Infinite Possibilities

Enterprise Grade PTP and PTMP Solution

User Manual

ENTERPRISE GRADE
POINT-TO-POINT
AND
POINT-TO-MULTIPOINT SOLUTION

This document helps you to understand the product features, configuration, login and logout process of CPE through Graphical User Interface (GUI). This manual guides you through the installation process and the entire software user set.

Revision: A0-01

9th Nov, 2021

About HFCL Limited

HFCL Limited delivers innovative, customized and competitive products and latest solutions in the high technology telecommunications infrastructure sector, thereby enabling its customers to stay ahead of their peers in technology and network efficiency.

The company's core specialization lies in manufacturing and providing a wide range of turnkey solutions. HFCL Limited has implemented several Greenfield projects (setting up CDMA & GSM networks, satellite communications, wireless spectrum management and DWDM optical transmission network), rolled out over 100,000 kilometres of OFC network, implemented over 25,000 2G/3G cell sites, provided high security applications to Defence and has developed expertise in the areas of Railways, Homeland Security and Smart cities.

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Revision History

Date	Rev No.	Description	By
09-11-2021	A0-01	Initial Draft	Shaileyee Mukherjee

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1   About this Document

1.1   Purpose

This document helps you to understand and provides information to familiarize you with the product features, installation process and the entire software user set.

1.2   References

Following documents can be referred:

1. EMS User Manual

1.3   Intended Audience

The intended audiences for this document are:

- Network Administrators
- System Administrators
- Product managers
- System Integration and Verification team at HFCL Limited

1.4   Document Conventions

The different conventions used in this document are explained in the following table:

Convention	Description
ⓘ Note	Note provides information about important features or instructions. This appears with a background.
⚠ Caution	This alerts you to potential damage to a program, device, or system. This appears with a background.
⚠ Warning	This alerts you to potential injury or fatality. It may also alert you to potential electrical hazards. This appears with a background.
Courier new font	File and directory names are represented in Courier New font.
Bold font	Any option that needs to be selected or typed in the user interface is represented using bold font.
<home_directory>	Command variables, the values of which you must supply.
cd$HOME	A command that you must enter in a Command Line Interface (CLI) exactly as written. This appears with a background.

1.5   Terms and Abbreviations

The different terms and abbreviations used in this document are explained in the following table:

Terms/Abbreviation	Expansion
AP	Access Point
BLE	Bluetooth Low Energy
CLI	Command-Line Interface
COS	Class Of Service
CPU	Central Processing Unit
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DSCP	Differentiated Services Code Point
EMS	Element Management System
GI	Guard Interval
GUI	Graphic User Interface
HAL	Hardware Abstraction Layer
HTTP	Hypertext Transfer Protocol
IEEE	Institute Of Electrical And Electronics Engineers
IP	Internet Protocol
IPV4	Internet Protocol Version 4
IPV6	Internet Protocol Version 6
KBPS	Kilobits Per Second
L2TP	Layer 2 Tunneling Protocol
L2VPN	Layer 2 Virtual Private Network
LAN	Local Area Network
LED	Light-Emitting Diode
LMAC	Lower Media Access Control
MAC	Media Access Control

Mbps	Megabits Per Second
MCS	Modulation And Coding Scheme
MIMO	Multiple-Input And Multiple-Output
MPEG	Moving Picture Experts Group
MTU	Maximum Transmission Unit
NTP	Network Time Protocol
OSD	On Screen Display
P2MP	Point-To-Multipoint
P2P	Point-To-Point
PCP	Priority Code Point
PoE	Power Over Ethernet
PTZ	Pan, Tilt, Zoom
QAM	Quadrature Amplitude Modulation
QOS	Quality Of Service
RFID	Radio Frequency Identification
RJ	Registered Jack
RSSI	Elative Received Signal Strength
Rx	Reception
SNMP	Simple Network Management Protocol
SNR	Signal-To-Noise Ratio
SSH	Secure Shell
STA	Station
TDMA	Time-Division Multiple Access
Tx	Transmission
U-BOOT	Universal Boot-Loader
UBR	Unlicensed Band Radio
UID	User Id
UTP	Unshielded Twisted Pair

VAP	Virtual Access Point
VGA	Video Graphic Adapter
VLAN	Virtual Local Area Network
WAN	Wide Area Network
WDS	Wireless Distribution System
WIDS	Wireless Intrusion Detection System
WLC	Wireless Lan Controller
WPA	Wi-Fi Protected Access

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2   Federal Communication Commission Certified

These equipments are 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.

These 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 these 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:

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

FCC Caution:

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (Example - use only shielded interface cables when connecting to computer or peripheral devices).

FCC Radiation Exposure Statement:

These equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. These equipments should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

These devices complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. These devices may not cause harmful interference
2. These devices must accept any interference received, including interference that may cause undesired operation.

3   Product Overview

Thank you for choosing the IO's UBR(CPE). Enterprise Grade point-to-point and point-to-multipoint solution is optimally designed to support low to medium capacity enterprise applications in unlicensed 5 GHz spectrum for short and long range links.

The UBR Configuration is controlled through CLI, UBR GUI and EMS.

3.1   2x2 Unlicensed Band Radio (CPE) with 25dB Dish Antenna(ION4L3_CPED)

Figure 1: Unlicensed Band Radio (CPE) with 25dB Dish Antenna

3.2   2x2 Unlicensed Band Radio with integrated Antenna(ion4l3)

Figure 2: Unlicensed Band Radio (CPE) with integrated Antenna

4   Hardware Setup

4.1   System Requirements

Before installing the UBR, make sure that your system includes the following:

1. 10/100/1000 Mbps local area network device such as a hub or switch**.**
2. The Category 5 UTP straight-through Ethernet cable with RJ-45 connector included in the package, or one like it**.**
3. We can power up the device through AC/DC PoE adaptor which should be 803af compliant. A 100–240 V, 50–60 Hz AC power source.
4. A web browser to configure the devices.

4.2   Packaging Content

Your package contains the following items.

1. 2x2 UBR.
2. Mounting kit
3. Quick Start Guide with cabling and UBR setup instructions. If any parts are incorrect, missing, or damaged, contact HFCL Limited customer care support.

5   Getting to Know the IO UBR(CPE)

5.1   2x2 UBR (CPE) - Front / Side View with 25dB Dish Antenna

A basic overview of the front/side view of the 2x2 UBR (CPE) is given below:

Figure 3: Front/side view of the 2x2 UBR (CPE) with 25dB Dish Antenna

Information displayed in the above figure is detailed in the table below:

Table 1: List of information displayed in front/side view of the 2x2 UBR(CPE)

Callout	Name	Description
1.	PoE/LAN port	This port works as both PoE power and LAN as well (power/traffic)
2.	Humidity controller cap	Cap to control the humidity
3.	25dB Dish Antenna	25dB Dish Antenna is used with Outdoor UBR
4.	Assembly Screws	These Screws are used to assemble the units

5.2   2x2 UBR - Back View with 25dB Dish Antenna

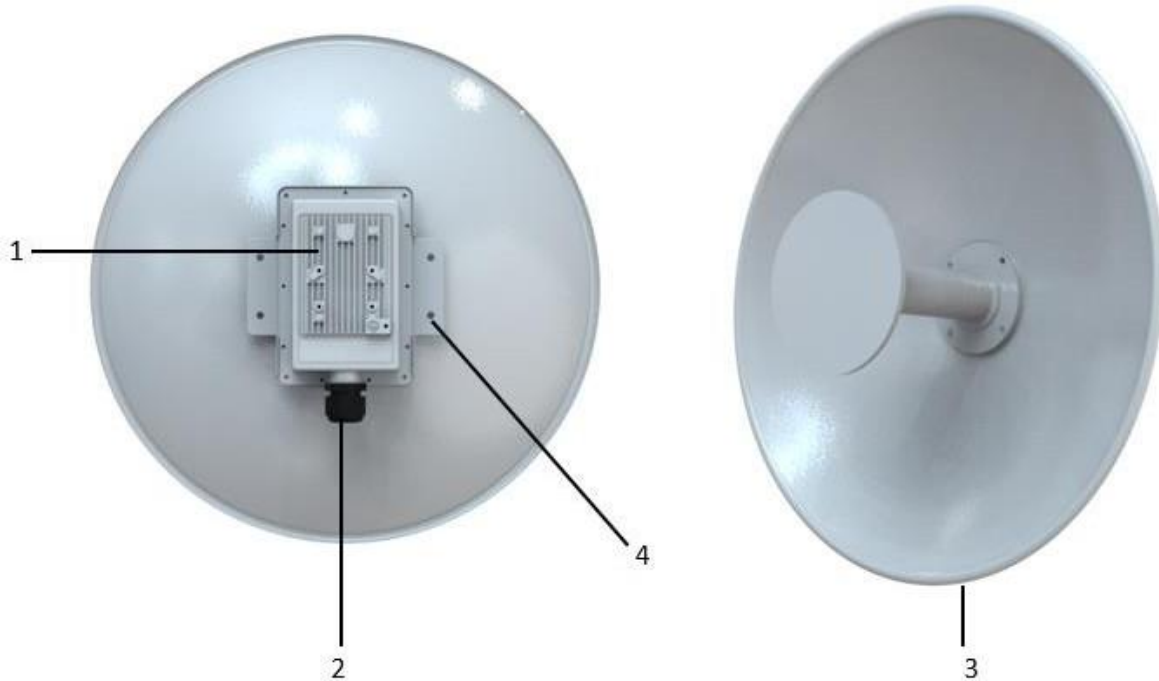A basic back side overview of the 2x2 UBR is given below:

Figure 4: Back view of the 2x2 UBR(CPE) with 25dB S Dish Antenna

Information displayed in the above figure is detailed in the table below:

Table 2: List of information displayed in back view of the 2x2 UBR(CPE)

Callout	Name	Description
1.	Mounting Brackets	Mounting Brackets are provided to hold it with the pole in field.
2.	Humidity controller cap	Cap to control the humidity
3.	External antenna	External 25dB Dish antenna is provided.
4.	Mounting Screws	Mounting Screws are provided for assembly in field.

Note: The Reset button is inside the 2x2 UBR device located below the humidity controller cap. Turn the humidity controller cap in counter clock wise and remove it from the access point. It serves two functions:

1. Restart: Press and release the Reset button quickly.
2. Restore to Factory Default Settings: Press and hold the Reset button for more than five seconds.

5.3   2x2 UBR (CPE) – Front/Side View with integrated Antenna

A basic overview of the front/side view of the 2x2 UBR is given below:

Figure 5: Front/side view of the 2x2 UBR (CPE) with integrated Antenna

Information displayed in the above figure is detailed in the table below:

Table 3: List of information displayed in front/side view of the 2x2 UBR(CPE)

Callout	Name	Description
1.	PoE/LAN port	This port works as both PoE power and LAN as well (power/traffic)
2.	Humidity controller cap	Cap to control the humidity
3.	Integrated Antenna	Integrated Antenna is used with Outdoor UBR
4.	Assembly Screws	These Screws are used to assemble the units

5.4   2x2 UBR (CPE) - Back View with Integrated Antenna

Figure 6: Back view of the 2x2 UBR (CPE) with Integrated Antenna

Information displayed in the above figure is detailed in the table below:

Table 4: List of information displayed in back view of the 2x2 UBR(CPE)

Callout	Name	Description
1.	Mounting Brackets	Mounting Brackets are provided to
2.	Humidity controller cap	Cap to control the humidity
3.	Integrated antenna	Integrated antenna is provided.
4.	Indication	'This Side Up' indication helps to mount the device in field

Note: The Reset button is inside the 2x2 UBR device located below the humidity controller cap. Turn the humidity controller cap in counter clock wise and remove it from the access point. It serves two functions:

3. Restart: Press and release the Reset button quickly.
4. Restore to Factory Default Settings: Press and hold the Reset button for more than five seconds.

6 Initial Setup

Observe the following safety precautions and avoid damage to the UBR (CPE):

1. Do not power the device during installation.
2. Do not subject the device to high temperatures.
3. Keep away from high voltage cables.
4. Disconnect the device before cleaning it.
5. Do not wipe the device with a damp cloth.
6. Do not wash the device with liquid.
7. Do not open the enclosure when the UBR is working.
8. Fasten the device tightly.

UBR: Power up the device using power over Ethernet.

Figure 7: Basic overview of the device (UBR CPE) power up with 25dB Dish Antenna

Figure 8: Basic overview of the device power up with Integrated Antenna

6.1   Installation Setup

2x2 UBR has four holes on its back side for the attachment of mounting bracket, as shown in "Figure 3: Back view of the 2x2 UBR" of this document. The mounting bracket is designed in such a way that the UBR can be mounted on the pole with the help of its attaching parts. It provides the freedom of movement to the UBR even after the mounting.

1. The mounting bracket is fixed onto the mounting holes of 2x2 UBR as shown in the figure below:
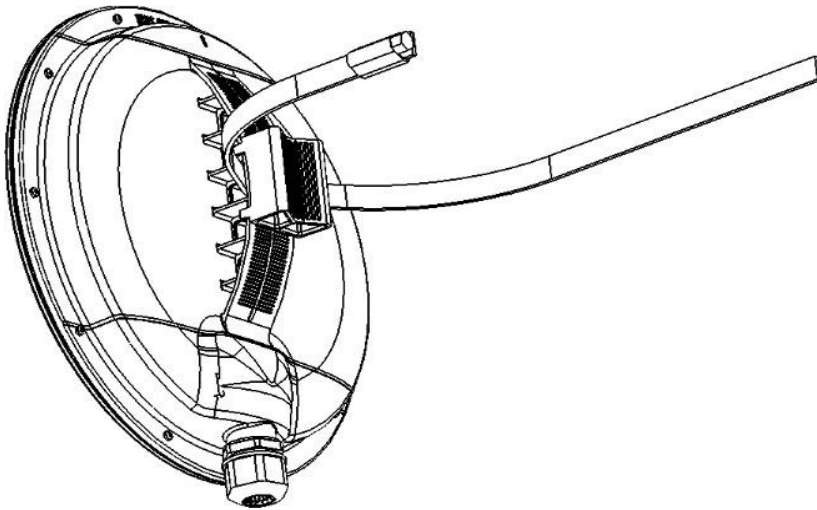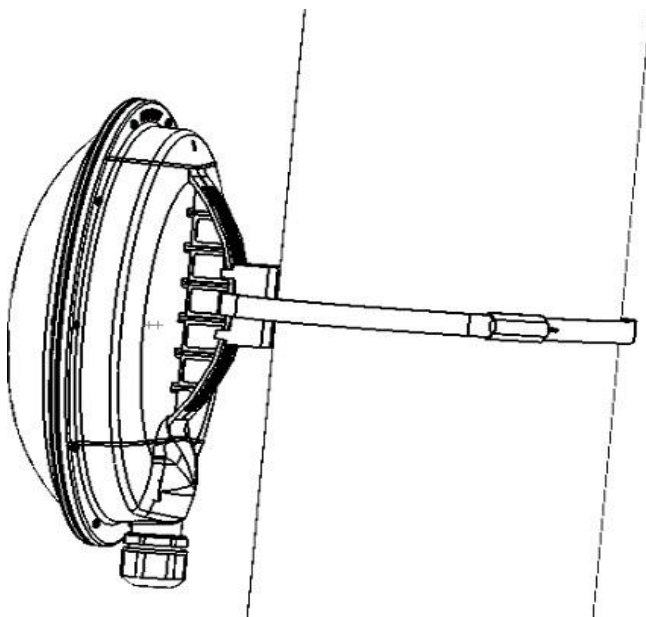

Figure 9: Mounting bracket attachment with the 2x2 UBR(CPE) device with Integrated Antenna

6.2   2x2 UBR mounting to the Pole

Follow the steps given below and mount the device onto the pole:

1.   Align the bracket mounted UBR device with pole holder and U-bolt as shown below:

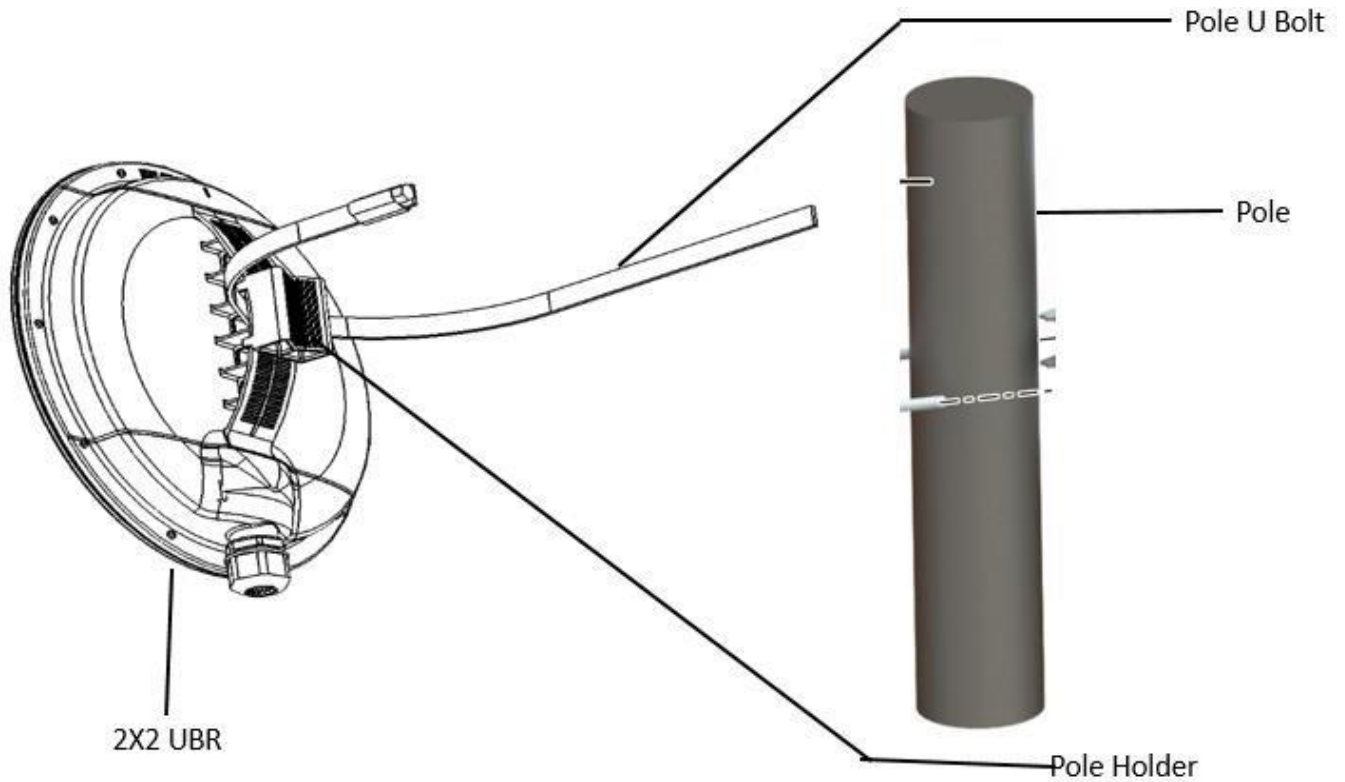*Figure 10: Overview of the 2x2 UBR (CPE) device with pole and mounting bracket attaching parts*

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2. The final alignment of 2x2 UBR in a pole mounting is shown in the figure below:
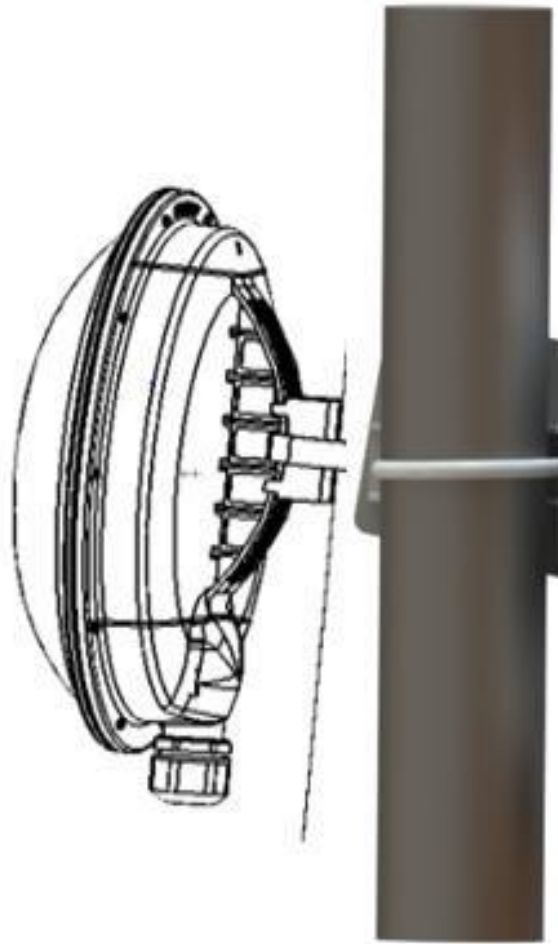

Figure 11: Basic overview of pole mounted 2x2 UBR (CPE) device

7   Connect to the UBR

Follow the steps mentioned below and connect to the UBR through GUI:

1. Configure a computer with a 1-domain static IP address e.g. 192.168.1.198 and a subnet mask of 255.255.255.0.
2. For help configuring a static IP address on your computer, check the instructions or online help that came with that computer.
3. Connect the Ethernet cable to the computer.
4. Connect the other end of the Ethernet cable to the PoE/LAN port on the UBR.
5. Connect the UBR's PoE supported ethernet port (eth0) to PoE injector or PoE switch. Device will be powered On.
6. Open a web browser and enter the "UBR static IP address" in the address bar. The default static IP address is set to 192.168.1.1.
7. A login screen will appear.

7.1   Login through GUI

This is the 1st screen of UBR GUI. It provides access to the users with valid login credentials only. The login credentials will determine the access rights of the user. For more details on access rights and respective roles refer to "**Error! Reference source not found.**" section in this document.
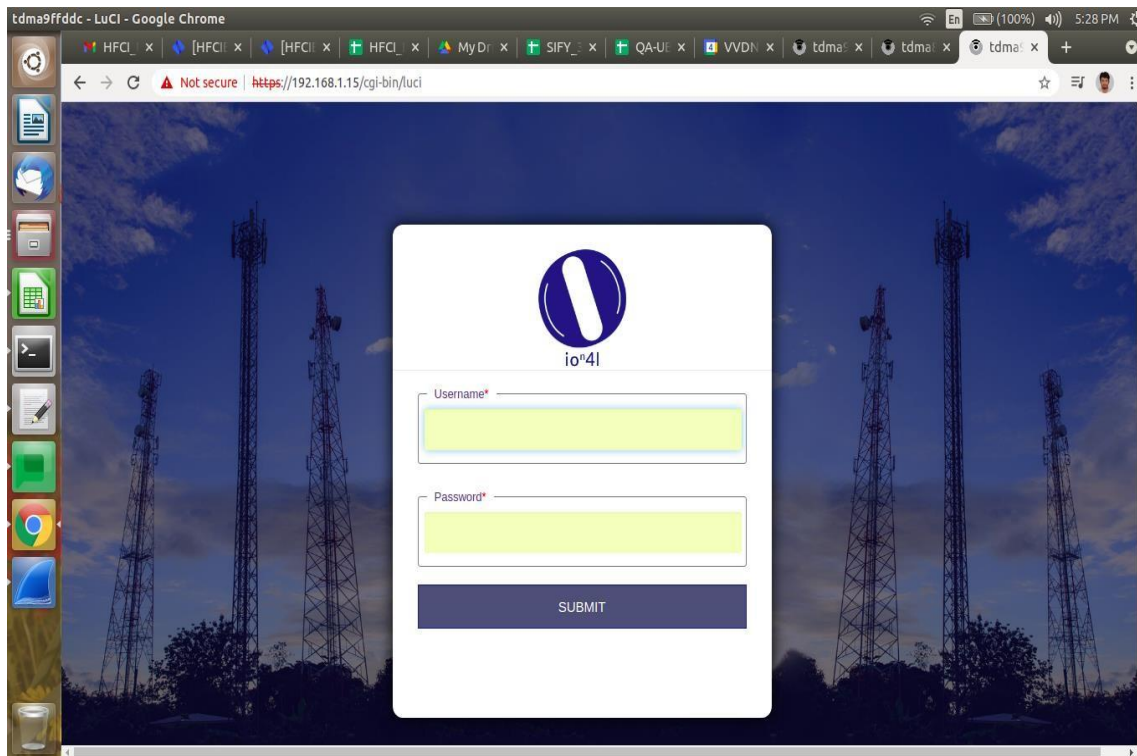
A basic overview of the same is shown below:

Figure 12: Basic overview of login screen

Follow the steps given below to login through GUI:

Table 5: List of actions to login through GUI

Callout	Name	Description
1.	Web browser	Open a web browser and enter the "UBR IP address" in the address bar. The default static IP address for the 2x2 UBR is set to "192.168.1.1"
2.	User name	Enter the valid "User ID". The default user ID for the 2x2 UBR is "admin"
3.	Password	Enter the valid "Password". The default password for the 2x2 UBR is "hfcl1"

Click on "Submit", a successful/authenticated login will take the user to Status Overview screen.

8   Screen toolbars

The toolbars on the screen are designed for the ease of user and to aid them in accessing information. Each toolbar has its own options, through which the user can perform various activities or can view various information.

There are two toolbars provided with each screen as listed below:

1. Overview toolbar on the top
2. Navigation toolbar on the left

8.1   Overview toolbar on the top

From this toolbar, the user can view or hide the backhaul network overview of the UBR at any point of time. The backhaul network overview is available in both tabular and graphical format.

The user can click on "Table/Graphic/All" option to view the backhaul network overview in tabular/graphical/all formats respectively. The user can click again on the same option to hide the same. The user can update the configuration of the respective UBR and can monitor the impact on the system from this toolbar without leaving the working screen.

A basic overview of the information displayed in the toolbar is given below:
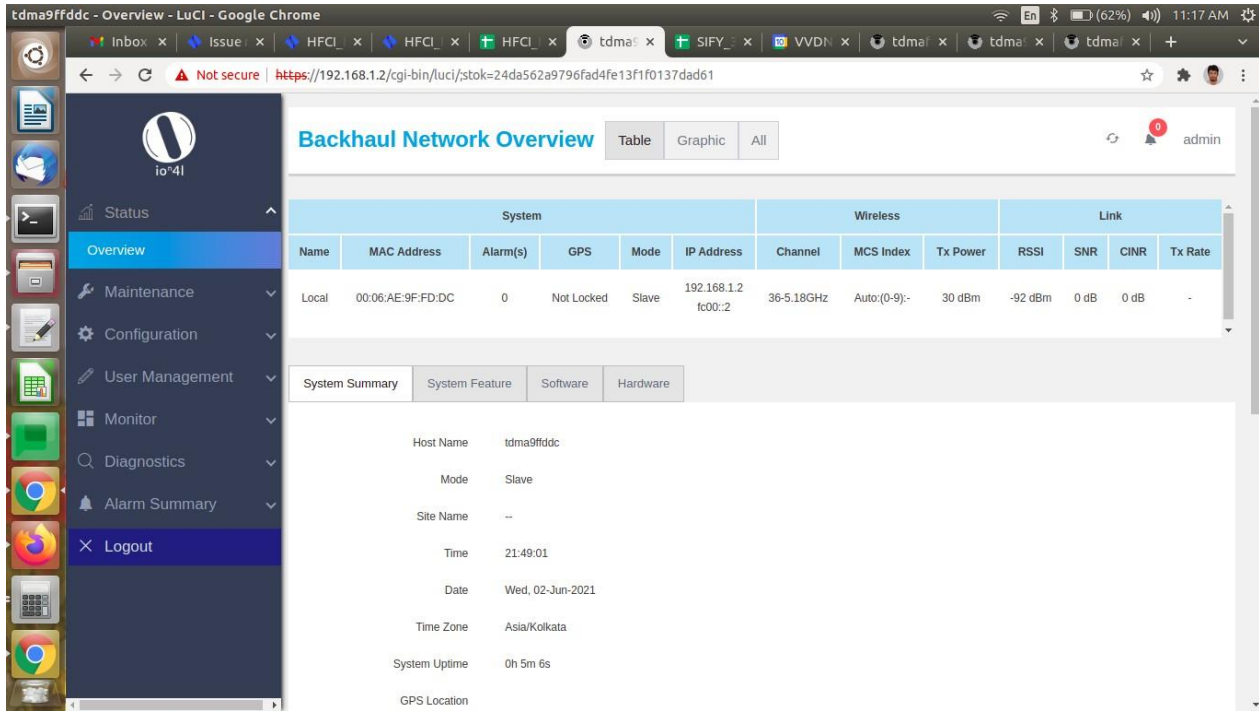
Figure 13: Basic overview of toolbar on top

The list of actions available at overview toolbar on the top is as follows:

Table 6: List of actions at overview toolbar on the top

Callout	Name	Description
1.	Table	Click on the "Table" option to view the backhaul network overview in a tabular format. Click on the "Graphic" option to hide the table and view the graphical overview
2.	Graphic	Click on the "Graphic" option to view the backhaul network overview in a graphical format. Click on the "Table" option to hide the graphical overview and view the tabular overview
3.	All	Click on the "All" option to view the backhaul network overview in both tabular and graphical format.
4.	User	The name of the user is displayed
5.	Bell Icon	Click on the bell icon to view all alarms and notifications of respective UBR. The user will be directed to Alarm listing page once clicked.
6.	Refresh	Click on the icon and refresh the page

9   Status overview screen

The screen provides the status overview of:

1. System summary

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2. System feature
3. Software
4. Hardware

9.1 System summary

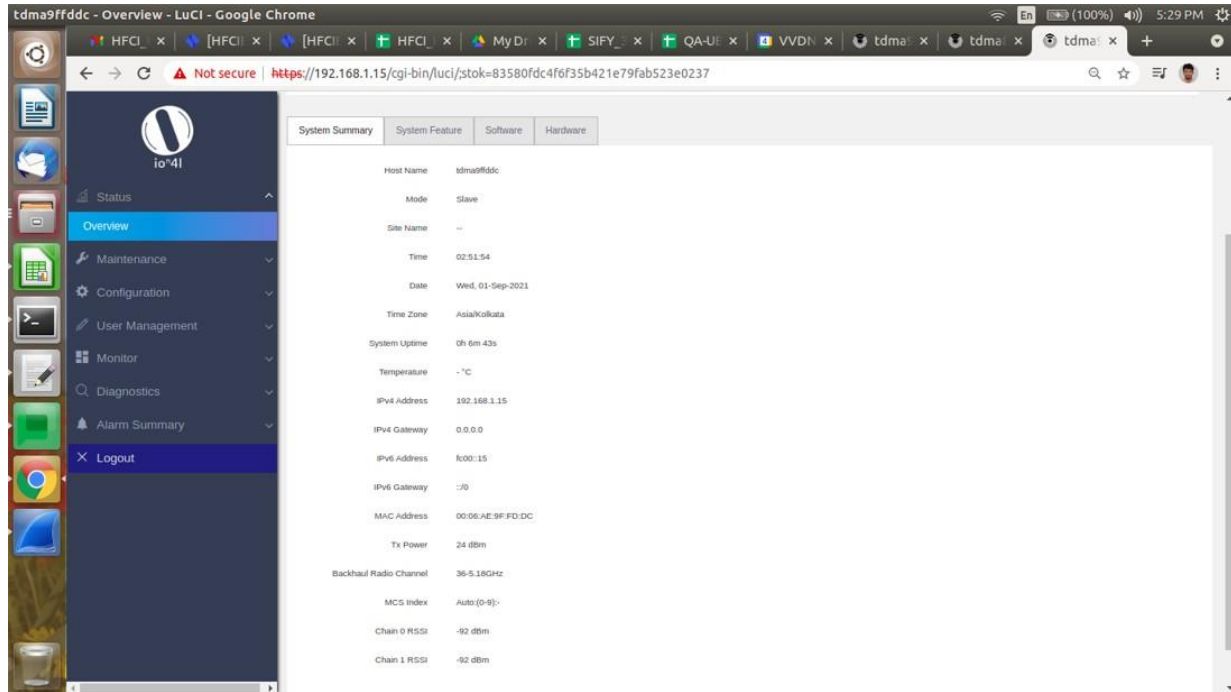A basic layout of the system summary is given below:

Figure 14: Basic layout of the system summary screen

Follow the steps given below to view the system summary:

Table 7: List of information displayed in the system summary

Callout	Name	Description
1.	Status	Click on the "Status" dropdown in navigational toolbar
2.	Overview	Click on "Overview" option
3.	System summary	Click on "System summary" option
4.	Hostname	Displays the "Hostname" assigned to the respective UBR in the "System Configuration" screen
5.	Mode	Displays the acting mode (Master or Slave) of the respective UBR in the P2P or P2MP link. The same is configured for the UBR in the "Link settings" section
6.	Link Type	Displays the role of the respective UBR in the link. Either the device is participating in P2P link or P2MP link. The same is configured in the "Link settings" section
7.	Site Name	Displays the name of the site with which the respective UBR is associated to. The site name is given in the "System Configuration" screen
8.	Time	Displays the time details according to the time zone allocated in the "System Configuration" screen
9.	Date	Displays the date details according to the time zone allocated in the "System Configuration" screen
10.	Time Zone	Displays the selected time zone according to which the date and time calculations are done for the respective UBR. The same is configured in the "System Configuration" screen
11.	System uptime	Displays the time duration since the respective UBR board is up and successfully running without any shutdown
12.	IPv4 Address	Displays the assigned IPv4 address of the UBR
13.	IPv4 Gateway	Displays the assigned IPv4 gateway address of the UBR
14.	IPv6 Address	Displays the IPv6 address, if assigned to the UBR or displays "Not connected" if no IPv6 address is assigned to the UBR
15.	IPv6 Default Gateway	Displays the IPv6 Default Gateway, if assigned to the UBR or displays "Not connected" if no IPv6 Default Gateway is assigned to the UBR
16.	Master MAC Address	Displays the MAC address of the master device
17.	Tx Power	Displays the power of wireless radio signal being transmitted over the link
18.	Backhaul Radio Channel	Displays the wireless radio channel being used for transmission
19.	MCS Index	Displays the MCS index
20.	RSSI per chain	Displays the RSSI value of connected chains or displays "Disconnected"

10 Logout

The user can click on the "logout" option to terminate the session as shown in the figure below:
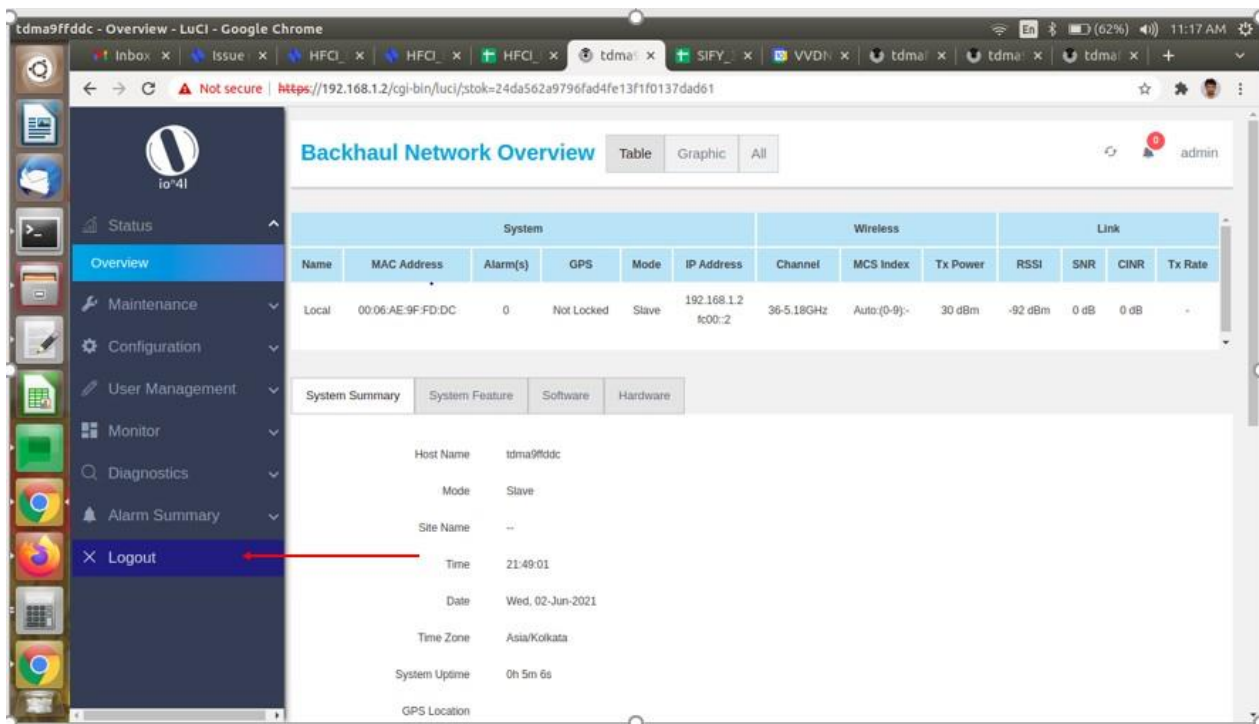

Figure 15: Basic overview of the UBR GUI with logout option

Once logged out the user will be presented with the login screen.

11 Use Cases

A. Enterprise Grade Point-to-Multipoint Solution
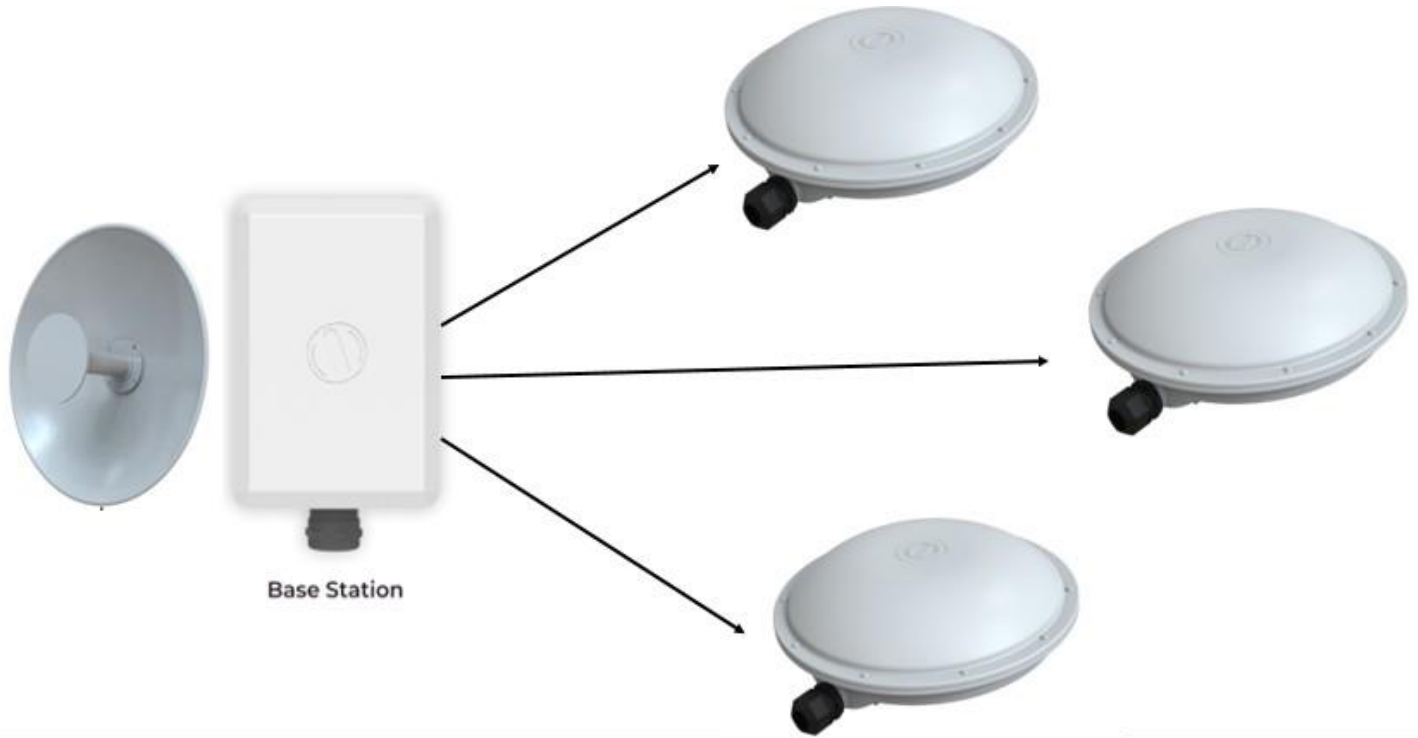

Figure 16: Use Case Diagram of Enterprise Grade Point-to-Multipoint Solution
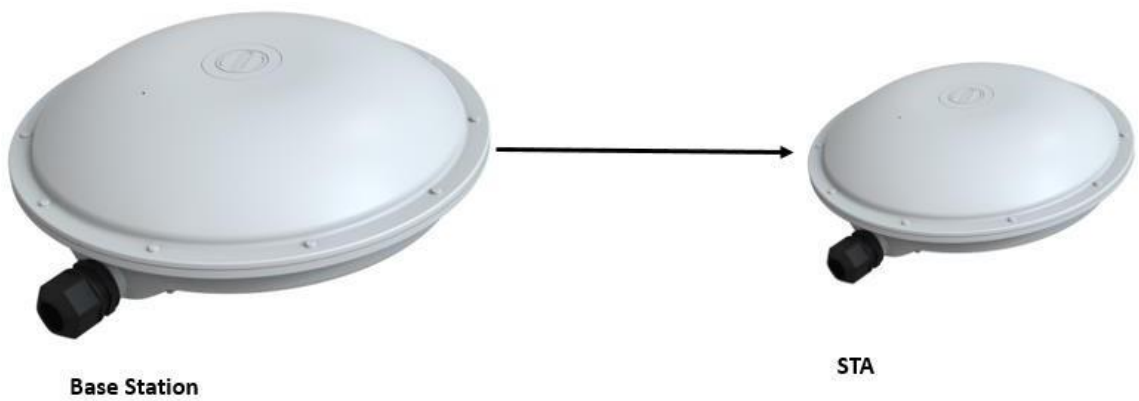
B. Enterprise Grade Point-to-Point Solution

Figure 17: Use Case Diagram of Enterprise Grade Point-to-Point Solution

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