LoRa - The Beginning of a New Era

Ever wondered what it would be like if everyone had unlimited access to free internet?
Or what if you could exchange information without relying on the internet?
Though how?
Guess what the people's response was when they saw electricity for the first time? Or perhaps you can recall the period when IT (Information Technology) was in vogue?

" Everything seems to be impossible before it's done ".

Every big breakthrough, or maybe I should say invention, has altered how the normal person sees the world.
A significant transition from 2G/3G to 4G had broadened people's vision and even paved the way for several unicorns to emerge and flourish.

Understanding the difference between LoRa/LoRaWAN.

One such Tech stack is - LoRa/LoRaWAN " Long Range Wide Area Network ".
LoRa is a Protocol that can send data to a range of 832 Km(as tested by TheThingsNetwork - conference) without the internet and guess what ?? It's still secure.
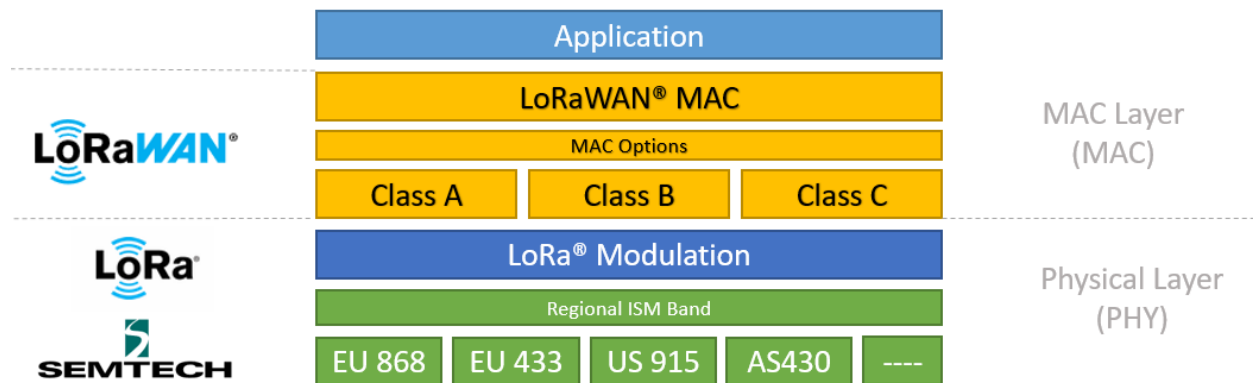
Ref : [LoRa World Record Broken: 832km/517mi using 25mW](#)

Interesting isn't it ??

I will thus provide you with assistance on how to transfer data from a LoRa chip to an application in this blog.
 Hooold a minute…… ,didn't you just mention that LoRa is a protocol and now you say its a chip

Yes my friend , LoRa is a protocol. Come I will show you something.

LoRa is a Hardware over which the LoraWAN works.
In Technical terms LoRa is a Radio signal that carries data and LoRaWAN is a communication protocol that defines the data Transfer.
For example : Consider a bus where LoRa arranges the passenger in a manner that the travel is smooth and peaceful whereas LoRaWAN takes the bus forward like a Driver and all passengers are actually data segments.

LoRa has adapted this technique from Chirp Spread spectrum modulation - similar to the way dolphins and bats communicate!

Simply put, data is divided into multiple segments and distributed randomly throughout the spectrum. As a result, even if a signal is intercepted by an interference device, the data could not be acquired by them; only the receiver has the knowledge or access to reassemble the data into its original form.
   -   This technique makes it more Secure.

You mentioned something about layers ,what does that mean

My friend these are OSI layers - an important concept in the Engineering Multiverse.

Understanding OSI layers.
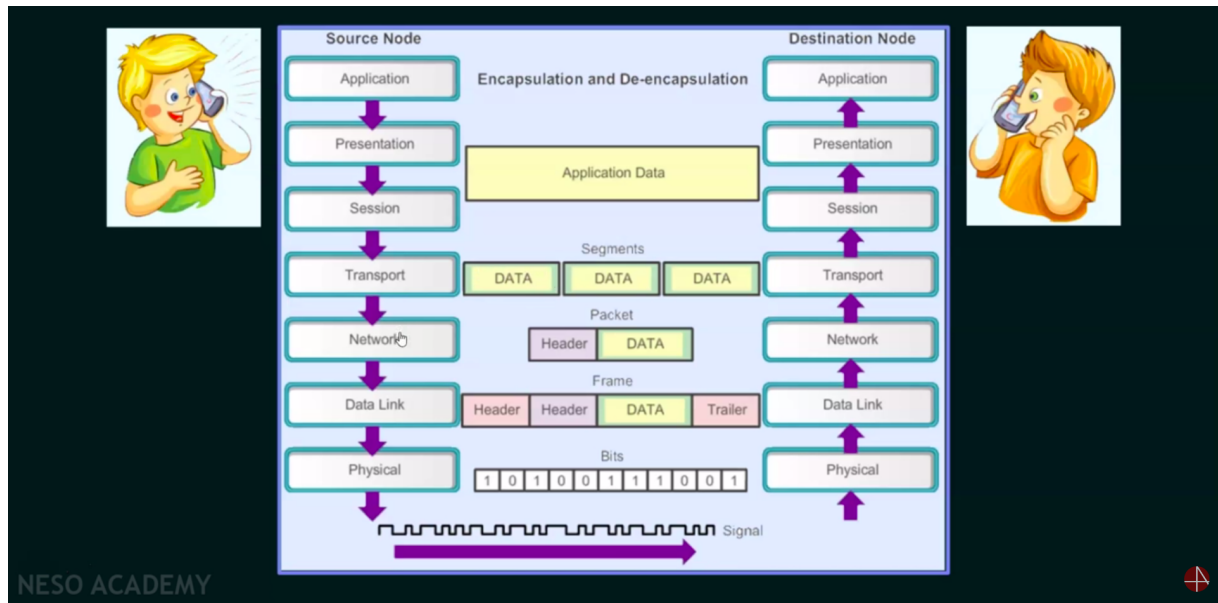
We have 7 layers that single handedly can explain the data transmission and reception.

Similarly LoRaWAN is a protocol that works on Data Link Layer and LoRa works on Physical Layer.

A fun way to remember the 7 layers.

Layer 1: Physical = Please.
Layer 2: Data Link = Do.
Layer 3: Network = Not.
Layer 4: Transport = Touch.
Layer 5: Session = Steve's.
Layer 6: Presentation = Pet.
Layer 7: Application = Alligator.

Understanding LoRa Communication.

Now that you know , what LoRa is ?
Let me show you how the data travels from place to place before reaching the destination in milliseconds obviously.
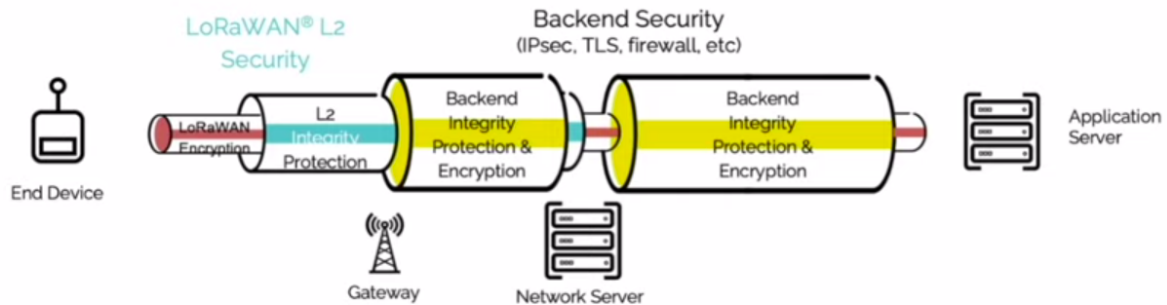
Image source: "Secure + reliable connectivity" webinar hosted by Semtech, Actility and The Things Industries

An end-device is the data generating device or { sensor + LoRa chip }
The data is modulated and encrypted by the LoRa chip and sent to the Gateway - here I have used RAKwireless and TheThingsNetwork .
The data from the gateway can then be sent to Application via Network Server and Application Server.

Gateway- Setup:

Step 1: Download and flash the latest firmware for RAk2245
Link : RAK2245 Pi HAT WisLink LPWAN Concentrator Datasheet | RAKwireless Documentation Center
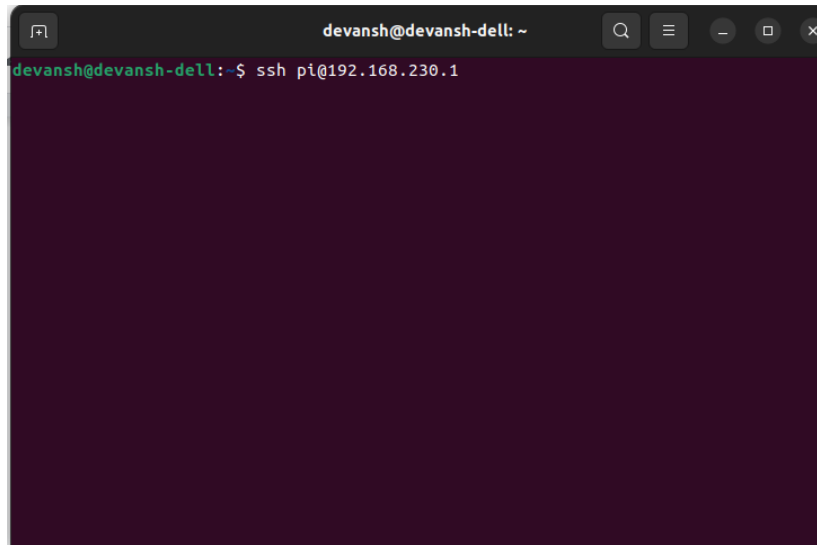
 Step 2: By default, the Gateway will work in Wi-Fi AP Mode which means that you can find an SSID named "Rakwireless_XXXX" on your PC Wi-Fi Network List.

Step 3: Once connected to the RAk-Wifi network, let SSH{Secure Shell Host } access the gateway configuration.

By default IP address is : 192.168.230.1

Default Username : pi
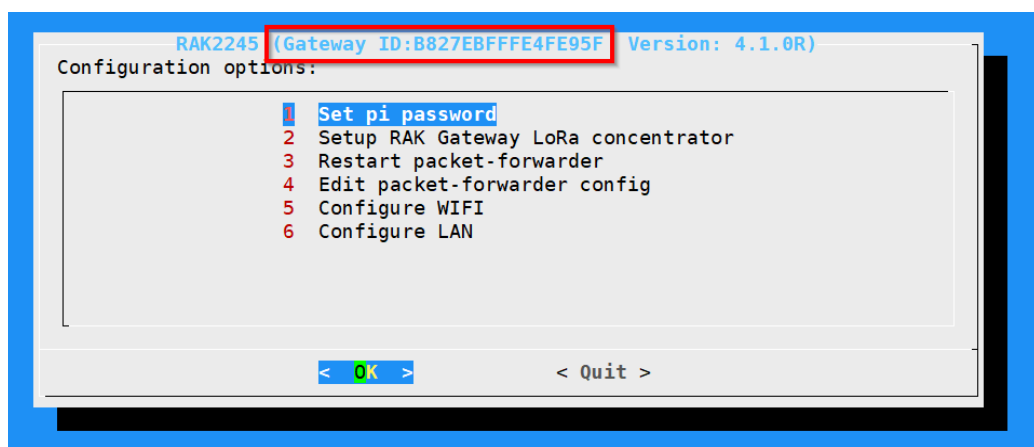
Default password : raspberry

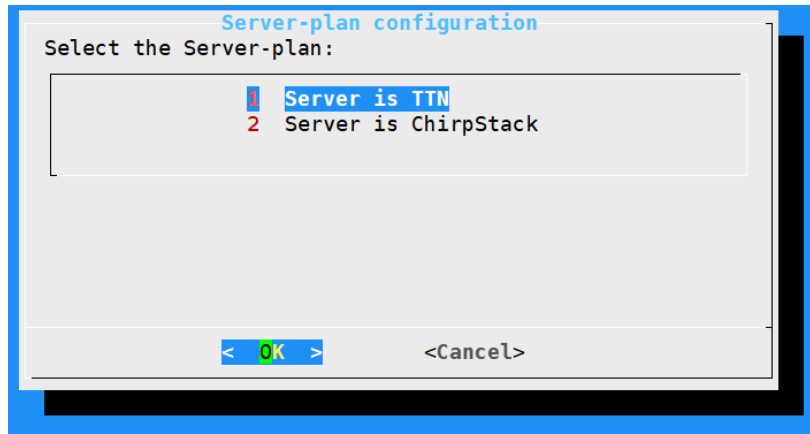Step 4: Now you will get the raspberry-pi shell screen , Enter the command

sudo raspi-config

Step 5: Now we can configure WIFI and connect RAK gateway to our WIFI network.

Step 6: Restart after adding new WIFI and access via SSH

Step 7: Now choose the "Setup RAk ……..concentrator" option.

Step 8: Select "SERVER AS TTN" and select the required frequency plan, For india its IN865.

What is frequency ? and what is this plan? - Dude I only know Jio plans

Relax ,my friend. A frequency plan is same like a jio plan
When you buy a plan you are actually buying access to that particular frequency plan- LoRa uses only free frequency plans.
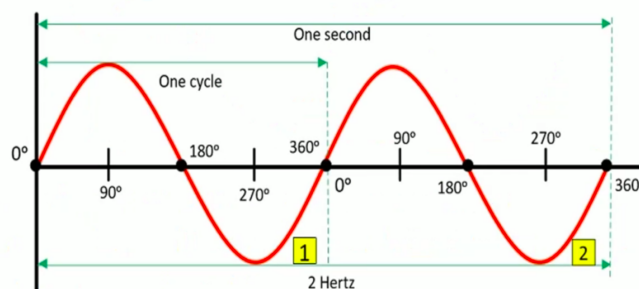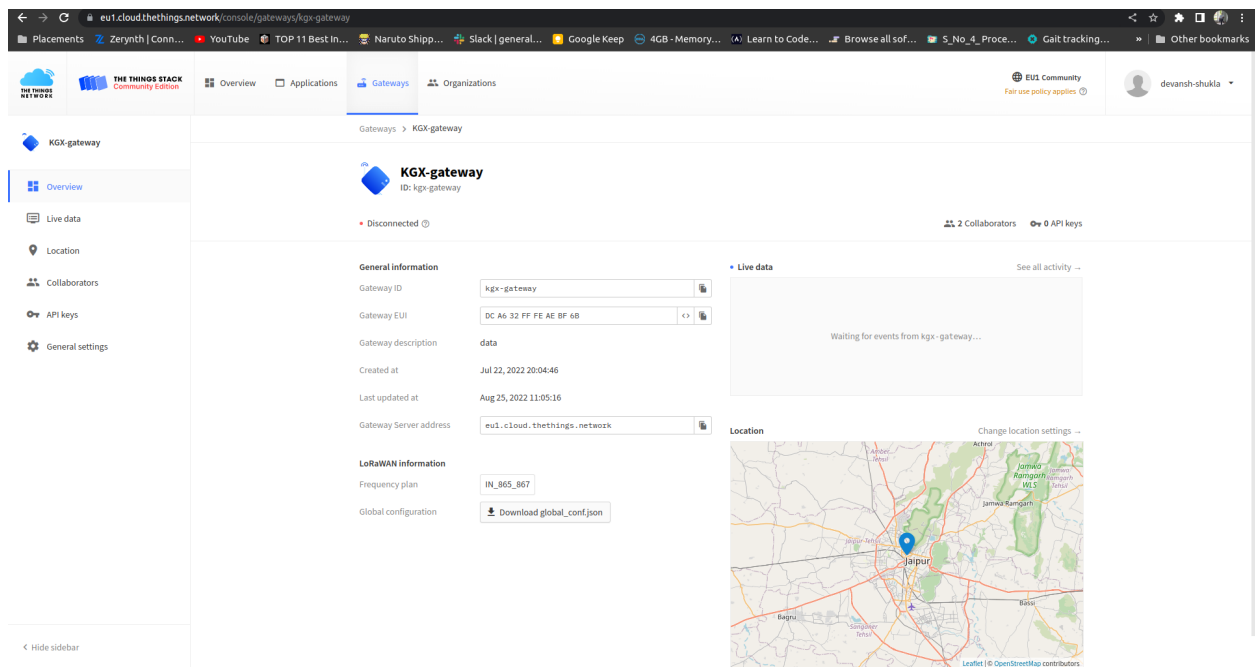

There are different frequencies for different countries.

Step 9: Login to TheThingsNetwork website and create a gateway with the Gateway ID you have.
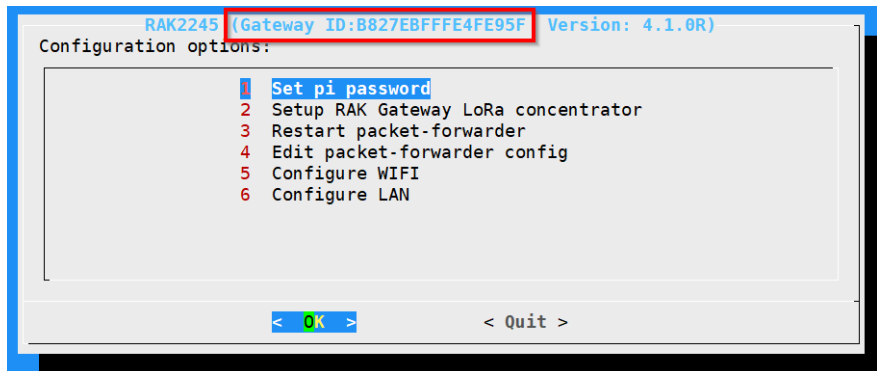
NOTE : Copy the Gateway ID from your RAKwireless hardware and paste in TheThingsNetwork website's "Gateway EUI".

Step 10: Register the Gateway and you can see a screen like this.

A screenshot of my gateway on TheThingsNetwork.
You can see " gateway status " on the website.

Once you see a Connected status, we are good to go.
Ref: RAK2245 Pi HAT Quick Start Guide | RAKwireless Documentation Center

Sending data from LoRa device to gateway:

There are So many LoRa devices to choose from, I would recommend
1. SEEED LoRa E5 Dev Kit {Wio-E5 Development Kit - Seeed Wiki}
2. SODAQ {SODAQ Low power development boards}

Connect your board to your PC and open a Serial Monitor
{ I have used Arduino ide}

NOTE : Create an Application in TheThingsNetwork with device ID of your hardware or you can generate from TTN and update it to the Hardware

Step 1: Register an Application and add a device with its ID.
Step 2: With boards connected to your PC Enter a few AT commands.

- AT+ID // Read all, DevAddr(ABP), DevEui(OTAA), AppEui(OTAA)
- AT+ID=DevAddr // Read DevAddr
- AT+ID=DevEui // Read DevEui
- AT+ID=AppEui // Read AppEui
- AT+ID=DevAddr,"devaddr" // Set new DevAddr
- AT+ID=DevEui,"deveui" // Set new DevEui
- AT+ID=AppEui,"appeui" // Set new AppEui
- AT+KEY=APPKEY,"16 bytes length key" // Change application session key
- AT+JOIN // Send JOIN request
- AT+MSG="Hello from Devansh" // Use to send a string format frame which does not need to be confirmed by the server.

Step 3: You can see the message displayed on the application.

https://medium.com/@rdevanshshukla26