WiSenMeshWAN® Mini Smart Gateway

User Manual

Wuxi Wisen Innovation Co., Ltd.

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Revision History and Clarification

Rev.	Issue Date	Revisions	Written By	Revised By
V1.0	17/11/2019	1st Issue	Xiaoyan Huang	Dr. Yan Wu
V1.1	26/02/2021	Minor wording changes.	Xinhu Nie	Dr. Yan Wu

Document Definition:

It defines the specifications (i.e., introduction, technical features, deployment and maintenance methods) of the WiSenMeshWAN® Smart Gateway, which is one of the key components in WiSenMeshWAN® Low Power, Intelligent, Wireless Sensor Network (WSN) Monitoring system. It is responsible to:

- Form a time-synchronized WSN with all the nodes in the system;
- Receive the data packets from all the nodes including sensor nodes and interface nodes;
- Issue network command in order to optimise the network reliability, such as sampling interval, frequency hop, relay period, RSSI threshold modifications, etc.;
- Forward data and system information to a Windows laptop.

Scope:

Customer Site Project Managers and Engineers, Wisen Service Engineers, etc.

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1. Product Introduction

The WiSenMeshWAN® Mini Smart Gateway is one of the key products in our patented WiSenMeshWAN® geotechnical safety monitoring system. Working together with the WiSenMeshWAN® Node products, it intelligently collects, converts and delivers the real-time information from nodes to a local PC via standard USB connection. The WiSenMeshWAN® Mini Smart Gateway is powered by USB port (5VDC).

This product operates using our core technology, i.e., WiSenMeshWAN® Low Power, Intelligent, Wireless Sensor Network protocol. This product satisfies the three fundamental identities of the system:

A. Network Life Span: to maximise battery life across the mesh network as a whole;

B. Network Data Arrival Rate: to minimise data packet loss;

C. Single Node Environmental Coverage: to maximise radio coverage.

Our product is small in size, reliable in performance, easy for maintenance, and has strong immunity to radio-interference.

Figure 1. Mini Smart Gateway Overview.

2. System Structure Layout

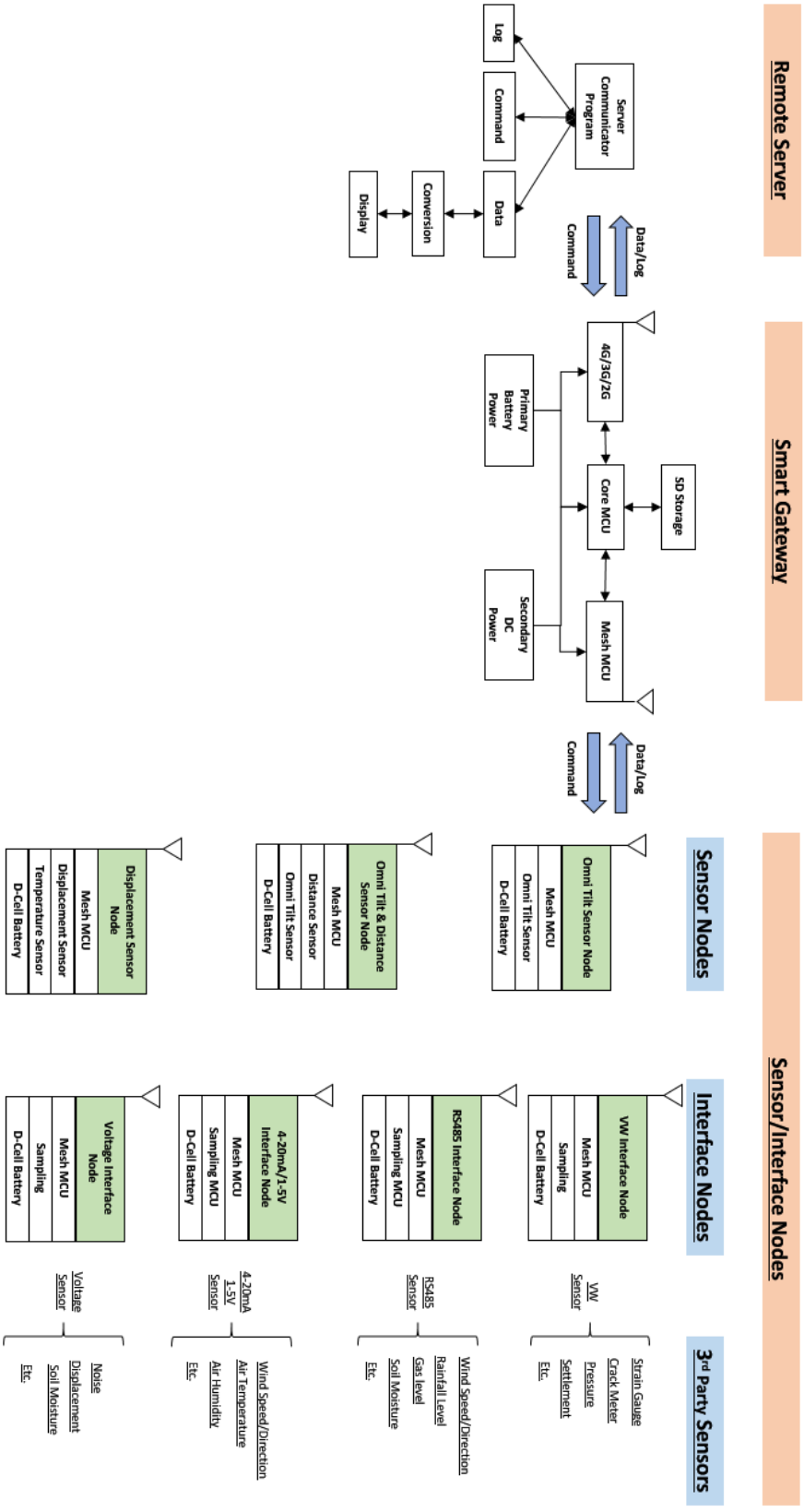

Figure 2. System Structure Layout.

3. Gateway & Radio Features

Gateway Features:

Basics	
Primary Battery Power	USB 5VDC
L x W x H	52 x 50 x 40mm
Weight	< 80g
Cable Gland	Qty. 1 x USB Connection
Local Storage	N.A.
External Interface	
Wired Port	USB
WSN Interface	
WSN Protocol	WiSenMeshWAN® Protocol
Standard System Parameter	
Temperature	Range: [-40, 85]°C, Accuracy: ±1°C (Typ. 0.5°C), Resolution: 0.1°C
Voltage	Accuracy: +/-0.1V
Re-Calibration Method	
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)
Industrial Standard	
Casing and Painting Materials	PC
Operating Temperature	-40 to 85°C

Radio Features:

	FCC 915MHz System	**CE 868MHz System**
Radio Band	902-928MHz	865-868MHz
Central Frequency (**Default**)	**905**/910/915/920/925/922/923MHz	865.75/866.25/866.75/**867.25**MHz
Default Transmit Power	18dBm	14dBm
Transmit Power Range	5-20dBm	
Receive Sensitivity	-112dBm	
Bandwidth	500kHz	
Transmission Speed	19.2kb/s	
No. of Mesh Hop*	6 Hops	

Supported		
Sampling Interval	1-60mins	
Antenna Description	Mesh Antenna	Omni-directional (20cm in length) or Customised
	Antenna Connector	SMA (M)

* E.g., the radio link from a gateway to the 1st layer node is called the 1st hop.

4. Gateway Terminologies

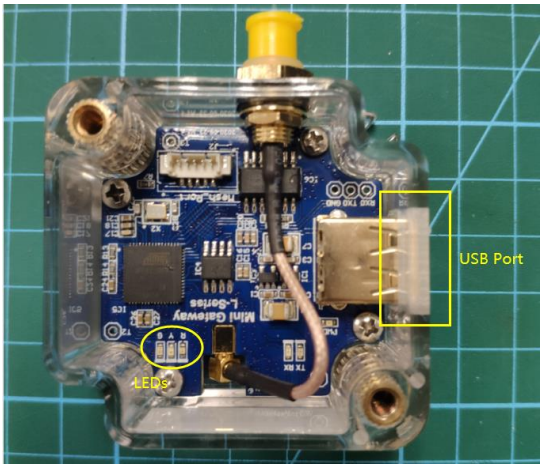

Figure 3. Gateway Internal Terminologies.

5. Operation Procedures

5.1. Gateway Location Choices

Location: There are two fundamental considerations that are used by Wisen to identify available location for a Gateway:

1) Firstly, the mesh coverage is the primary factor to be considered. It is vital to arrange the wireless mesh topology so that all the nodes in the system are connected. The recommended location of a Gateway is in the centre of the network;
2) Secondly, Mini Smart Gateway should be closed to the PC or industrial computer. Make sure the USB cable is as short as possible to reduce interference;

Once the location is chosen, you are ready to deploy your WiSenMeshWAN® system.

5.2. Deployment Procedures

1) Antenna Installation: screw the antennas firmly onto the Mini Gateway.
2) Power on: Connect the USB cable between Mini Gateway and PC.

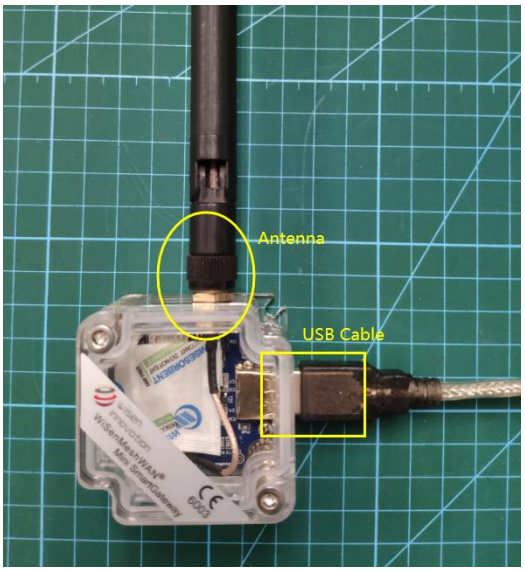

Figure 5. USB Connections.

LED flashing sequence: You should see three Mesh LEDs flashing 3 times, then green LED on for 1s, then a quick flash on the 3 LEDs, then Off. If not, unplug the gateway (to power off), and leave it fully discharged for 180s before the next powering-on.

3) Gateway should have its antennas point upwards.
4) Open WISENMESHNET Standard Serial Port Monitoring Software in Windows PC to validate the gateway data.

6. General Maintenance and Notification

1) Once the WiSenMeshWAN® Smart Gateway is installed and working, please do not interfere with it unless it is absolutely necessary;
2) The Gateway relies on radio signals to communicate with the nodes. It must be deployed before the nodes and please ensure that it is not covered by any materials, which would block the radio signals, for example, chicken wire, aluminum sheet hoardings, etc.;
3) If no data is received from the Gateway, then please carry out investigations in the following two stages:
   A. Remote Inspection of historical data, to identify:
      a) Whether the heart-beat message has been sent back successfully at each time interval;

b) Whether the voltage in the heart-beat message is as expected, if not, please check the USB power supply;

c) Whether the signal strength has become significantly weaker, if yes, please check the antenna has been screwed on firmly;

B. On-site Inspection: if all above are good, please arrange for an on-site inspection to check:

a) Whether the Mini Gateway has visible external damage;

b) Whether the antenna is bent or damaged and the node (gateway or sensor node) is not blocked by new construction, e.g., hoardings.

c) When it is possible, check that the signal strength is normal by using a spectrum analyser;

d) Whether any connectors are loose.

Notices:

i. Case One: If any change has been made from the list above, please inspect the data from the remote server;

ii. Case Two: If all the actions from the list above have not cured the problem, please contact Wisen. We will be happy to help.

7. Package Information

Standard:

No.	Items	Dimension (mm)	Qty.
1	WiSenMeshWAN® Mini Smart Gateway	52x50x40	1
2	Mesh Antenna	200	1
3	User Manual*	Downloadable from Wisen Visualisation Platform.	
4	Inspection Report*		

8. Safety and Warning

Warning: Please read the following instructions carefully.

1) Operation Safety

- Before taking any action, please read all the information provided carefully, and keep the guidance documents safe;
- Ensure that any procedure and installation are correctly carried out. This product has been designed to a certain water-proof level. However, it is vulnerable to water ingress when the lid is open or if the cable gland has not been sealed properly.

2) Warning

- This product must not be disassembled under any circumstances, to do so will void the warranty and may leave the product in a dangerous state;
- If all the above are not followed, the manufacturer cannot be held responsible for any damage and injury caused to the users.

3) Caution

- Danger of explosion if battery is incorrectly replaced. Replace only with the type recommended by the manufacturer. Observe any warnings specified by the battery manufacturer.
- When disposing of the batteries, please contact your local authorities or dealer and ask for the correct method of disposal.

9. Contact

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