RAK

LoRa Gateway Developer Kit

RAK831 & Raspberry Pi & Converter Board

RAK831

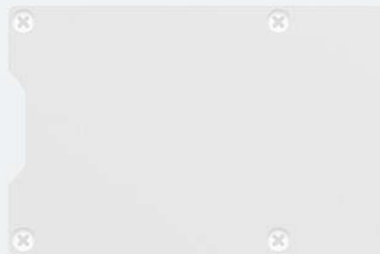Raspberry Pi

GPS Antenna

Converter Board

Raspberry Pi Casing

16G TF Card

LoRa Antenna

Micro USB

RAK831 LoRa/LoRaWan Gateway Developer Kit with Raspberry Pi and MAX-7Q GPS

What is RAK831 LoRa Gateway Module?

RAK831 is an RF front end of a LoRa gateway. It is able to receive on different frequency channels at the same time and is able to demodulate the LoRa signal without knowledge of the used spreading factor of the sending node.

With the compact design, this is an ideal module product to help you realise the whole LoRa system development. With the USB-SPI converter module FT2232, you can quickly develop the software on your PC. Also, you can integrate the concentrator module in your production products to realise the LoRa gateway function. This is an economical way to address for a huge variety of applications like smart grids, intelligent farming, and other Internet of Things (IoT) applications.

The RAK831 needs a host system like Raspberry Pi or WasAP (OpenWRT based) or WisCam for proper operation. the host processor can be a PC or MCU that will connected to RAK831 via USB or SPI.

Kit Includes

- RAKwireless RAK831

- Raspberry Pi 3 Model B

- GPS Antenna

- Converter Board

- Raspberry Pi Casing

- LoRa Antenna

- Micro USB Cable

- 16GB TF Card

Frequency Bands

- 433 Frequency Band: 433MHz - 435MHz

- 470 Frequency Band

o RX: 470MHz - 490MHz

o TX: 490MHz - 510MHz

- EU868 Frequency Band: 865MHz - 872MHz

- AS923 Frequency Band: 923MHz - 925MHz

- AU915 Frequency Band: 915MHz - 928MHz

- US915 Frequency Band: 902MHz - 928MHz

TF Card details
The TF card contains all the necessary drivers and TTN gateway code pre-installed for developers to get their gateways up and running in no time.

Benefits of using this board

- Developers need not go through tons of documents to get their gateway setup. This card has all the software included to start right from day one

- Test commands for gateway components are pre-built and ready to be used out of the box.

- Note: Developers are encouraged to open an account on the TTN website and change the configuration parameters as per need.
  Fully assembled
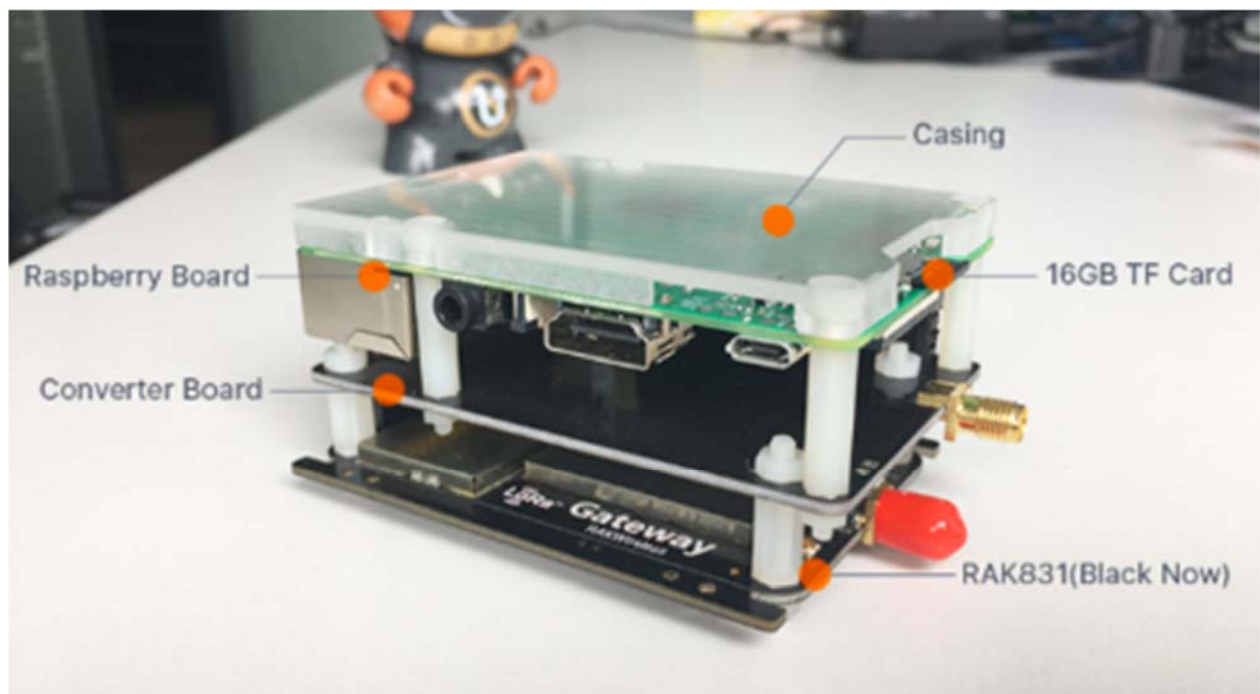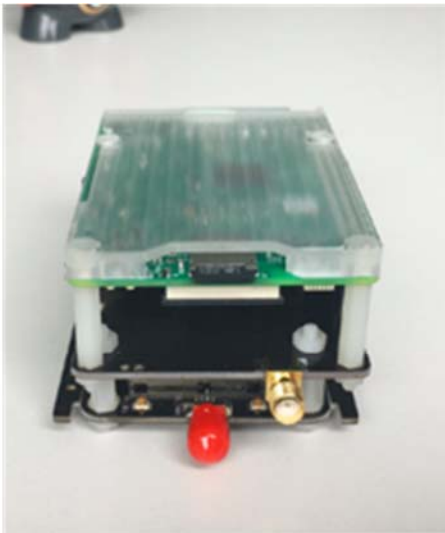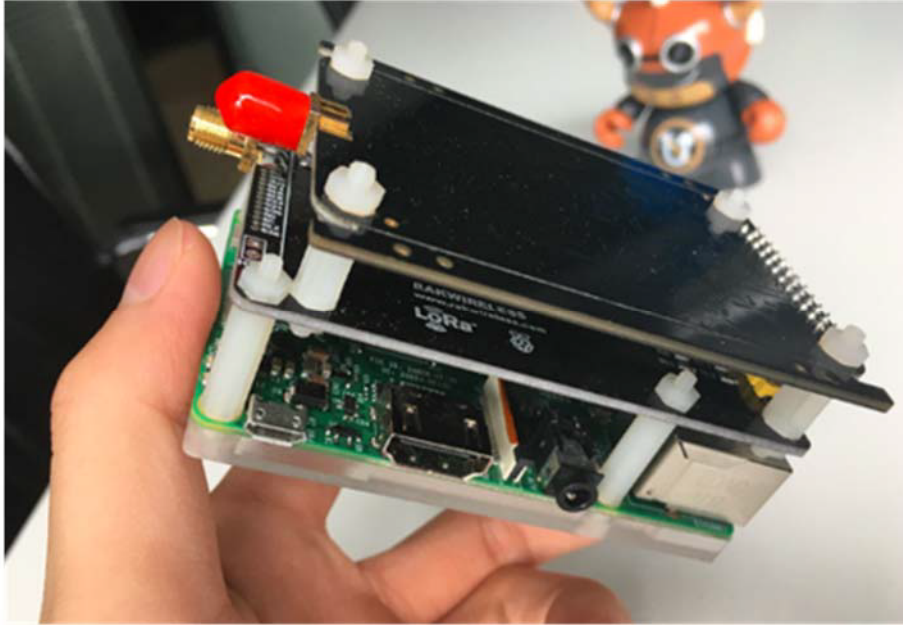
Why do we need LoRa gateways?

Public utilities (gas and other instruments, municipal pipelines, street lamps, landfills), large areas of livestock and agricultural irrigation, extensive layout and harsh weather, hydrology, mountain data collection, mines and remote outdoor operations; they suffer from...

- Insufficient signal coverage - low strength and cannot guarantee data stability.

- Power consumption - It is difficult to have a sustainable power supply in harsh environments.

- Low economic efficiency - Low utilization rate, occupation of network resources, high cost.

LPWAN Solution
LPWAn is a very good solution to the above problems

Complex urban environments can transfer 3 km and open area transmissions can be up to 15 km, penetrating harsh environments to transmit signals.

Sleep/low power mode means power consumption is very low

Supports narrowband data transmission resulting in low cost of network communications.

Supports 8 channels (LoRa Gateways create LPWAN IoT Network)
For example, 7 LoRa Gateway modules can cover the Lower Manhattan area

Key Features

- Based on Semtech SX1301

- Sensitivity down to -142.5 dBm

- Frequency bands 433MHz/868MHz/915MHz

  o 433MHz with 2x SX1255 as Tx/Rx front ends

  o 868/915MHz with 2x SX1257 as Tx/Rx front ends

- USB & SPI interface

- Output power level up to 23 dBm

- Range up to 15 km (Line of Sight)

- RF interface optimised to 50ohm allowing for simple system integration

- Supports 8 channels

- Temperature range from -40 to 85 degrees

- Compact size 80.0 x 50.0 x 5.0mm

- HAL is available form

LoRaWAN

LoRaWAN communication protocol can handle node roaming, base station capacity management, node authentication and other cellular technology requirements, and because of its openness, a large number of R&D companies in the world continuously update and improve the LoRaWAN communication protocol.

Due to the high range a star topology can be used. Compared Star and Mesh topology, we can see the advantages of LoRaWAN on the wireless network.
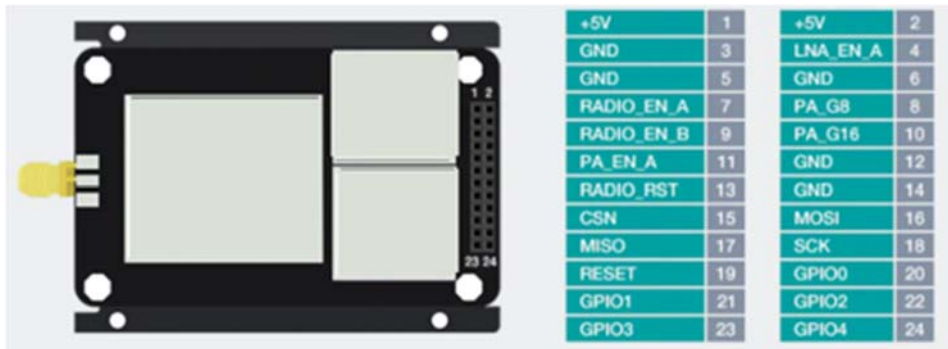
Project	Star	Mesh	Who wins Start	Who wins Mesh
Topology reasons	LoRa long distance Single-hop easy to achieve network range	GFSK short range Multi-hop increase network range	⊖	⊖
Hops	Single-hop Node only communicates with the gateway	Multi-hop Relay node needs to be forwarded	🏆	⊗
Delay	Small Real-time controllable	Large The final receiving time is not controllable	🏆	⊗
Energy saving	Good The node is dormant immediately after sending and receiving	Poor Relay node at any time to listen to forward	🏆	⊗
Extended	Easy Increase the gateway can be	Difficult Need to adjust the network structure	🏆	⊗
Reliability	High Timely detection of lost frames and retransmission	Low Any jump failed This information is inaccessible	🏆	⊗
Complexity	Simple No route forwarding	Complex Need to deal with routing forwarding	🏆	⊗
Capacity	Large Increase the gateway that is to increase the broadband	Medium The more nodes, the more bandwidth transmission	🏆	⊗
Covering the blind spot	Increase the gateway The cost is higher	Increase the relay node The cost is low	⊗	🏆

SX1301 Chip
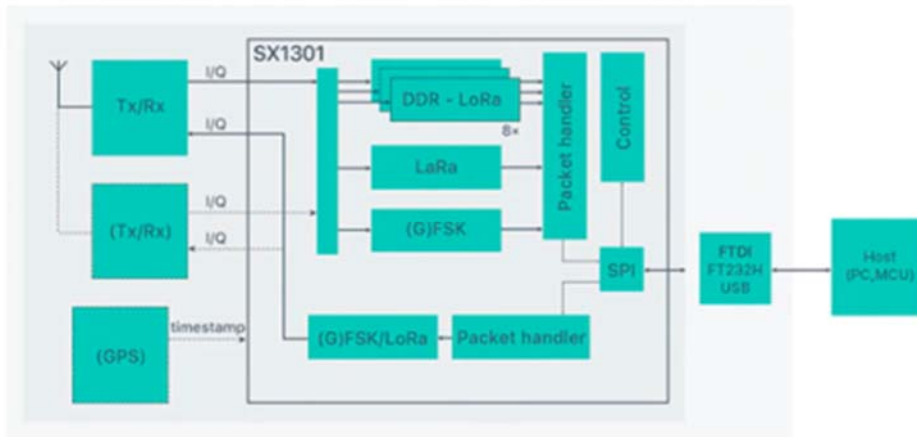
- Up to -142.5 dBm sensitivity with SX1257 Tx/Rx front end

- 70 dB CW interferer rejection at 1 MHz offset

- Able to operate with negative SNR, CCR up to 9 dB

- Emulates 49x LORA demodulators and 1x (G)FSK demodulator

- Dual digital TX&RX radio front end interfaces

- 10 programmable parallel demodulation paths

- Dynamic data-rate (DDR) adaption

- True antenna diversity or simultaneous dual-band operation

- Any combination of spreading factor and intermediate frequency for up to 8 packets is possible

Pinout Description

+5V	1	+5V	2
GND	3	LNA_EN_A	4
GND	5	GND	6
RADIO_EN_A	7	PA_G8	8
RADIO_EN_B	9	PA_G16	10
PA_EN_A	11	GND	12
RADIO_RST	13	GND	14
CSN	15	MOSI	16
MISO	17	SCK	18
RESET	19	GPIO0	20
GPIO1	21	GPIO2	22
GPIO3	23	GPIO4	24

Parameter

Operating Voltage	**DC 5V**
Operating Temperature	-40 to 85
Radio Chipset	SX1301
RF Output Power	23dbm
Input Signal	Not more then -13dBm
GPS Receiver	Optional
Receiver Sensitivity	Up to -142.5dBm (@293bps)
SNR Handling	9dB
Control Interface	SPI
Dimension	80mm*50mm*5mm
Firmware	Gateway HAL
Range	up to 15KM

Potential applications

- Wireless Star Networks
- Remote controls
- Smart metering
- Wireless Sensor
- Wireless alarm and security systems
- M2M
- IoT
- ome/Building/Industrial automation