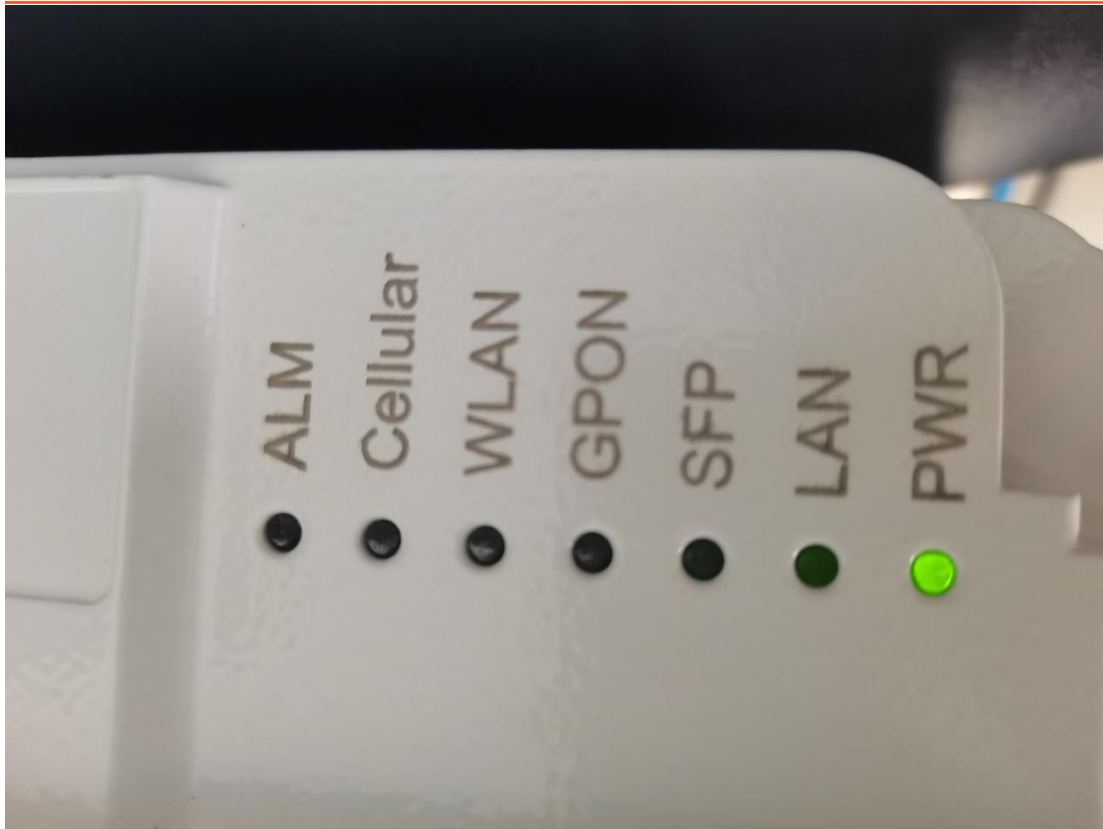| Neutrino430X unit	1	
Power Cable	1	
PoE Power Adaptor	1	

You will need standard tools, Ethernet cable, ground wire, and RJ-45 connectors for installing and connecting the unit.

The Port with lable "POE++" is the PoE port,Picture as follows:

2.2 Led

The LED lamp indicated the current base station status with 7 lights: PWR, LAN,SFP,GPON,WLAN,Cellular,ALM (see figure below)

- **PWR**

    Green light on   Power Supply is normal

    Green light off   Power Supply is wrong

- **WLAN**

    Red light off,Green light on   wifi work,no station connected

    Red light off,Green light flashes wifi work,some stations connected

- **Cellular**

    Green light off   cell is abnormal

    Green light on   cell is normal

Note: The status of the lamp is meaningless during the start-on process, and wait for the start-on (5 minutes) before checking the LED status.

3. Login Web Client

3.1 Web Client Environmental Requirements

Table 3-1 describes the requirements on computer of the client.

Table 3-1 Environmental Requirements of the Client

Item	Description
CPU	Above Intel Core 1GHz
Memory	Above 2G RAM
Hard disk	No less than 100 MB space available
Operating system	• Microsoft: Windows 10, or Windows 11 • Mac: MacOSX10.5 or above
Screen resolution	Above 1024 x 768
Browser	Chrome 6 or higher

## 3.2 Connect Web Client to Base Station

Connect the Ethernet interface of the computer to the LAN interface of the base station through the Ethernet cable.

3.3 Set Up Client Computer

Before logging into the Web client, the client computer's IP address needs to be set up first so that the connection between the client and the server is possible. Take Windows 7 as an example:

1. Click "**Start>Control Panel**" and later "**Network and Internet**" in the window that pops up.

2. Click "**View network status and tasks**" and later "**Local Connectivity**" in the window that pops up.

3. In "**Status of Local Connectivity**", click "**Properties**" to see the "**Properties of Local Connectivity**" pop-up window.

4. Select "**Internet Protocol Version (TCP/IPV4)**" and click "**Properties**" to see the pop-up window as Figure 3-1.

Figure 3-1 Internet Protocol Version (TCP/IPV4)
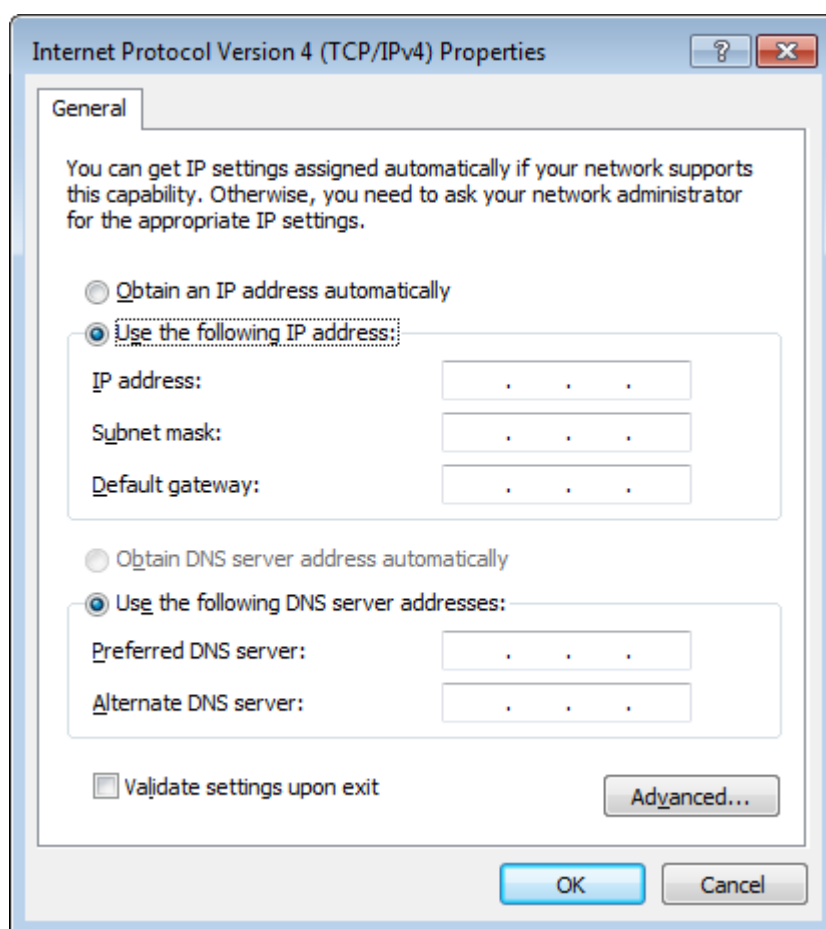
Select either "**Obtain an IP address automatically**" or "**Use the following IP address**":

- If "**Obtain an IP address automatically**" selected, go directly to step 7
- If "**Use the following IP address**" selected, follow step 5 ~ step 7

NOTE: In general, if the auto obtaining fails, one needs to set up the IP address manually.

5.   Select "**Use the following IP address**".

6.   Input IP address, subnet mask, and default gateway, and then click "**OK**".

- IP address: 192.168.151. XXX: (recommended XXX: 100~254)

   Because the LAN interface of the base station uses the IP address of 192.168.151.1, others should avoid using this address.

- Subnet mask: 255.255.255.0

- Default gateway: 192.168.151.1

7.   In the command window, execute ping 192.168.151.1 and check whether the connection between the client computer and the server works or not.
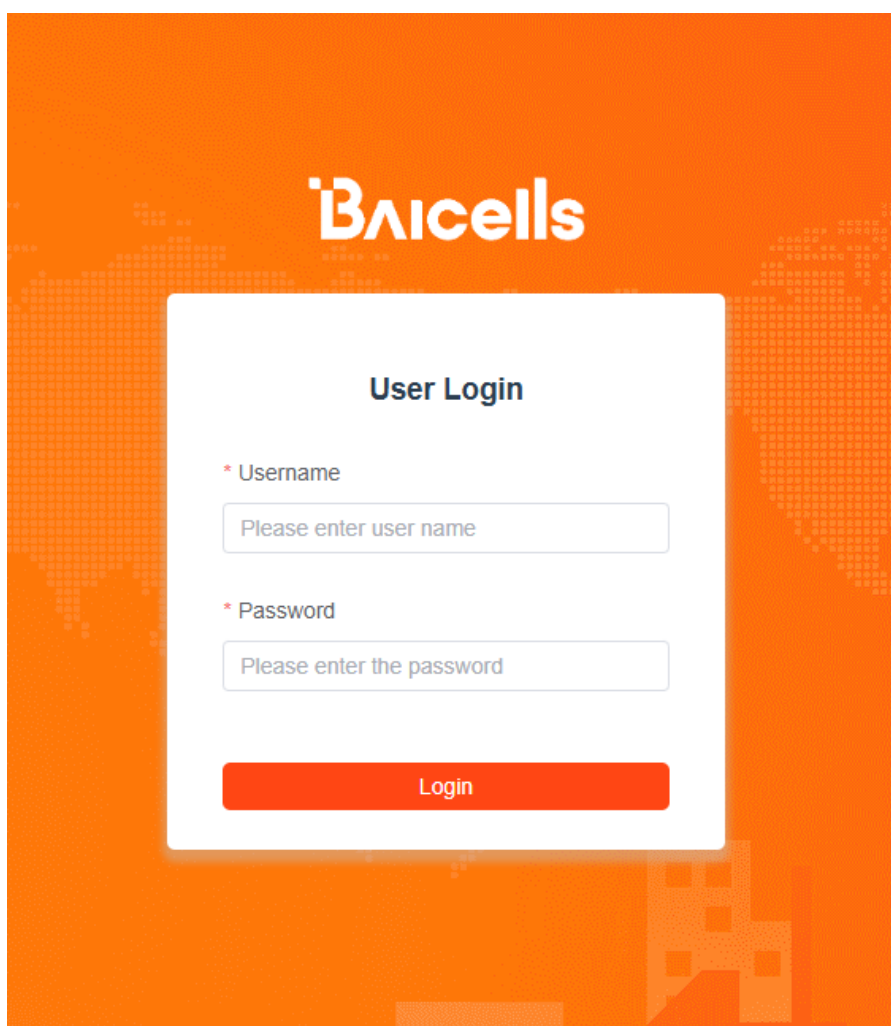
3.4 Log In

1. Open a web browser, and enter http://192.168.151.1, as shown in Figure 3-
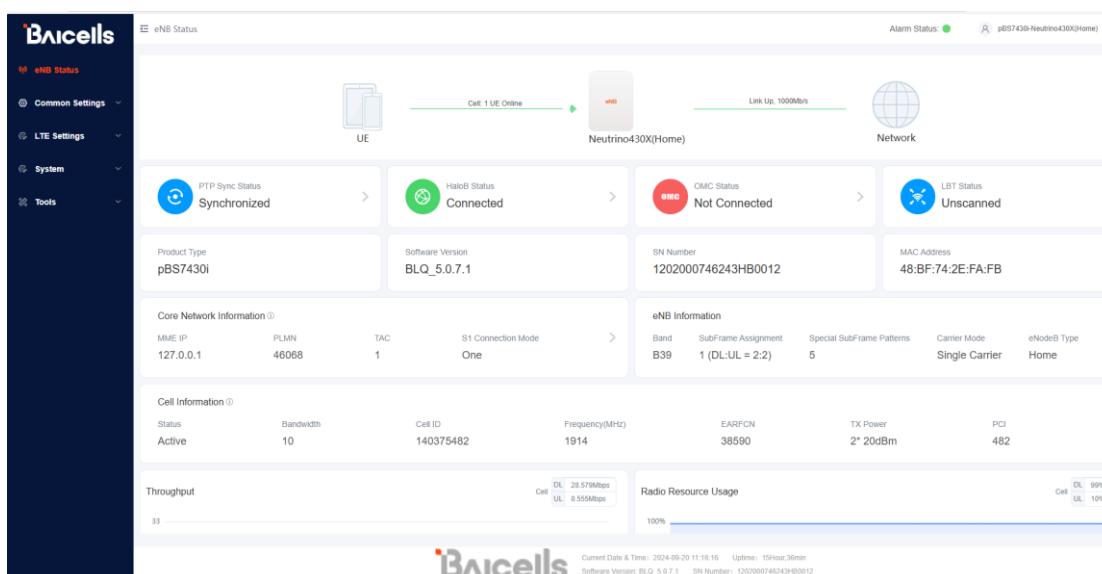
   Figure 3-2 GUI Guide
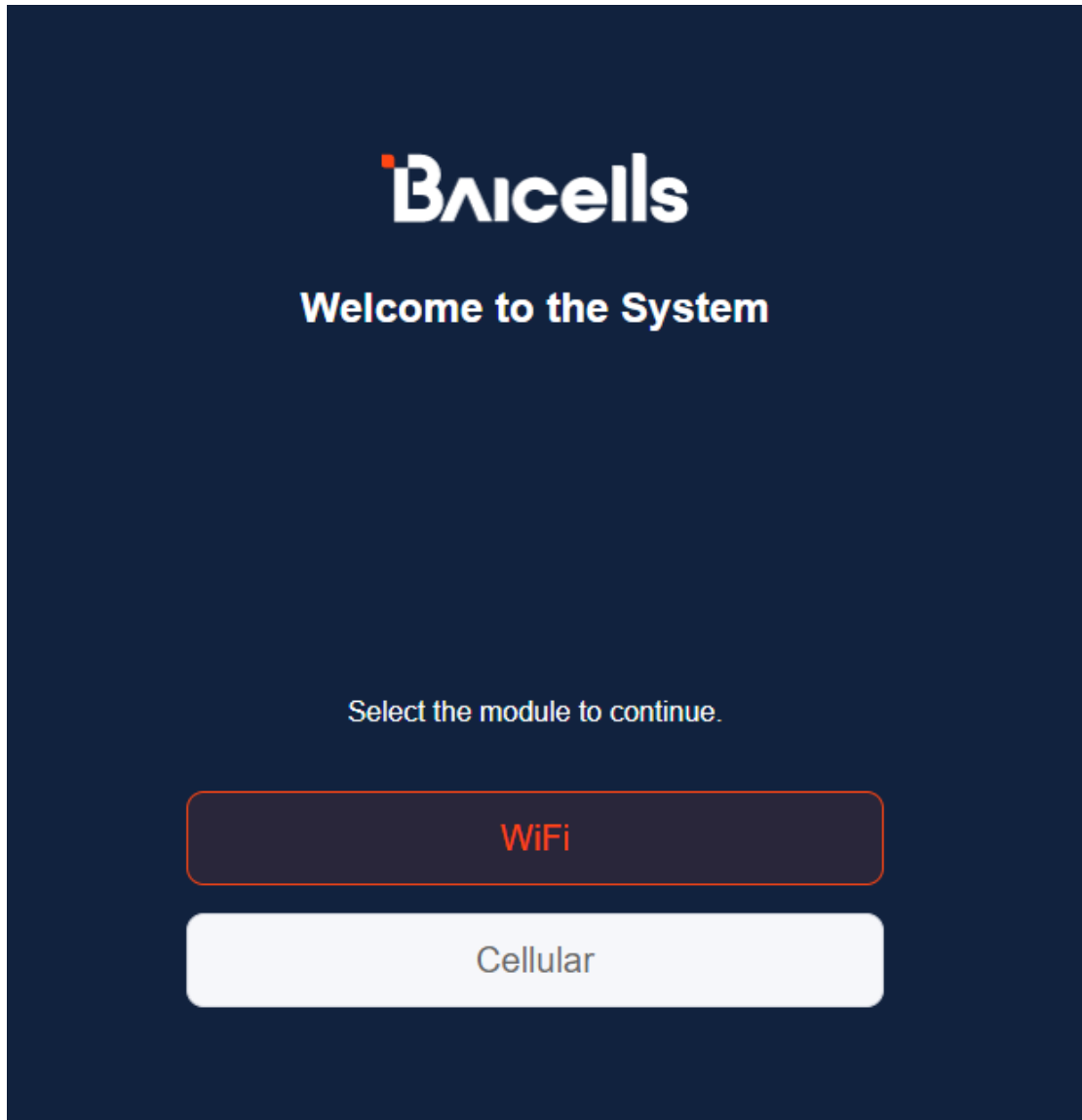
2. Click "**Cellular**", will enter eNB section configuration , as shown in Figure 3-.

Figure 3-3 GUI Login

3. Input user name, password, and click "**Login**". The homepage is given in Figure 3-.

Figure 3-4 GUI Homepage

NOTE: The information may vary by product type or software version.

The homepage displays the navigation pane on the left, and shows the window for the first menu: **eNB Status**. This window is like a dashboard for the eNB.

The default homepage displays the eNB information.

The home page is consist of following parts.

- External connection status information

  This part shows the status information of synchronization, core network, OMC connection, and SAS status.

  - Click **>** on the right of Sync status, go to "**Common Settings > Sync Setting**" the menu.

  - Click **>** on the right of Core status, go to "**Common Settings > Network Settings > Core Network**" the menu.

  - Click **>** on the right of OMC status, go to "**Common Settings > Management Server**" the menu.

  - Click **>** on the right of LBT status, go to "**Advanced Settings >LBT Setting**" the menu.

  When you complete the setting, click **Back** on the browser, go back to the homepage.

- eNB information

  This part shows the product type, software version, series number, and MAC address.

- Basic setting

  Before starting up the eNB, some basic parameters must be configured, including Core Network Information, eNB Information, Cell1/Cell2 Information.

 The detailed setting of these information refer to "4 eNB eNB Basic Setting".

- Chart

  This part shows the throughput and Radio Resource Usage of Cell1 and Cell2.

At the top of the window, the icons of the UE, eNB and Network displays. Click each icon, following displays corresponding settings and information about network element (NE).
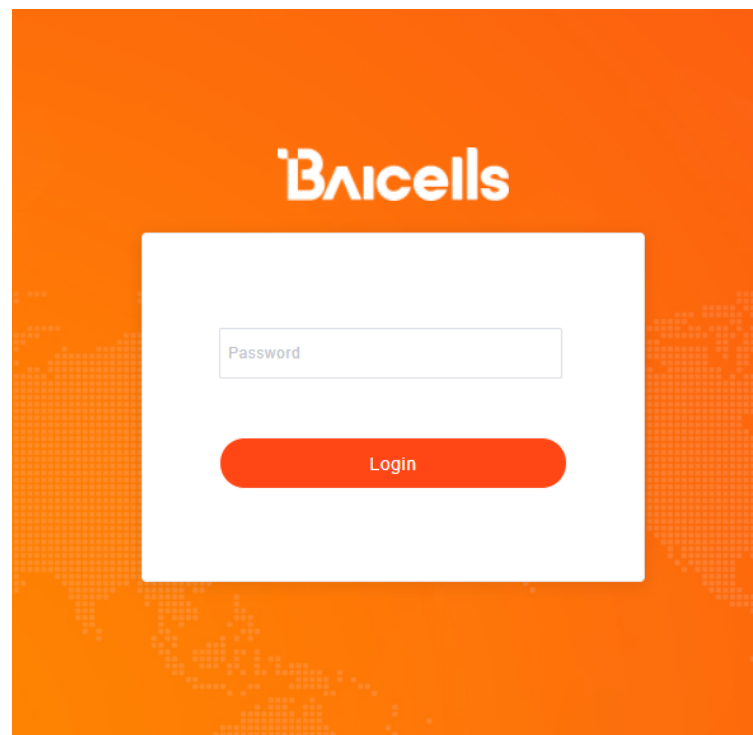
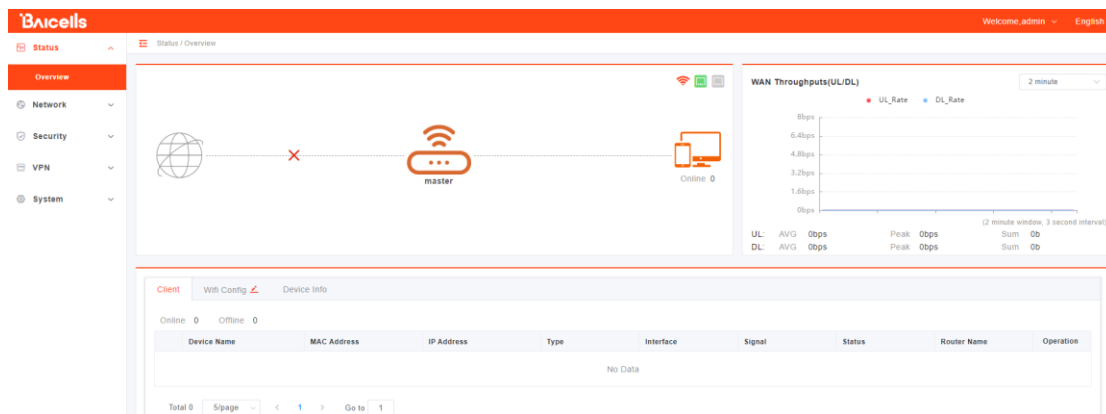Click UE icon, following shows the UE status information.

Figure 3-5 UE Status
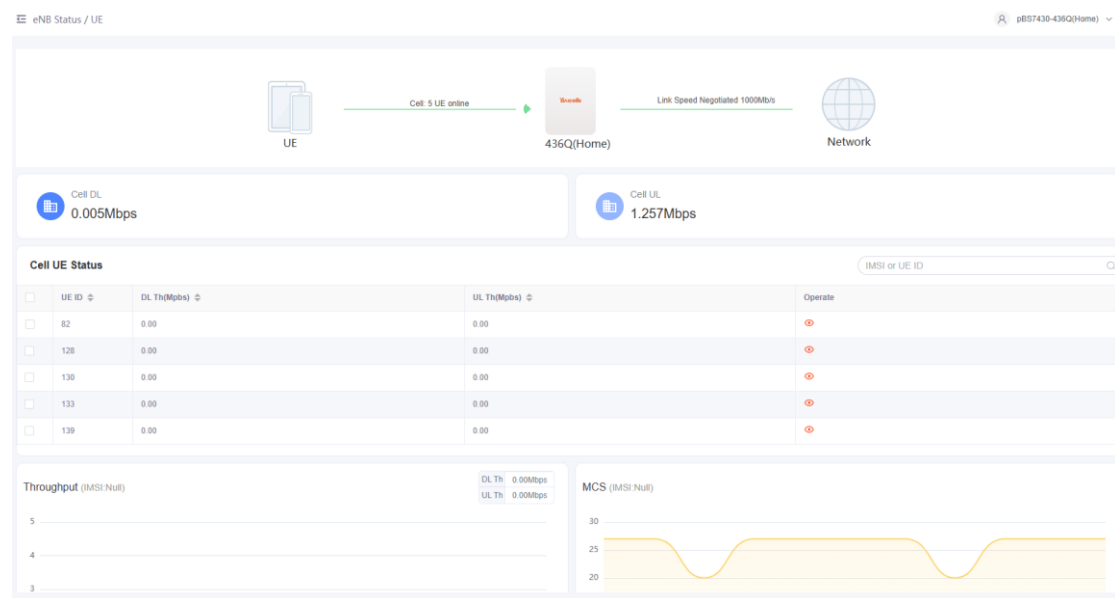
4. For Figure 3-,Click "**WiFi**", will enter WiFi section configuration,as shown in Figure 3-

Figure 3-6 WiFi GUI Login

5. Input password, and click "**Login**". The homepage is given in Figure 3-

Figure 3-7 WiFi GUI Homepage

4. eNB Basic Setting

The eNB basic settings determine important RF parameters, as well as connectivity to Baicells ColudCore Evolved Packet Core (EPC).

- Core Network Information

  Click **>** in the Core Network Information area to pop up the core network setting page, as shown in Figure 4-1.

  Figure 4-1 Core Network Setting

The parameter descriptions of the core network setting are given in Table 4-1.

Table 4-1 Core Network Parameter Description

Parameter	Description
TAC	Tracking Area Code (TAC) of the cell site where the eNB resides. The TAC is used to determine the range of the paging information.
S1 Connection Mode	The connection mode of the S1 interface between the eNB and the core network. • One: The eNB will connect only to the first MME. • All: The eNB will connect to all MMEs configured.
S1 Link Port	The port of S1 link used. **NOTE**: If HaloB is set to ON, this parameter cannot be set.
MME IP	IP address of the cell's associated MME, identical to the IP address of the MME at the core network side. The IP address of MME is configured in "5.1.2.1 Normal Mode". When the MME IP is added, it will display in the MME IP list. **NOTE**: This parameter will not appear in HaloB mode.

• eNB Information

Click **>** in the eNB Information area to pop up the eNB setting page, as shown in Figure 4-2.

Figure 4-2 eNB Setting

The parameter descriptions of the eNB setting are given in Table 4-2.

Table 4-2 eNB Setting Parameter Description

Parameter	Description
Band	The system selects the operating frequency band automatically according to the hardware board type. If SAS is enabled, the band will be assigned by the SAS vendor.
SubFrame Assignment	Downlink (DL) and uplink (UL) sub frame configuration. • 1 (DL: UL=2:2) transmission ratio • 2 (DL: UL=3:1) transmission ratio (default) • 6 (DL: UL=3:5) transmission ratio
Special SubFrame Patterns	Special sub frame pattern This is a standard LTE setting that pertains to synchronization of downlink and uplink timing. The guard period between switching from DL to UL or UL to DL determines the maximum supportable cell size. The guard period has to be large enough to cover the propagation delay of DL interferers. Range is 5 or 7. Default is 7.
Carrier Mode	The carrier mode eNB supported. • **Single Carrier** In single carrier mode, the eNB only support one cell. • **Dual Carrier** In dual carrier mode, the eNB support two cells. Cell 1 and cell 2 must be configured in quick setting. The two carriers are independent of each other. • **Carrier Aggregation** In carrier aggregation mode, the eNB support one cell, but the bandwidth and throughput are twice of in single carrier mode. The primary carrier is responsible for signaling and services, while the second carrier is responsible for services only

• Cell Information

Click **>** in the cell Information area to pop up the cell setting page, as shown in Figure 4-3.

If the eNB operates in single carrier mode, only one cell is supported, here displays one Cell Setting. If the eNB operates in dual carrier mode, two cells are supported, here displays Cell1 and Cell2 Setting. If the eNB operates in carrier aggregation mode, here displays Primary cell (Pcell) and Secondary Cell (Scell) Setting.

Figure 4-3 Cell Setting

The parameter descriptions of the quick setting are given in Table 4-3.

Table 4-3 Cell Setting Parameter Description

Parameter	Description
Band	The system selects the operating frequency band automatically according to the hardware board type. If SAS is enabled, the band will be assigned by the SAS vendor.
Bandwidth	Select the uplink and downlink bandwidth. [Time Division Duplexing (TDD) products only]. • 5MHz • 10MHz • 15MHz • 20MHz
EARFCN	The absolute radio frequency channel number, selected by the operator. Allocated by the operator.
Frequency (MHz)	The eNB's operating frequency, selected by the operator. The range depends on the base station model and country code.
PCI	Physical Cell ID (PCI) allocated by the operator. PCI is an essential Layer 1 cell identity for each cell site in the network.

Parameter	Description
	Planning PCIs is crucial for QoS. Range from 0 to 503. **NOTE**: Baicells does not use and does not work with PCI 0.
Cell ID	Unique identification number for the Cell ID. The range is 0 to 268,435,455.
RF Status	Enable/disable the radio frequency emissions of the eNB. The default value is enabled. If the RF status is set to be disabled, the eNB is no longer transmitting or receiving signals.
Transmission Power	The maximum output power on each port. Must be within regulatory guidelines for the region. This field may be used in situations where you need to reduce the output power, such as testing the eNB before installing it on a tower; restricting the eNB output to reduce interference with other eNBs in the same geographical area; or staying within Effective Isotropic Radiated Power (EIRP) rules. If the check box on the right is selected, you can configure any power.
PLMN	The numerical identifier for the operator's Public Land Mobile Network (PLMN) for this cell. Must be a 5- or 6-digit number. When the PLMN ID is added, it will display in the PLMN list.

5. eNB Common Settings

5.1 Network Setting

The configuration of the network interface includes the WAN, VLAN, LAN, IPsec, LGW, and static route.

The LAN interface is the internal maintenance interface used in initialization and will no longer be needed in normal operation. The WAN interface is an external communication portal (Internet connection) the eNB's NMS and the MME. The eNB's NMS may be the Baicells Operation and maintenance center (OMC) or LTE NMS. The only option for the Interface name field is WAN. The WAN interface supports to configure multiple VLANs.

CAUTION: The IP address of WAN interface and LAN interface cannot in the same network segment.

5.1.1 Configure WAN

When the LGW function is enabled and "IP Access Mode" is set to "DHCP", if "IP Access

Mod" is modified, due to the change of the MAC address, the IP address will also change at the same time. Therefore, the configuration of the static route also should be modified.

1. Select "**Common Settings > Network Setting > WAN**" to enter the WAN interface configuration page, as shown in Figure 5-1.

Figure 5-1 Configure WAN/VLAN

This configuration page is divided into five parts: Connect Type, WAN Config, DNS Config, MTU Config and Allow Management Access over WAN.

2. Select Connection Type.

- Copper: RJ-45 electrical interface

- Fiber: optical fiber interface

The value is based on the eNB model. If the eNB does not support optical ports, the value must be set to "Copper".

3. Configure WAN interface

Up to four WANs are supported.

a) Click "**+Create table**" to pop up the WAN configuration window, as shown in Figure 5-2.

Figure 5-2 Configure WAN Interface

b) Input the WAN configuration parameters, which are given in Table 5-1.

Table 5-1 WAN Interface Parameter Description

Parameter	Description
Index	The index is generated automatically.
WAN Name	The WAN name is generated automatically.
IP Access Mode	The interface protocol used by WAN interface, include: • **DHCP**: If DHCP is selected, only option 60 the parameter needs to be configured. • **Static IP** • **IPv6 DHCP** • **IPv6 Static IP**
IP Address	IP address of the WAN interface. If DHCP is selected, the IP address acquired automatically.
Netmask	Subnet mask address of the IP address. If DHCP is selected, the IP address acquired automatically.
Gateway	IP address of the default gateway. If DHCP is selected, the IP address acquired automatically.
option60	If set "**IP Access Mode**", display this parameter. This is an identity to match with terminals to differentiate different terminals.
Prefix	If set "**IP Access Mode**" to "**IPv6 Static IP**", display this parameter. Prefix of IPv6 address for WAN interface.
IPv6 Gateway	If set "**IP Access Mode**" to "**IPv6 Static IP**", display this

Parameter	Description
	parameter. The gateway of IPv6 address for WAN interface.
VLAN	VLAN ID. When the operator needs to transmit the data of multi types through separate channel, configure more IP addresses for WAN interface through VLAN, and assign them with different VLAN ID. Range is from 1 to 4094 integer.

4. If enabling the DNS, first move the slider to right.

Up to two DNS are supported.

a) Click ✎ to enter the DNS edit window, as shown in Figure 5-3.

Figure 5-3 Configure DNS

b) Input DNS configuration parameter, as shown in Table 5-2.

Table 5-2 DNS Parameter Description

Parameter	Description
Index	The index is generated automatically.
DNS Address	The IP address of the DNS.

5. Set other configuration parameters, as shown in Table 5-3.

Table 5-3 Other Configuration of WAN

Parameter	Description
MTU	Maximum transmission unit, default is 1500 bytes. Setting the right MTU for the network can help to improve the transmission efficiency.

Access LMT via WAN	Select enable or disable the function that access the LMT through WAN interface for management. If this parameter is set to enable, the administrator can maintain the eNB through WAN interface.
Quick Interface Binding	The default binding interface is WAN.

6. Click "**Save**" to complete the WAN setting.

NOTE: If configuring a static IP, it needs to be different from the WiFi section WAN IP address.

5.1.2 Core Network

Core net setting includes three options, Normal mode, HaloB mode and CloudEPC mode.

5.1.2.1 Normal Mode

In the left navigation column, select "**Common Settings > Network Settings > Core Network**" to enter the core network parameter configuration page, as shown in Figure 5-.

Figure 5-4 Core Network Setting – Normal Mode

Core network configuration includes S1-C control plane and S1-U user plane configuration.

- S1-C setting

a) Select the interface binding with S1-C plane, which has been configured in "5.1.1 Configure WAN".

b) In Multi MME config list, click ➕ to pop up multi-MME configuration window, as shown in Figure 5-.

Figure 5-5 Multi MME Configuration

NOTE: PLMN and MME IP also can be configured in "4 eNB Basic Setting".

c) Select PLMN from the drop-down list.

d) Input corresponding MME IP address.

If the MME IP address need to be modified, delete the binding and add it again.

• S1-U (SGW) setting

If the SGW Switch is set to "**ON**", select the SGW binding interface from the drop-down list, which has been configured in "5.1.1 Configure WAN".

5.1.2.2 HaloB Mode

The *HaloB* optiion is used by operators who have a HaloB license for the eNB.

HaloB is a proprietary technology with intellectual property rights. This technology sinks the basic functions of the EPC into an eNB through which users can directly access the Internet.

NOTE: In HaloB mode, the Server Request (SR) does not be supported.

1. In Mode selection list, select **HaloB** to enter into HaloB configuration page, as shown in Figure 5-.

Figure 5-6 Core Network Setting – HaloB Mode

2. Select "HaloB mode" to **Standalone Mode** or **Centralized Mode**, "S1AP Mode" is **S1AP IPV4** or **S1AP IPV6**.

- Standalone Mode

  In the standalone mode, the client can maintain SIM Information locally. The administrator needs to import registration information and APN information from the LMT.

  a) Click **+** to add multiple APNs.

  b) Import the IMSI information, as shown in Figure 5-.

  Figure 5-7 Import IMSI Information

  Download the template first and filled it as required, and then import the file to the eNB. After SIM cards information is imported, the information will display in the subscription data list.

  c) Import APN information, as shown in Figure 5-.

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Figure 5-8 Import APN Information

APN Information

- **Import APN File**

  | Please Select .csv Type File | ⊡ Select File |

  [Import APN File] [Template Download]

- **APN Data List**

IMSI	APN NAME	GWIP	QCI	ARP PL	ARP PCI	ARP PVI	APN UL AMBR(Mbps)	APN DL AMBR(Mbps)	PDNTYPE	PDNIP
						No Data Available				

Download the template first and filled it as required, and then import the file to the eNB. After APN information is imported, the information will display in the APN data list.

- Centralized Mode

In the centralized mode, the eNB needs to connect to the OMC which do as an agent to manage the subscription data.

The OMC needs to cooperate with the user information import. The APN information needs to be set on the OMC and the APN for user access needs to be specified on the BOSS.

When a user accesses the system for the first time, he/she needs to perform access authentication with the BOSS. After authentication, the eNB with HaloB stores the signing information of the user. When users access the system again, they do not need to perform access authentication to the BOSS, but directly perform authentication at the eNB with HaloB.

It is supported viewing cached user information and APN information on the LMT and delete these information.

3. Click "**Save**" to complete the HaloB mode setting.

5.2 Synchronization Setting

The LTE technology standards specify timing and synchronization requirements between adjacent eNBs. Synchronized transmissions help to avoid eNBs interfering with one another, optimizes bandwidth usage, and enhance network capacity.

In the left navigation column, select "**Common Settings > Sync Setting**" to enter the synchronization configuration page, as shown in Figure 5-.

Figure 5-9 Synchronization Setting
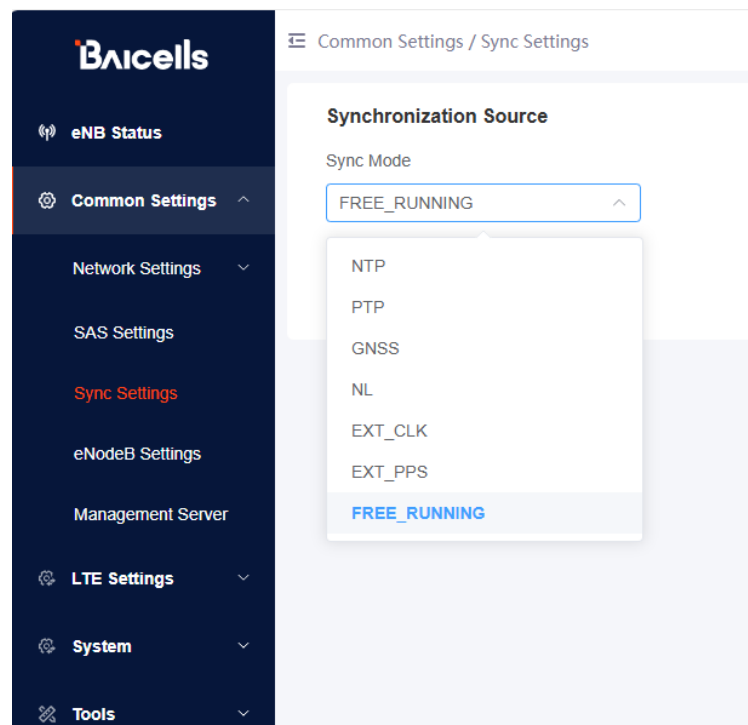
The following synchronization sources are supported.

- NTP: Network time protocol

- PTP: Precision timing protocol, complied with IEEE1588 protocol.

- GNSS: Only GPS is supported.

- NL: network listening

- EXT_CLK: external clock

- EXT_PPS: pulse per second synchronization

- FREE_RUNNING: If there is no any synchronization resource, select free running mode.

Following introduces the configuration steps for different synchronization source separately.

- PTP synchronization

  When "**Sync Mode**" is set to "PTP", that is, 1588v2 synchronization, the page is shown in Figure 5-0.

Figure 5-10 Synchronization Setting - PTP

The PTP parameters should be configured, as shown in Table 5-4.

Table 5-4 PTP (1588v2) Parameter Description

Parameter	Description
Profile	Profile protocol. • 1588v2 • G8265.1 **NOTE**: The current version only supports 1588v2 mode.
Sync Mode	The current synchronization mode is Time, which is set by the system.
PTP Trigger	The current synchronization mode is SECONDARY, which is set by the system.
Interface	The current synchronization mode is WAN.
Transport	Transport protocol. • Ethernet • UDP **NOTE**: The current version only supports UDP mode.
Unicast Address	The address for unicast. If this parameter does not be configured, the system is set to multicast mode.
Domain	This parameter value is related to the Profile.When the Profile mode is 1588v2, it is value 0.

• GNSS synchronization

When "**Sync Mode**" is set to "GNSS", the page displays the number of satellite, longitude, latitude and the GPS satellite signal level, as shown in Figure 5-1.

Figure 5-11 Synchronization Setting - GNSS

• FREE_RUNNING

When "**Sync Mode**" is set to "FREE_RUNNING", "EXT_CLK", or "EXT_PPS", no other parameters are configured. Take free running is an example, the page is shown in Figure 5-42.

Figure 5-42 Synchronization Setting –FREE_RUNNING

Select FREE_RUNNING, there is no need to connect any clock source, relying on its own crystal oscillator to provide synchronous clock.

6. WiFi Basic Setting

The WiFi basic settings determine WiFi SSID and password.

In the left navigation column, select "**Network > WLAN Settings**" to enter the WiFi parameter configuration page, as shown in Figure 5-.

Figure 6-1 WLAN Settings

7.WiFi WAN Settings

Support for dynamic / static IP configuration.

In the left navigation column, select "**Network > WAN Settings**" to enter the WAN parameter configuration page, as shown in Figure 5-.

Figure 7-1 WAN Settings

NOTE: If configuring a static IP, it needs to be different from the eNB section WAN IP address.

Appendix: Regulatory Compliance

FCC Compliance

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.

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

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 or more 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.

Warning:

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