GLR200-R Rugged LoRaWAN Gateway

User Manual

Version:1.2

Revision History

No.	Description	Date
V1.0	First release	Jun. 2, 2024
V1.1	Updated the graphics for pole mounting	Jul. 24, 2024
V1.2	Added chapter 3 to demonstrate how to transmit data from an end node to the network server	Dec. 3, 2024

Table of Contents

Foreword

Thank you for purchasing GLR200-R rugged LoRaWAN gateway ("the gateway" or "the product"). This manual intends to provide guidance and assistance necessary on setting up, operating and maintaining the product. Please read this manual and make sure you understand the structure and functionality of the product before putting it into use.

Intended Users

This manual is intended for:

- Network administrators
- Technical support engineers
- Other users

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Disclaimer

While all information contained herein has been carefully checked to assure its accuracy in technical details and typography, Vantron does not assume any responsibility resulting from any error or features of this manual, nor from improper uses of this manual or the software.

It is our practice to change part numbers when published ratings or features are changed, or when significant structure changes are made. However, some specifications of the product may be changed without notice.

Technical Support and Assistance

Should you have any question about the product that is not covered in this manual, contact your sales representative for solution. Please include the following information in your question:

- Product name and PO number;
- Complete description of the problem;
- Error message you received, if any.

Vantron Technology, Inc.

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Email: sales@vantrontech.com

Regulatory Information

The product is designed to comply with:

- FCC
- ISED

Please refer to the Appendix for Regulatory Compliance Statement.

Symbology

This manual uses the following signs to prompt users to pay special attention to relevant information.

	Caution for latent damage to system or human injury
	Attention to important information or regulations

General Safety Instructions

The product is supposed be installed by knowledgeable, skilled persons familiar with local and/or international electrical codes and regulations. For your safety and prevention of damage to the product and other equipment connected to it, please read and observe carefully the following safety instructions prior to installation and operation. Keep this manual well for future reference.

- Do not disassemble or otherwise modify the product. Such action may cause heat generation, ignition, electronic shock, or other damages including human injury, and may void your warranty.
- Keep the product away from heat source, such as heater, heat dissipater, or engine casing.
- Do not insert foreign materials into any opening of the product as it may cause the product to malfunction or burn out.
- To ensure proper functioning and prevent overheating of the product, do not cover or block the ventilation holes of the product.
- Follow the installation instructions with the installation tools provided or recommended.
- The use or placement of the operation tools shall comply with the code of practice of such tools to avoid short circuit of the product.
- Cut off the power before inspection of the product to avoid human injury or product damage.

Precautions for Power Cables and Accessories

⚠ Use proper power source only. The product supports 12V DC power supply. Make sure the supply voltage falls within the specified range.

⚠ Place the cables properly at places without extrusion hazards.

⚠ Use only approved antenna(s). Non-approved antenna(s) may produce spurious or excessive RF transmitting power which may violate FCC limits.

⚠ Cleaning instructions:

- Power off the product before cleaning
- Do not use spray detergent
- Clean with a damp cloth
- Do not try to clean exposed electronic components unless with a dust collector

⚠ Power off and contact Vantron technical support engineer in case of the following faults:

- The product is damaged
- The temperature is excessively high
- Fault is still not solved after troubleshooting according to this manual

⚠ Do not use in combustible and explosive environment:

- Keep away from combustible and explosive environment
- Keep away from all energized circuits
- Unauthorized removal of the enclosure from the product is not allowed
- Do not change components unless the power cable is unplugged
- In some cases, the product may still have residual voltage even if the power cable is unplugged. Therefore, it is a must to remove and fully discharge the product before replacement of the components.

CHAPTER 1 INTRODUCTION

1.1 Overview

Vantron GLR200-R is a fully rugged, IP65-rated LoRaWAN gateway designed to withstand harsh environments. The gateway supports the LoRa physical layer technology and complies with the LoRaWAN 1.0.3 specification to ensure reliable data transmission. Operating with high receiver sensitivity, it facilitates long-range wireless connectivity while consuming less than 5W of power under load.

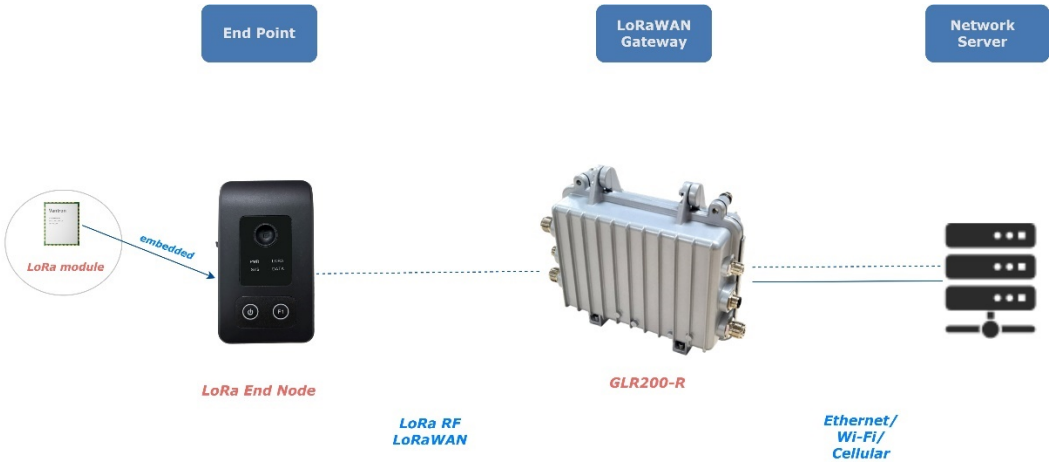
GLR200-R features 8 frequency channels and 8 spreading factors from SF5 to SF12 for efficient detection and demodulation of data packets from LoRaWAN Class A and C end devices. It then forwards these packets to a LoRaWAN network server, which manages the entire LoRaWAN network. It offers two fast Ethernet ports for connection to an Ethernet switch/router and provides essential IP networking features. It also supports 4G LTE and optional Wi-Fi connectivity, while the multi-mode GNSS module provides precise timestamping and high-accuracy geolocation.

GLR200-R offers a comprehensive solution for deploying LoRaWAN networks, combining robust network management capabilities and advanced geolocation functionalities. It allows connection of thousands of end devices scattered in very long distances and is well-suited for smart grid, agriculture, digital medical, oil & gas, public security, and more.

1.2 Typical Application

Option 1: A LoRa-enabled DTU involved for nodes without LoRa capability

Option 2: Direct connection with LoRa-enabled nodes



1.3 Unpacking

The product has been carefully packed with special attention to quality. However, should you find anything damaged or missing, please contact your sales representative in due time.

- 1 x GLR200-R rugged LoRaWAN gateway
- 1 x LoRa antenna
- 2 x 4G LTE antenna / 1 x 4G LTE antenna + 1 x Wi-Fi antenna
- 1 x GNSS antenna
- 2 x M12 cable tube
- 1 x Mounting bracket
- 2 x M6 x 12mm hex-head bolt
- 1 x Mounting strap
- 1 x 12V 1A DC power adapter

Actual accessories might vary slightly from the list above as the customer order might differ from the standard configuration options.

1.4 Specifications

GLR200-R		
System	CPU	MIPS24KEc, 580MHz
	Memory	256MB
	SPI flash	64MB
Communication	Ethernet	1 x LAN, 100Mbps; 1 x WAN, 100Mbps
	Wi-Fi	Wi-Fi 802.11 b/g/n (Optional)
	4G LTE	CAT 1
	RF	LoRa
	GNSS	BDS, GPS, GLONASS, GALILEO
LoRa Features	Frequency	915MHz
	Transmit power	~ 22dBm
	Bandwidth	125 kHz / 250 kHz / 500kHz
	Packet detector	8 Channels x 8 Spreading factors (SF5~SF12)
	Receiver sensitivity (Typical)	-121 dBm (at 125kHz bandwidth, SF5)
		-127 dBm (at 125kHz bandwidth, SF7)
		-141 dBm (at 125kHz bandwidth, SF12)
	Antenna impedance	50Ω
	LoRaWAN	LoRaWAN V1.1 (backward compatible with V1.0)
		Support for Class A and C end devices
4G LTE Features	Frequency band	North America: WCDMA: B1/B2/B4/B5/B6/B8
I/O	M12 connector	2 x M12 connector (WAN + DC in, LAN + RS232 debugging)
	Internal SIM slot	1 x Internal Micro SIM slot
	Antenna	1 x LoRa antenna, N-type (omni-directional, gain: 4.3dBi)
		1 x GNSS antenna, N-type (directional, total gain: 30dBi)
		2 x 4G LTE / 1 x 4G LTE + 1 x Wi-Fi antenna, N-type (omni-directional, gain: 3.8dBi)
System Control	Internal LED indicator	1 x Power indicator
		1 x LoRa communication indicator
		1 x Network status indicator
		1 x System status indicator
	Internal button	1 x Restore button (1~5s: Restart the device; > 5s: Factory reset)
Mechanical	Enclosure	Aluminum
	Dimensions	184mm x 133mm x 72mm (enclosure only)
	Installation	Pole mounting
	IP rating	IP65
Power	Input	12V/1A DC
		3-pin DC input included in an M12 connector for power supply
	Consumption	< 5W (load)

1.3 Specifications (Cont'd)

GLR200-R		
Software	Operating system	VantronOS
	Device management platform	Vantron BlueSphere GWM (Optional)
	Log	Supported
	Upgrade	Local, OTA update
Network	IP features	DHCP client (IPv4), Static IP (IPv4), PPPoE
		Network Address Translation (NAT)
		Domain Name System (DNS)
		Network Time Protocol (NTP)
	Network diagnostics	Ping, Traceroute, Nslookup
Security & Reliability	Firewall	Supported
	VPN	OpenVPN, L2TP, PPTP, IPSec
	Multi-level permission	Supported
	Link detection	Heartbeat detection, automatic re-connection
	Network reliability	Failover supported, link backup between Ethernet and 4G LTE
	Software integrity	Secure boot, SHA256 for firmware signature, and u-boot
Environment Condition	Temperature	Operating: -20°C~+60°C
		Storage: -40℃ ~ +85℃
	Humidity	Operating: 5%-95% RH (Non-condensing)
	EMC level	EMC Level 3
	Certification	FCC, ISED

1.5 Product View

1.5.1 Bottom view

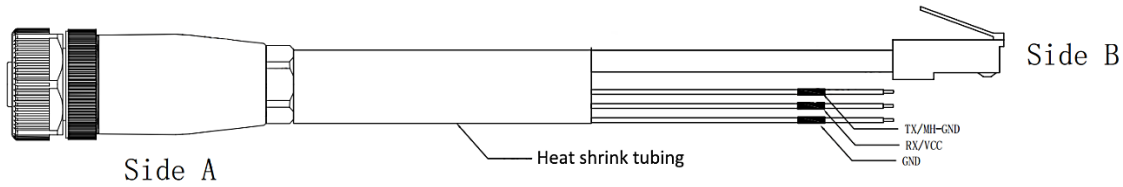
I/O description:

No.	Name	Description
1	GNSS antenna connector	For connecting the GNSS antenna, N-type, fiber reinforced plastic
2	WAN + DC in	M12 connector, offering pins for WAN + DC in
3	LoRa antenna connector	For connecting the LoRa antenna, N-type, fiber reinforced plastic (gain: 4.0dBi, impedance: 50Ω)
4	Primary 4G antenna connector	For connecting a 4G antenna, N-type, fiber reinforced plastic
5	LAN + debugging	M12 connector, offering pins for LAN + RS232 debugging
6	Diversity 4G antenna / Wi-Fi antenna connector	For connecting a 4G antenna or Wi-Fi antenna (WLAN version), N-type, fiber reinforced plastic

1.5.2 M12 cable tube

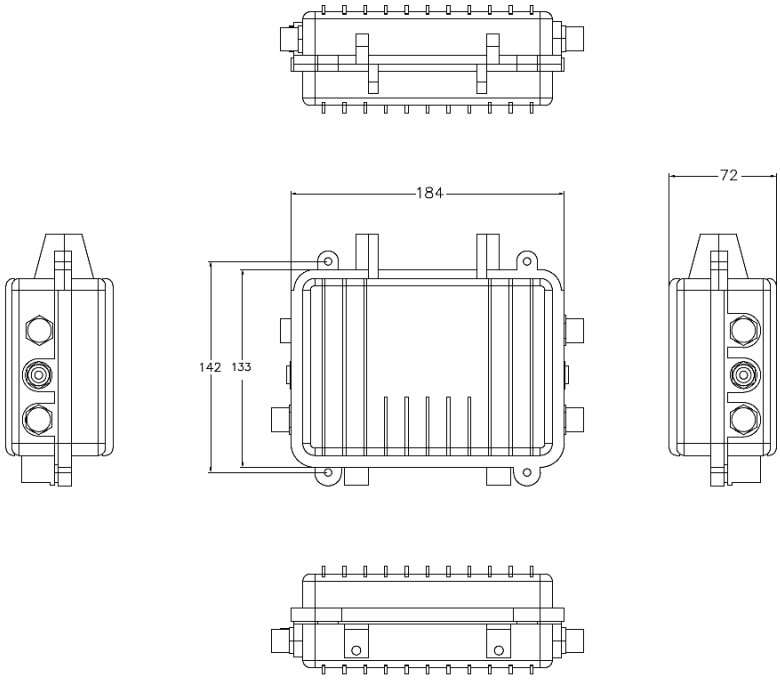
There are two M12 connectors on the gateway, one offering WAN and 3-pin DC input for power, the other offering LAN and 3-pin RS232 for debugging.

The pinout of the matching cable is shown below.



1.6 Mechanical Dimensions

- 184mm x 133mm x 72mm (enclosure only)

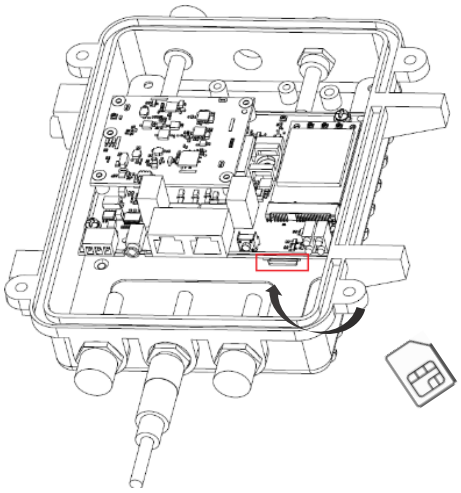


CHAPTER 2 QUICK START

2.1 Setting up the Device

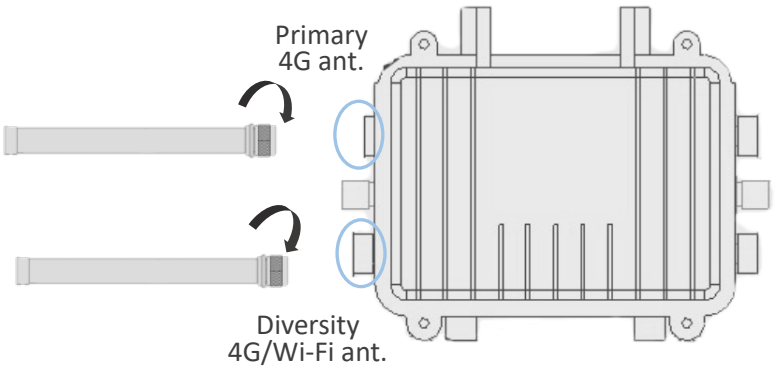
2.1.1 Hardware connection

1. Unscrew the top cover of GLR200-R and open it;
2. Insert an activated SIM card into the Micro SIM slot at the back of the 4G LTE module, with the golden contact facing up;

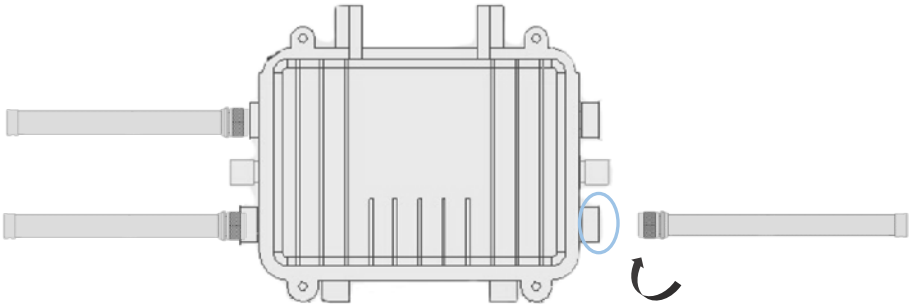


Gently push the SIM card in again, and it will eject from the slot automatically.

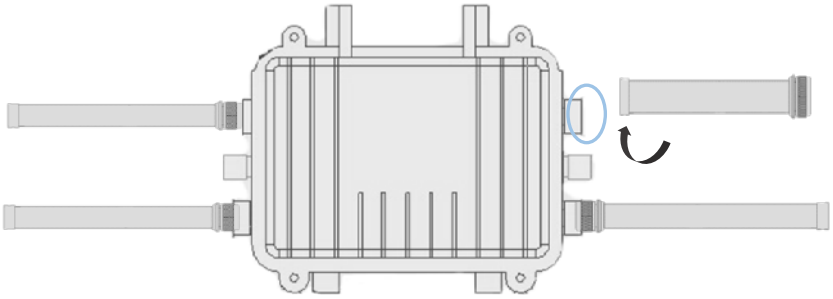
3. Close the top cover and fasten the screws;
4. Install the 4G LET antennas / 4G LTE + Wi-Fi antennas as indicated by the label on the antenna;



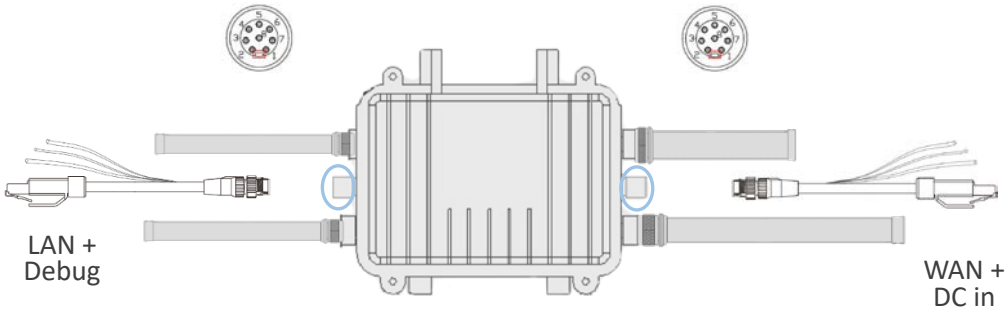
5. Install the LoRa antenna as indicated by the label on the antenna;

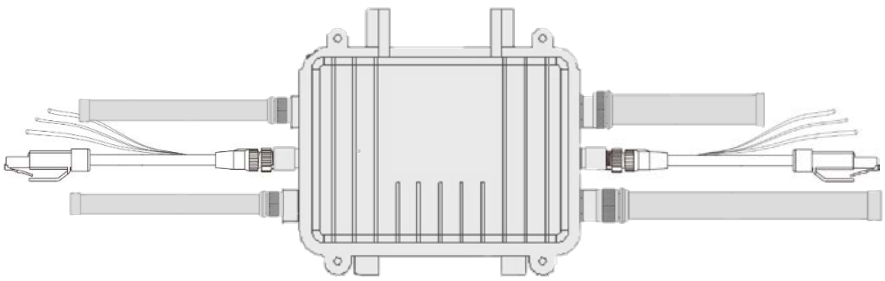


6. Install the GNSS antenna as indicated by the label on the antenna;



7. Align the mark on the connectors and install the two M12 cable tubes to the M12 connectors;

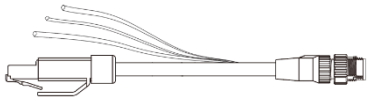




8. Connect the Ethernet cable of the WAN + DC in cable tube to the LAN port of a router/switch to connect the device to the internet;

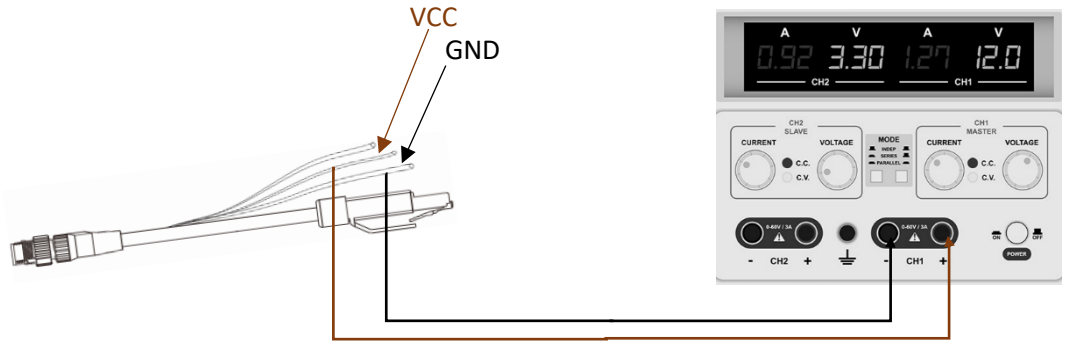
An Ethernet extender might be needed.

9. Connect the Ethernet cable in the LAN + Debugging cable tube to a host computer;



An Ethernet to USB extension cable might be needed.

10. Connect the VCC and GND wires of the WAN + DC in cable tube to the positive and negative poles of a DC power supply, respectively;

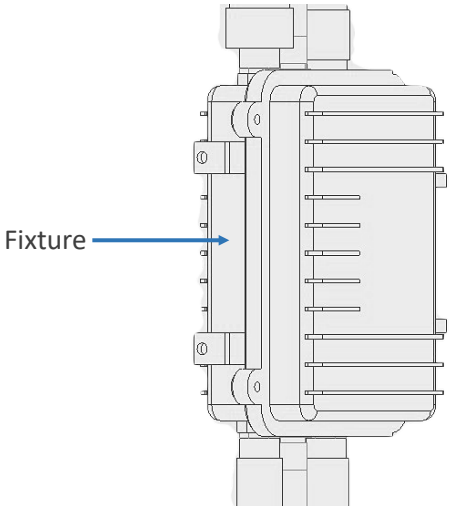


11. Turn on the power supply to power up GLR200-R.

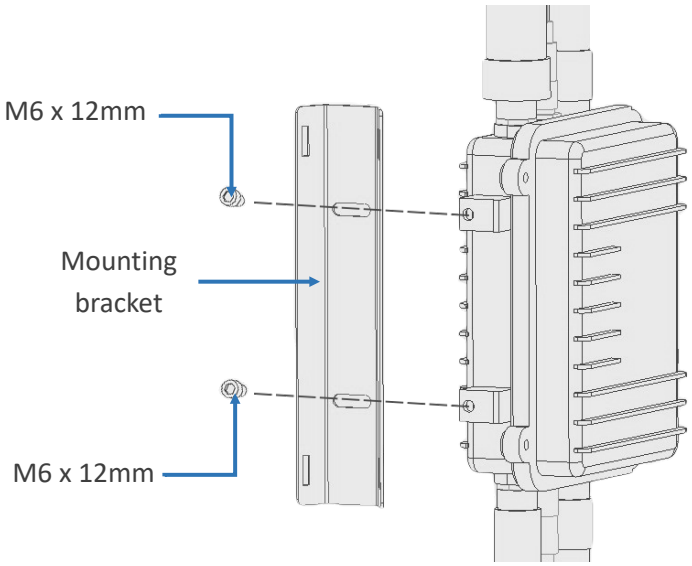
Before mounting GLR200-R to a pole, please make sure the pole is secured in place.

2.1.2 Pole mounting

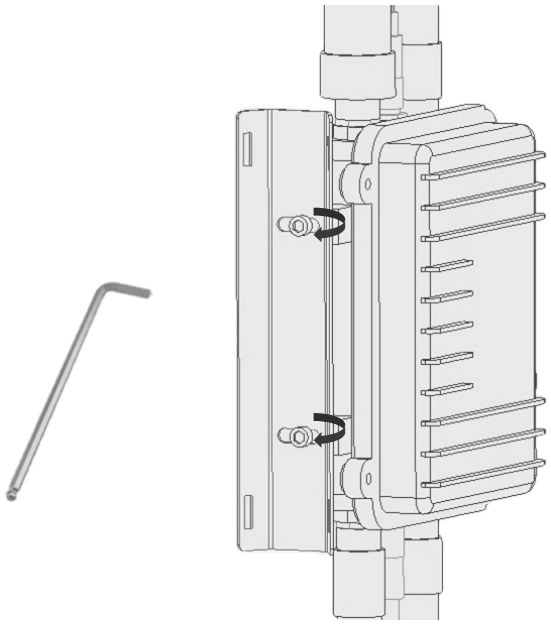
1. Vertically hold the gateway with the fixture side facing the outside;



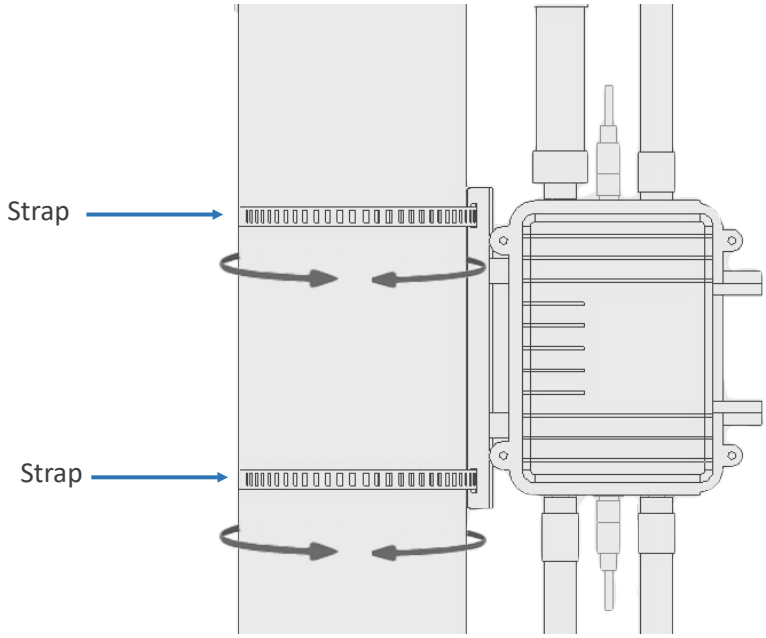
2. Align the slots of the mounting bracket to the screw holes on the fixture and attach the bracket to the gateway using the two M6 x 12mm screws provided in the package;



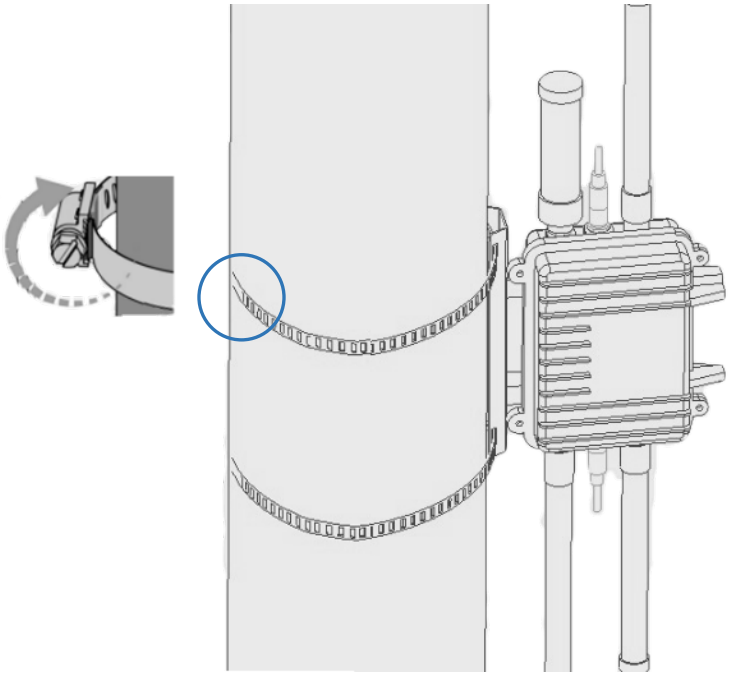
3. Use an inner hexagonal spanner to tighten the screws so that the mounting bracket is secured on the gateway;



4. Select an appropriate height on the pole, position the mounting bracket against the pole, and then route the mounting straps through the slots on the bracket;



5. Wrap the straps around the pole and lock the straps to prevent the mounting bracket from sliding down the pole.



2.2 GPS Module

The GPS module is automatically turned on after device bootup.

- To query the GPS information of the device, use the following command:

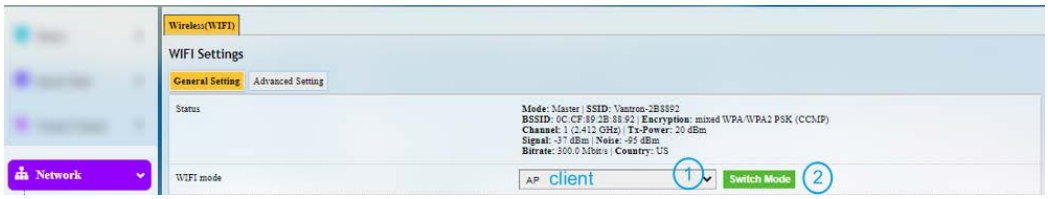
```
# vt_data_query --pretty gps
```

2.3 Connecting the Device to the Internet

GLR200-R is designed to connect to the internet via **Ethernet, cellular, or Wi-Fi** for data transmission. To connect it via Ethernet or cellular, refer to the steps outlined in 2.1.1 to set up the device. The device offers a Wi-Fi module as an optional feature, depending on the customer's specific use case.

To connect GLR200-R to a Wi-Fi access point, use the device's web management portal for configuration. The portal can also be used for managing the device settings.

1. Install the accessories and connect the Ethernet cable in the LAN + debugging cable tube to a host computer;
2. Log in to the web portal of the device using the default **LAN port IP: 172.18.1.1** with the following account:
   - Username: root
   - Password: rootpassword
3. Navigate to **Network > Wireless WIFI**, change the default Wi-Fi mode from AP to **client**, and save the change;



4. Under the **Wifi Client Setting** section, select the SSID of the target access point from the list, and input the password to join the network ;

5. When GLR200-R is successfully connected as a client, there will be the network information next to **Scan WIFI** button.

2.4 Data Transmission Over LoRaWAN

The LoRa module is automatically turned on after device bootup.

- To query the working frequency of the LoRa module, use the following command:

```
# gpio get lora freq
```

To ensure successful transmission of data packets from an end node to GLR200-R and ultimately to a network server, make sure the following prerequisites are met:

1. The end node is LoRa-enabled or connected to an intermediate LoRa-enabled device, such as a LoRa-enabled DTU, if it does not have LoRa capability.
2. The end node and GLR200-R are configured to operate on the same regional frequencies. GLR200-R typically operates at 915MHz in the US.
3. The end node, GLR200-R, and the network server are all compatible with the LoRaWAN protocol (GLR200-R supports V1.1 with backward compatibility).
4. The end node is a class A or class C device.

By registering GLR200-R and the end node with the same network server, GLR200-R will be able to transmit the data packets from the end node to the network server for further analysis and management.

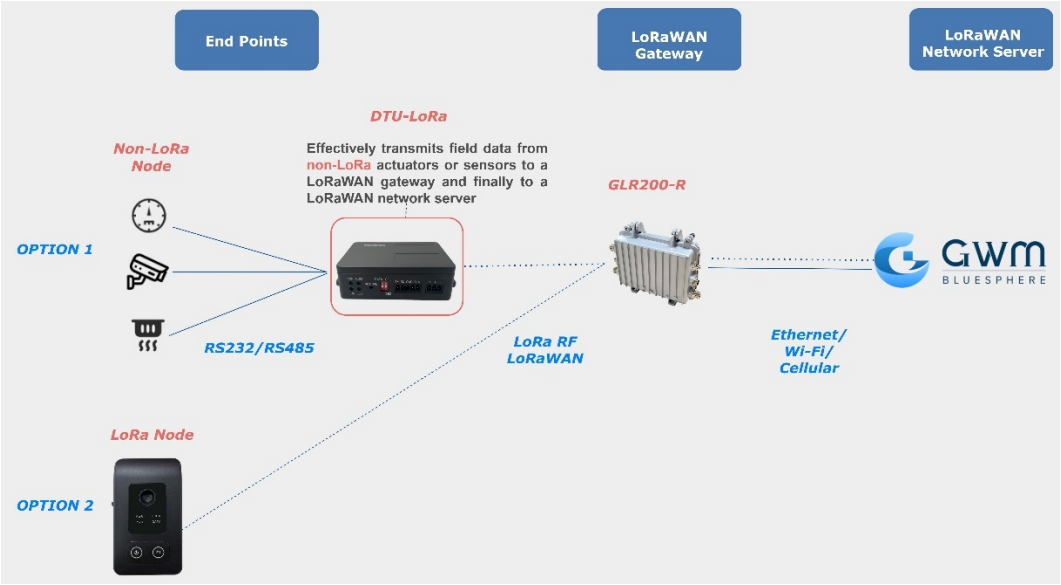
Please refer to chapter 3 for the typical use of GLR200-R in transmitting data packets from an end node to Vantron BalueSphere GWM, a self-developed cloud-based remote manager for IoT communication devices, which functions as the network server.

CHAPTER 3 USE CASE

GLR200-R is typically used to transmit data from LoRa-enabled end nodes to a network server. For end nodes without LoRa capability, it is recommended to use an intermediate LoRa-enabled device, such as a LoRa-enabled DTU, to interface with both the end node and GLR200-R.

To ensure smooth data transmission over a LoRaWAN network, you need to register both the end nodes (or the LoRa-enabled intermediate device, such as a LoRa-enabled DTU for non-LoRa devices) and GLR200-R with the same network server. This allows you to monitor and manage the transmitted data without issues.

In the following topology, data packets from the end nodes are transmitted by GLR200-R to BlueSphere GWM, a self-developed remote management platform for IoT communication devices that acts as the LoRaWAN network server, where they are then managed.



The difference between option 1 and option 2 is that in option 1, a LoRa-enabled DTU (e.g., VT-M2M-DTU-LoRa from Vantron) is used to connect the non-LoRa-enabled end node and transmit data to GLR200-R, while in option 2, the end node is LoRa-enabled and can transmit data directly to GLR200-R once connected over LoRa.

Before you proceed, ensure that all prerequisites set out in 2.4 are met. Then, follow the steps below to register GLR200-R and the LoRa-enabled device with BlueSphere GWM, respectively to enable smooth data transmission.

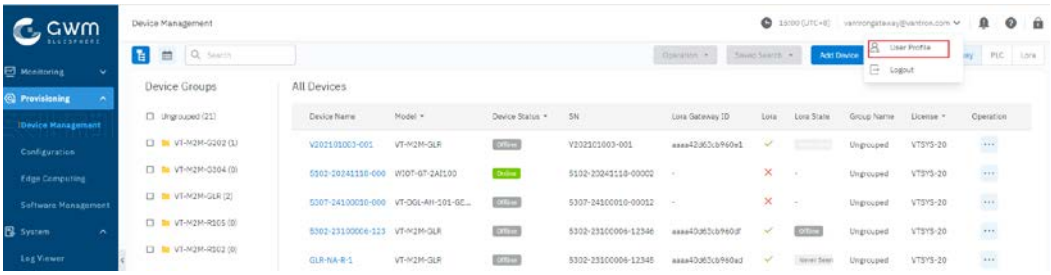
1. Install the accessories and refer to the steps outlined in 2.3 to connect GLR200-R to the internet via Ethernet, cellular, or Wi-Fi (if the WLAN variant is chosen);

2. Ensure the LAN port of GLR200-R is connected to a host computer via the Ethernet cable in the LAN + debugging cable tube;

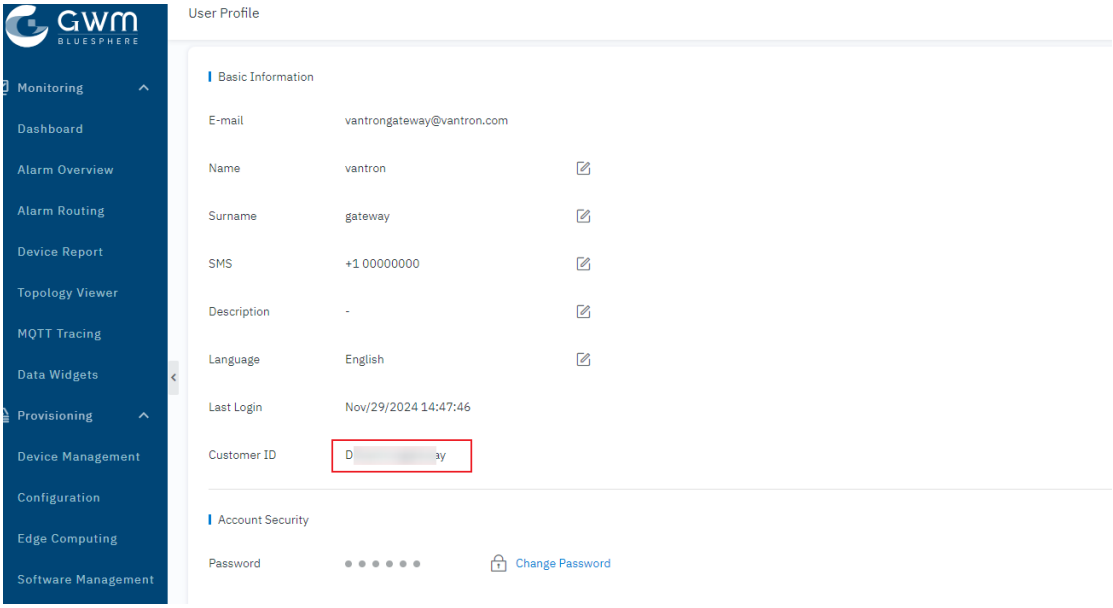
3. Log in to BlueSphere GWM at https://gatewaymanager.bluesphere.cloud/#/login with the authorized account and corresponding password;

   Generally, the account information will be provided upon delivery of the device.

4. Click the user account in the top right corner and select the **User Profile** option after the login;



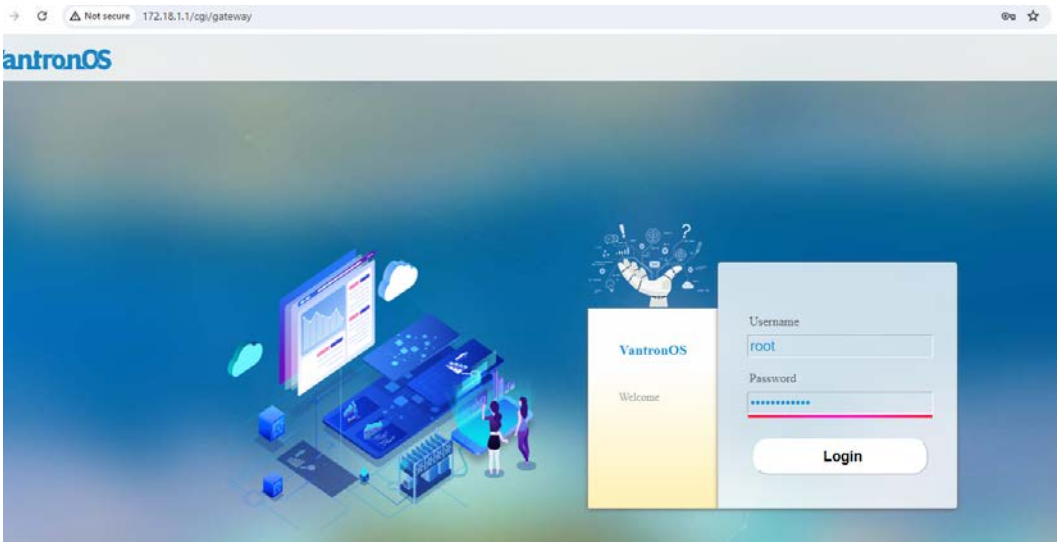
5. Locate the **Customer ID** and copy it for use in subsequent steps;



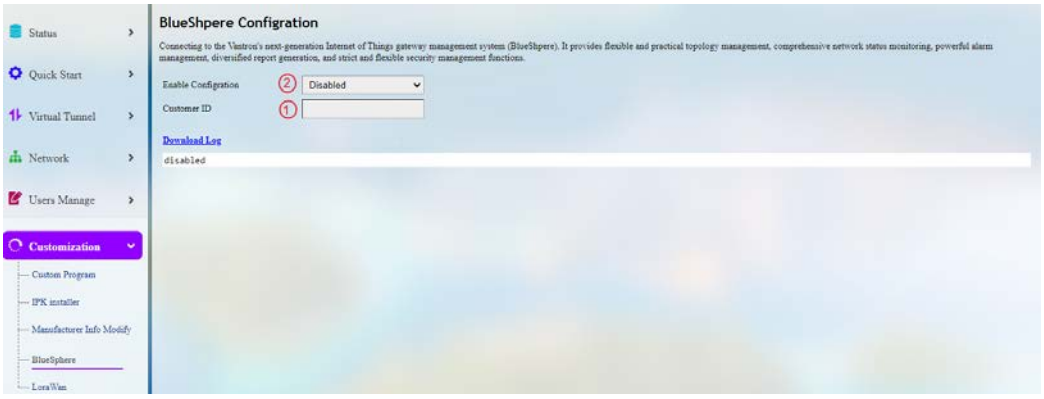
6. Log in to the web management portal (VantronOS) for GLR200-R using the **default LAN port IP: 172.18.1.1**;

   Account: root

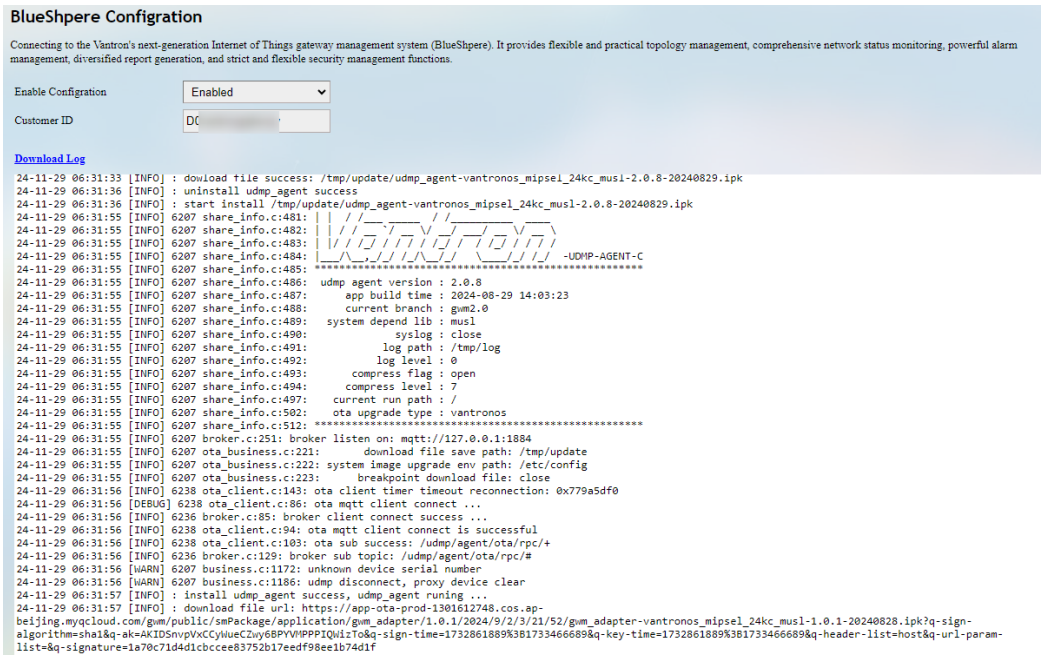
   Password: rootpassword



7. Navigate to **BlueSphere**, paste the previously identified Customer ID and select **Enabled** from the **Enable Configurations** tab;



8. Wait a few seconds to allow the settings to take effect and the connection information will be automatically printed below the configurations;

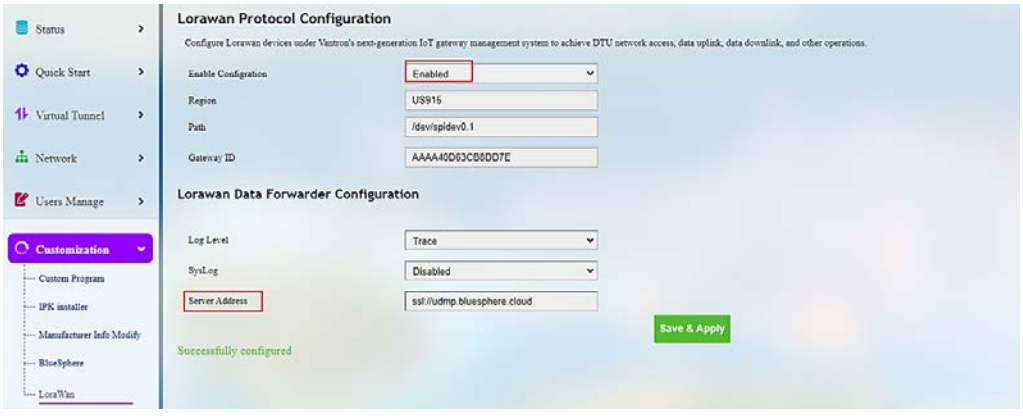


9. Navigate to the **LoraWan** page;

10. Select **Enabled** from the **Enable Configurations** tab and enter the **server address** that matches the login domain of BlueSphere GWM, then click the **Save & Apply** button;

    ssl://udmp.bluesphere.cloud for AWS;

    ssl://udmp-cn.bluesphere.cloud for Tencent cloud.



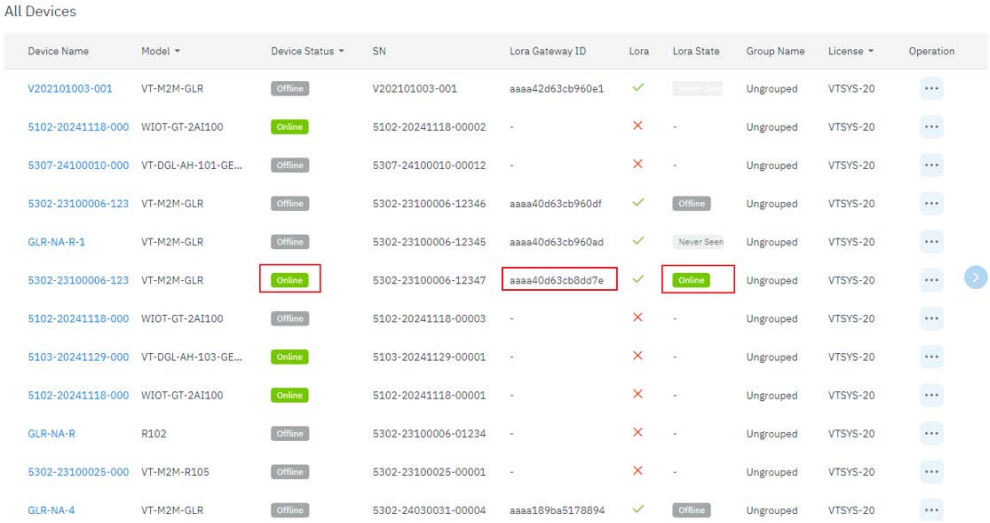
You can confirm the domain information with the aftersales team.

11. Return to the BlueSphere GWM platform and navigate to **Provisioning > Device Management** to check if the gateway is online with LoRa module functioning properly;

    *You can use the **LoRa gateway ID** to determine which is the target device.*

    VantronOS > LoraWan page:

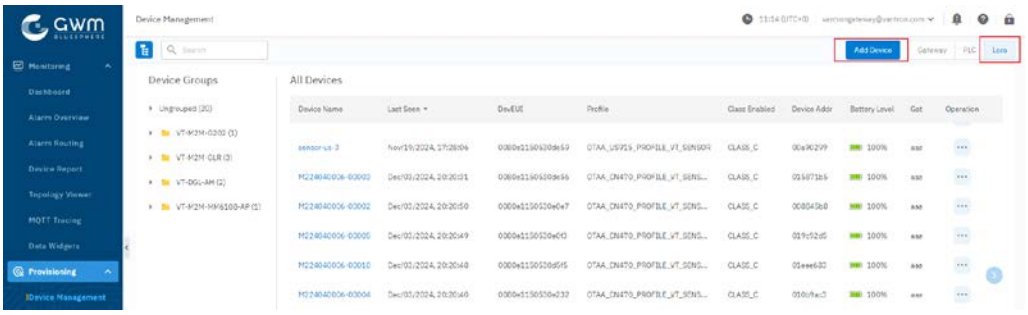
    BlueSphere > Provisioning > Device Management page:



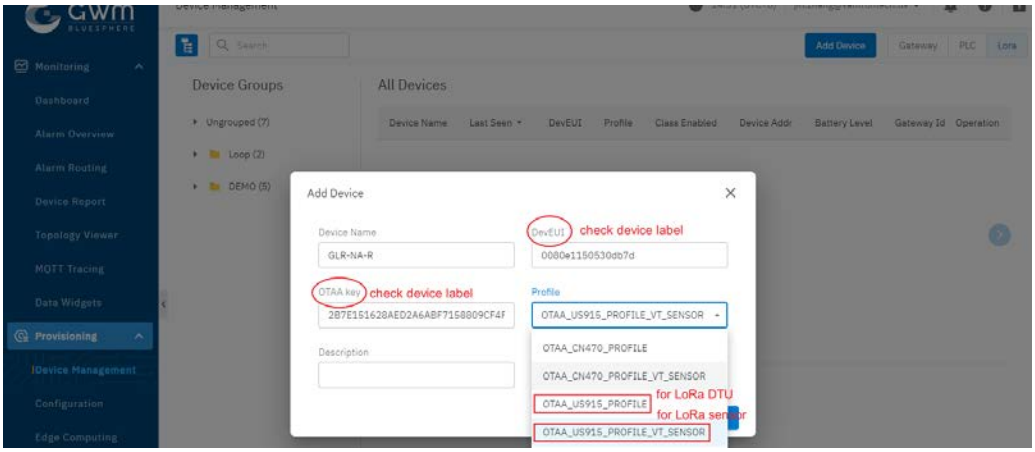
After adding GLR200-R to BlueSphere GWM, you need to register the LoRa-enabled end node or the LoRa-enabled intermediate device with the platform. This will establish a connection between the end node and GLR200-R for data transmission.

Before registering the LoRa-enabled intermediate device (e.g., VT-M2M-DTU-LoRa from Vantron), you need to connect it with the end node, typically via a serial port, depending on the available interfaces on both devices.

1. Log in to BlueSphere GWM at https://gatewaymanager.bluesphere.cloud/#/login with the authorized account and corresponding password;
2. Navigate to **Provisioning > Device Management** and click the **Add Device** button under the **Lora** tab;

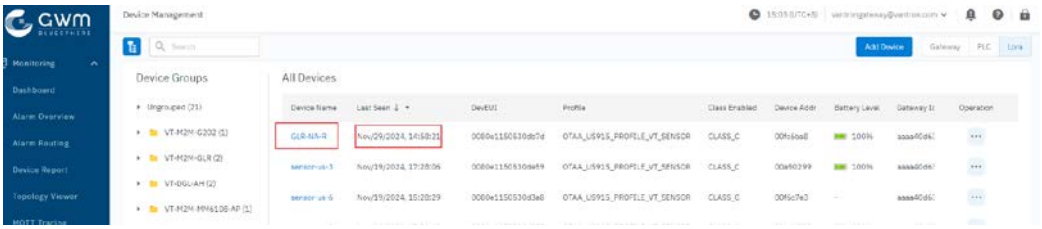


3. Refer to the device label and fill in the information of the end node accordingly;

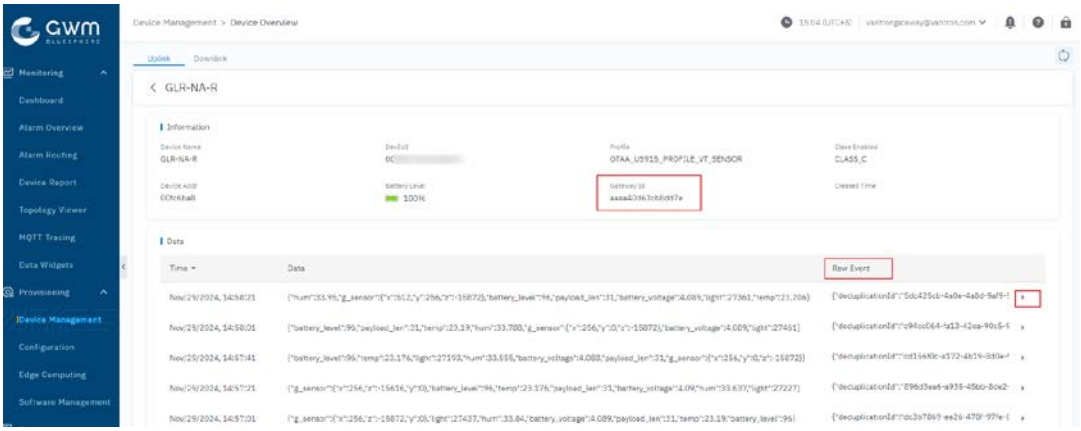


If the information is not provided on the device label, you may need to figure it out via the debugging interface of the device. Please confirm with the relevant personnel.

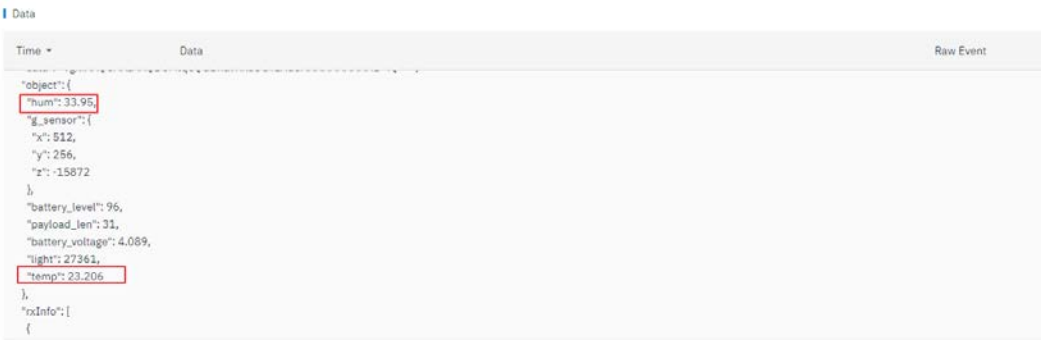
4. Wait a few seconds, and the device will be online, indicating successful registration with BlueSphere GWM. The date and time under the **Last Seen** tab indicate the last time data upload to the platform;



5. Click the device name to access the details of data transmission.



- Gateway ID indicates the LoRaWAN gateway that the end node is connected to;
- Clicking on the triangle after an entry will expand the details of the data that was uploaded to the platform at that time.



CHAPTER 4 DISPOSAL AND WARRANTY

4.1 Disposal

When the device comes to end of life, you are suggested to properly dispose of the device for the sake of the environment and safety.

Before you dispose of the device, please back up your data and erase it from the device.

It is recommended that the device is disassembled prior to disposal in conformity with local regulations. Please ensure that the abandoned batteries are disposed of according to local regulations on waste disposal. Do not throw batteries into fire or put in common waste canister as they are explosive. Products or product packages labeled with the sign of “explosive” should not be disposed of like household waste but delivered to specialized electrical & electronic waste recycling/disposal center.

Proper disposal of this sort of waste helps avoid harm and adverse effect upon surroundings and people’s health. Please contact local organizations or recycling/disposal center for more recycling/disposal methods of related products.

4.2 Warranty

Product warranty

VANTRON warrants to its CUSTOMER that the Product manufactured by VANTRON, or its subcontractors will conform strictly to the mutually agreed specifications and be free from defects in workmanship and materials (except that which is furnished by the CUSTOMER) upon shipment from VANTRON. VANTRON's obligation under this warranty is limited to replacing or repairing, at its option, of the Product which shall, within 24 months after shipment, effective from invoice date, be returned to VANTRON's factory with transportation fee paid by the CUSTOMER and which shall, after examination, be disclosed to VANTRON's reasonable satisfaction to be thus defective. VANTRON shall bear the transportation fee for the shipment of the Product to the CUSTOMER.

Out-of-Warranty Repair

VANTRON will furnish the repair services for the Product which are out-of-warranty at VANTRON's then-prevailing rates for such services. At customer's request, VANTRON will provide components to the CUSTOMER for non-warranty repair. VANTRON will provide this service as long as the components are available in the market; and the CUSTOMER is requested to place a purchase order up front. Parts repaired will have an extended warranty of 3 months.

Returned Products

Any Product found to be defective and covered under warranty pursuant to Clause above, shall be returned to VANTRON only upon the CUSTOMER's receipt of and with reference to a VANTRON supplied Returned Materials Authorization (RMA) number. VANTRON shall supply an RMA, when required within three (3) working days of request by the CUSTOMER. VANTRON shall submit a new invoice to the CUSTOMER upon shipping of the returned products to the CUSTOMER. Prior to the return of any products by the CUSTOMER due to rejection or warranty defect, the CUSTOMER shall afford VANTRON the opportunity to inspect such products at the CUSTOMER's location and no Product so inspected shall be returned to VANTRON unless the cause for the rejection or defect is determined to be the responsibility of VANTRON. VANTRON shall in turn provide the CUSTOMER turnaround shipment on defective Product within fourteen (14) working days upon its receipt at VANTRON. If such turnaround cannot be provided by VANTRON due to causes beyond the control of VANTRON, VANTRON shall document such instances and notify the CUSTOMER immediately.

Appendix Regulatory Compliance Statement

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.

FCC Compliance Statement

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.

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

Exposure to radio frequency energy:

The radiated output power of this device meets the limits of FCC radio frequency exposure limits. This device should be operated with a minimum separation distance of 20cm (8 inches) between the equipment and a person’s body.

NOTE: 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.

ISED Canada Compliance Statement

This device complies with ISED 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.

Operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

Exposure to radio frequency energy:

The radiated output power of this device meets the limits of ISED Canada radio frequency exposure limits. This device should be operated with a minimum separation distance of 20cm (8 inches) between the equipment and a person's body.

Le présent appareil est conforme aux CNR d'ISDE 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'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

La bande 5150–5250 MHz est réservée uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

L'exposition à l'énergie radiofréquence:

La puissance de sortie rayonné de cet appareil est conforme aux limites de la ISDE Canada limites d'exposition aux fréquences radio. Cet appareil doit être utilisé avec une distance minimale de séparation de 20cm entre (8 pouces) l'appareil et le corps d'une personne.