



LAB: Outdoor gateway

**Workshop on LPWAN Solutions for the Internet of Things
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This guide

is a concise version of the full documentation at

<https://doc.rakwireless.com/rak7249-macro-outdoor-gateway>

It does not replace the full guide!

... but it gives you the most important steps for this Lab

There is lots more to read, for example about

advanced configuration, outdoor deployment

What's in it?

What's included in the Package?



Figure 2: RAK7249 Macro Outdoor Gateway Package Contents

Before power, antennas!

First Time Power Up

1. Attach the antennas

First and foremost screw on the antennas. All 4 of them should be installed (**WiFi**, **LoRa®**, **LTE** on the top, and **GPS** on the bottom).

Warning:



Do not power the device if any antenna port has been left open. In case you do not desire to use one or more, make sure to terminate the port with a **50 Ohm load**.

2. Power on the Gateway

It is recommended to use a **CAT5 Cable** to provide power to the Gateway. Attach one end to the **PoE injector** and the other to the **Ethernet Port** on the bottom of the casing.

Once you have power, get access

Accessing your Gateway

Wi-Fi AP Mode

By default, the LoRaWAN™ Gateway will work in Wi-Fi AP Mode which means that you can find an SSID named like "**RAK7249_XXXX**" on your PC's Wi-Fi Network List. "XXXX" is the last two bytes of the Gateway MAC address.

Notes:

The WEB management platform can be accessed through the IP address of the LoRaWAN Gateway provided below through the use of a browser.



1. No password is required to connect via WIFI
2. IP Address: 192.168.230.1
3. WEB Management Platform username & password : root

WAN Port DHCP IP

When a DHCP Server is in the network where the Gateway WAN interface is located, the WAN interface can automatically get the an IP Address. After inquiring the IP address of the Gateway through the DHCP Server, the WEB management platform of the Gateway can be accessed through the aforementioned IP Address.

Web GUI

Web Management Platform

This document describes in detail the functionality of the Web Management UI. It is based on OpenWRT and is shared among all gateway products of RAKwireless Commercial Gateway line.

To get started open the browser, enter the IP address of the gateway, and open the login page of the WEB Management Platform. Type-in **root** as the username and password and click login. You can check the credentials needed for accessing the WEB Management Platform from the [Accessing your Gateway](#) document.

Next to read:

[Status Page](#) →

Web GUI - overview page

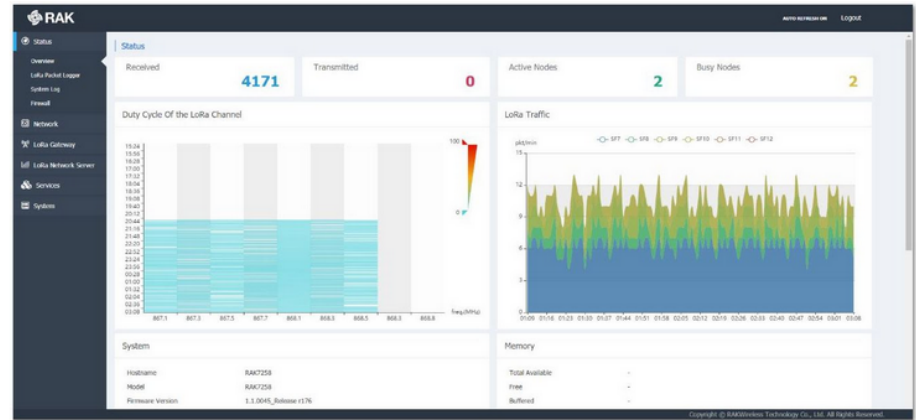
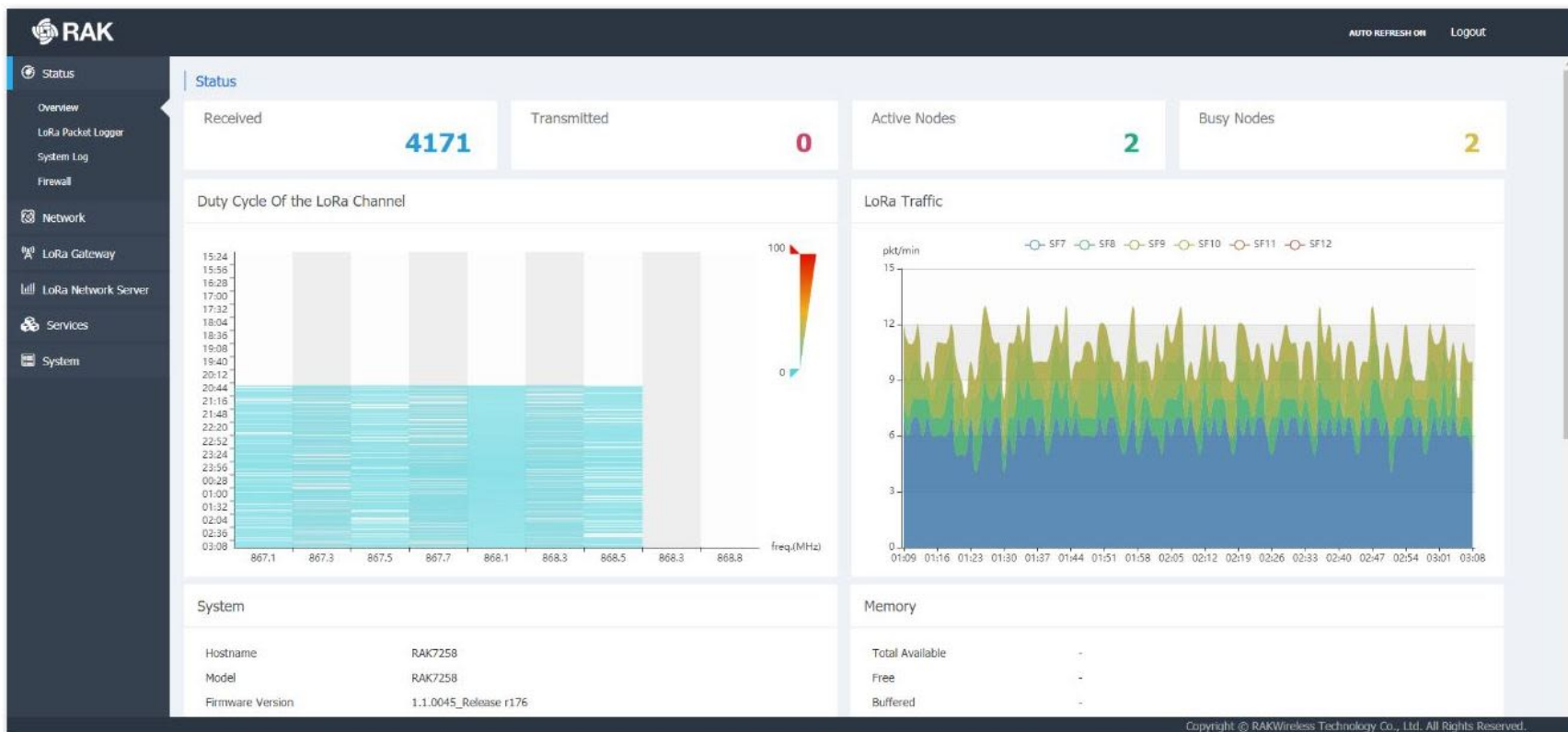


Figure 1: Status Overview of the WEB Management Platform.

The following are the parts of the Overview window:

- **Received:** Shows the total number of uplink LoRa® messages received by the gateway.
- **Transmitted:** Shows the total number of downlink LoRa message sent by the gateway.
- **Active Nodes:** Shows the number of active LoRaWAN™ Nodes within the LoRaWAN™ Gateway coverage. (Those that have sent no data for more than 10 min are discarded from the count.)
- **Busy Nodes:** Shows the number of busy nodes within the LoRaWAN™ gateway coverage (Nodes with an average message spacing of less than 60 seconds.)
- **Duty Cycle of the LoRa® Channel:** The graph represents the Duty Cycle load by frequency channel (Data is kept for the last 12 hours). The minimum resolution along the time axis is 60 seconds. Each value is an average over 60 seconds. The values are color code – green to red, low to high.
- **LoRa® Traffic:** The graph shows the packet per minute rate as a function of time. Above the image, one can see the color-coding of the different Spreading Factors, where the actual height of the values is a sum of all the packets over all spreading factors for the time sample.

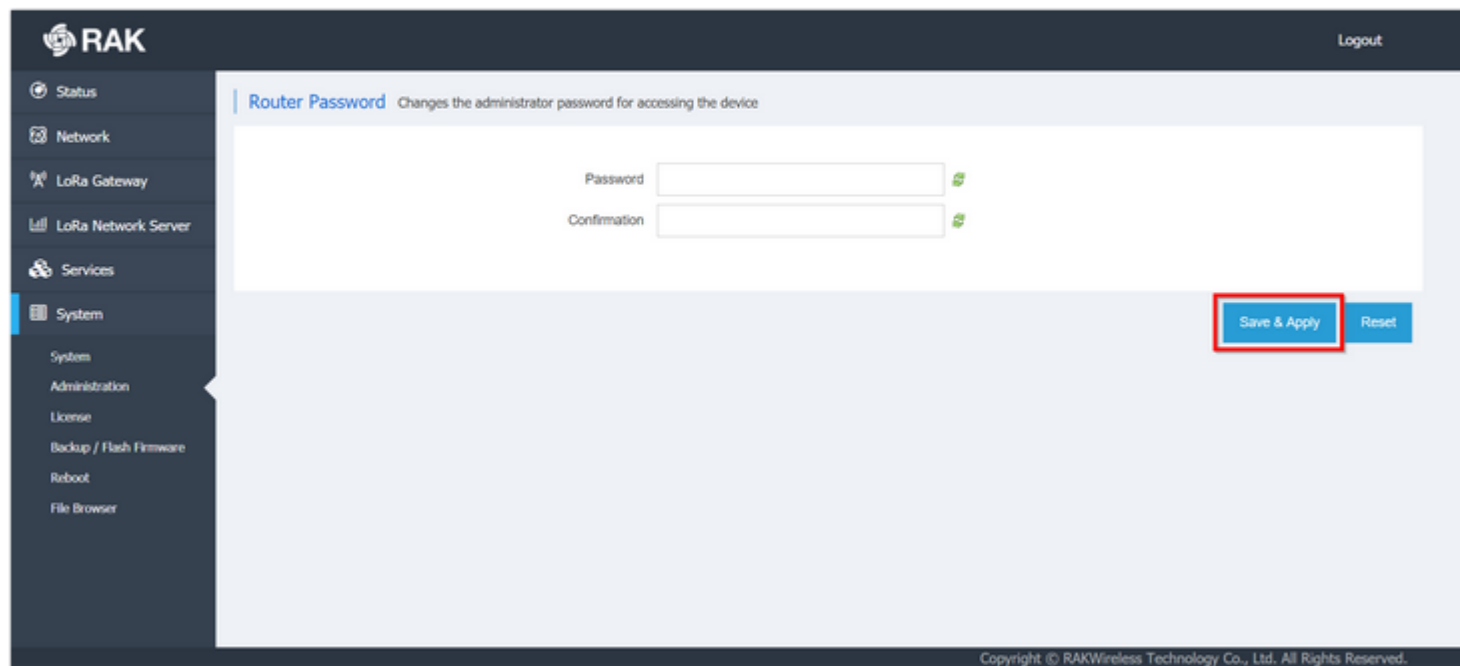
Web GUI - menu navigation



First things first: change password

2. Administration

This is where you change the administration password of the device.



The screenshot displays the RAK administration interface. On the left is a dark sidebar with a menu containing: Status, Network, LoRa Gateway, LoRa Network Server, Services, and System (highlighted). Under 'System', there are sub-items: System, Administration, License, Backup / Flash Firmware, Reboot, and File Browser. The main content area has a dark header with the RAK logo and a 'Logout' link. Below the header, the 'Router Password' section is active, with a subtitle 'Changes the administrator password for accessing the device'. It contains two input fields: 'Password' and 'Confirmation', each with a green eye icon for toggling visibility. At the bottom right of the form area, there are two buttons: 'Save & Apply' (highlighted with a red rectangle) and 'Reset'. The footer of the page reads 'Copyright © RAKWireless Technology Co., Ltd. All Rights Reserved.'

Figure 2: Administration panel

Network: ethernet

Network Configuration

1. WAN Interface

The screenshot shows the RAK Network Configuration web interface. The left sidebar contains a menu with the following items: Status, Network (selected), WAN Interface, LAN Interface, Wi-Fi, Static Routes, Diagnostics, Firewall, Ping Watchdog, LoRa Gateway, LoRa Network Server, and System. The main content area is titled 'WAN Interface' and displays the following configuration details:

- Status:**
 - Uptime: 0h 2m 37s
 - MAC-Address: 60:C5:A8:74:D2:F1
 - RX: 142.27 KB (1826 Pkts.)
 - TX: 2.42 MB (2958 Pkts.)
 - IPv4: 192.168.50.60/24
 - IPv4: 169.254.210.241/16
- Protocol:** A dropdown menu currently set to 'DHCP client'.
- Use DNS servers advertised by peer:** A toggle switch is turned on. A note states: 'If unchecked, the advertised DNS server addresses are ignored.'
- Use gateway metric:** A text input field containing the value '0'.
- Override MTU:** A text input field containing the value '1500'.

At the bottom right of the configuration area, there are three buttons: 'Save & Apply', 'Save', and 'Reset'.

Figure 1: WAN Interface Configuration

The user can check the Status (Uptime, IPv4 Address, etc.), or configure the protocol to be used in connecting to your provider's network. The following options are available: **DHCP/PPPoE/static IP** address.

Network: Wi-Fi

3. Wi-Fi

RAK Logout

Status

Network

WAN Interface

Cellular Interface

Wi-Fi

Firewall

Diagnostics

Ping Watchdog

LoRa Gateway

LoRa Network Server

System

Wi-Fi

Radio

Wireless network is enabled [Disable](#)

Mode

Channel

Wi-Fi Access Point

ESSID

Encryption ☒ No Encryption

Key

[Save & Apply](#) [Reset](#)

Figure 3: Wi-Fi Configuration

Enabling/Disabling the Wi-Fi is done from this page via the blue button at the top. Additionally, you can pick a radio channel or leave it on Auto configuration. The Wi-Fi can work in one of two modes:

Access Point - By default, there is no password. One can access the Web UI via the IP address: **192.168.230.1** once connected to the AP. The SSID is "**RAK7249_XXXX**" by default.

Client - Choose this option to use Wi-Fi as a back haul for the Gateway. You need to manually enter the **SSID**, **Encryption method** and the **Key** itself.

LoRaWAN

LoRaWAN™ Gateway Configuration

All settings related to the LoRaWAN™ Gateway's performance can be found in this section. Setting those in an optimum matter will ensure that packets from end nodes are forwarded correctly, nodes are registered and errors are avoided.

1.LoRa® Packet Forwarder

As this is the backbone of the LoRaWAN™ Gateway, the number of settings and options is greatest in here. Thus, this section will be larger and provides information in more details than the previous ones. For the aforementioned reasons this section has several configuration tabs, which are listed in the following paragraphs. Additionally some of the configuration options have their own documents, with detailed explanation of the configuration process.

The screenshot shows the RAK LoRaWAN Gateway Configuration web interface. The left sidebar contains navigation links: Status, Network, LoRa Gateway (selected), LoRa Packet Forwarder, LoRa Gateway MQTT Bridge, LoRa Network Server, Services, and System. The main content area is titled 'LoRa Packet Forwarder' and 'LoRaWAN Packet Forwarder Configuration'. It features three tabs: 'General Setup', 'Packet Filter' (active), and 'GPS Information'. The 'Packet Filter' tab contains the following configuration fields:

- Gateway EUI: 60c5a8ffe766232
- Protocol: Semtech UDP GWMP Protocol (dropdown)
- Server Address: router.us.thethings.network
- Server Port Up: 1700
- Server Port Down: 1700
- Push Timeout (ms): 200
- Statistic Interval (s): 30
- Keepalive Interval (s): 5
- Automatic data recovery: ☐ Data messages are automatically stored when the connection to the server is lost
- Auto-restart Threshold: 30
- Log Level: NOTICE (dropdown)
- Import Frequency Plan Template: --Select Frequency Plan-- (dropdown)
- Standard Frequency Setup Mode: [Switch to Advanced Mode](#)

At the bottom of the configuration area is a 'Frequency Plan' section. The footer of the interface includes the text: 'Copyright © RAKWireless Technology Co., Ltd. All Rights Reserved.'

LoRaWAN

General Setup

Additionally, there is a field for adding the Standard LoRa® Channel and FSK channel (you need also choose the SF, Bandwidth and data rate of each of the aforementioned).

This is where the core settings are: **Gateway EUI, Frequency channels**, etc.

1. Gateway EUI

The value in this field is necessary for registering your gateway with any LoRaWAN™ Network Server.

2. Protocol

You have three options, which define how the Gateway will function:

- **Semtech UDP GWMP Protocol:** By default, this is the Semtech Packet Forwarder, which sends packets to the Server Address of your choice (IP or URL). By default it points to the local TTN router. The **default port value** is **1700** used by TTN. One can also set parameters as the Statistic Interval (s), Push Timeout (ms), and the Auto-quit Threshold.
- **LoRaWAN™ Gateway MQTT Bridge:** By choosing this option, you make the Gateway act as a bridge to the MQTT Broker, which is hosted somewhere separate. You need to configure the Gateway to point to the correct address of the MQTT broker
- **Built-in LoRa® Server:** In case you require an integrated solution where the LoRa® Network Server is hosted on the gateway itself you choose this option. The configuration of the LoRa® MQTT Bridge itself is done in a separate section of the configuration UI, which is discussed in Paragraph 3.3.2

3. Frequency Plan Template

Currently, the Indian, Russian and European Union bands are supported. After selecting the appropriate choice and pressing the Import button, the Concentrator module settings at the bottom of the page will be populated automatically.

Please refer to the [Custom Frequency Plan Configuration Manual](#) for details on how to edit the settings in order to have your choice of channels to be used by the Gateway.

LoRaWAN

Frequency Plan

This part of the page is common for all gateway from the RAK72xx series. However, there are variations on the number of Concentrator modules installed. The difference is when there is a second Concentrator is that first has to be configured and second only needs the fields for the central frequencies for Radio 0 and Radio 1 be set.

There are two mode for setting the frequencies:

- **Standard Mode:** You can start by importing a region via the drop down menu (EU868 is the default one). You will get the defaults channels for the chosen frequency band and the option to add additional ones. Simply enter the frequency in the text box (in MHz) and click the "Add" button. You can add as many channels as you need as long as they fall in the Regional band. Additionally for the LoRa® Standard and FSK channels, you are also required to select the Bandwidth and Data Rate.

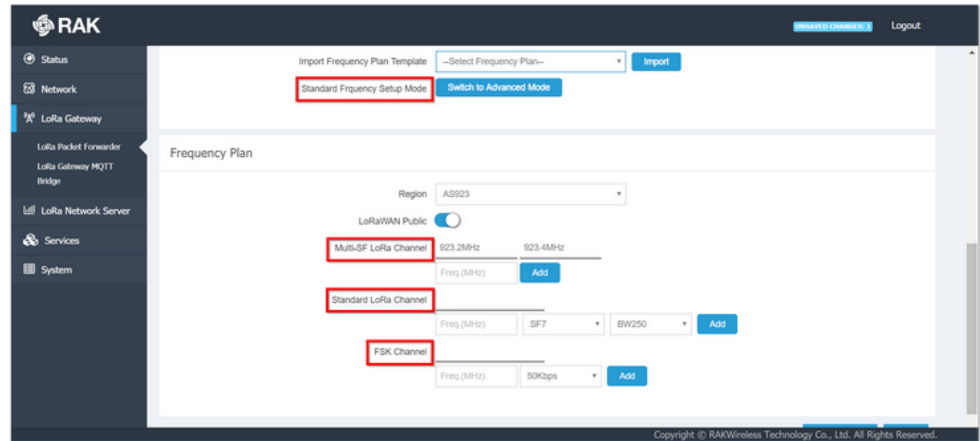


Figure 2. Frequency Plan (Standard Mode)

- **Advanced Mode:** Because of the presence of double SX1257s, you need to configure the two radios separately. You have eight Multi Spreading Factor Channels, The LoRa® Standard Channel and the FSK Channel. The sliders can enable or disable those, so you can choose to have any number of them active. Additionally you can choose which radio to use for a given, channel as long as you do not assign more than five channels per radio. In order to set the desired channel to a given frequency you need to input an offset value in the **If field**. Thus, the channel frequency will be the central frequency (Radio 0 Freq or Radio 1 Freq parameter) summed with the offset value (in Hz). As mentioned before you can choose to import those settings for the Indian, Russian and EU Regions (in accordance with the LoRa Alliance® specifications).

For details on the procedure refer to the [Custom Frequency Plan Configuration Manual](#).

Now we are ready to register on TTN

REGISTER GATEWAY

Gateway ID

A unique, human-readable identifier for your gateway. It can be anything so be creative!


uganda-test-indoors 

☐ **I'm using the legacy packet forwarder**

Select this if you are using the legacy [Semtech packet forwarder](#).


Description

A human-readable description of the gateway

our first indor gateway 

Frequency Plan

The [frequency plan](#) this gateway will use

Europe 868MHz 

Router

The router this gateway will connect to. To reduce latency, pick a router that is in a region which is close to the location of the gateway.

ttn-router-eu 

Location

The exact location of you gateway. This will be used if your gateway cannot determine its location by itself. Set a location by clicking on the map.

