Challenge My First LoRa

Semester 4 IOT

Long Distance Protocols

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Acronyms

Acronym	*Meaning*
IOT	→ Internet of Things
ESP32	→ Expressif32

Table 1 – List of acronyms used throughout the report

Introduction

The assignment on which this document presents a small challenge of IOT subject. In this subject, we will learn how to use hardware to connect to the internet using internet protocols and such. The hardware that is going to be used to demonstrate these protocols is an ESP32. The ESP32 is a microcontroller that is used in embedded systems with an inbuilt wireless connectivity. In the following sections will provide the procedure and conclusion of the assignment.

Procedure

In this challenge, TTGO LoRa32 SX1276 OLED will be used throughout the assignment. This ESP32 board has a built in LoRa chip and an SSD1306 0.96-inch OLED display. With the ESP32 board, we are going to show how to send and receive LoRa packets which is a point-to-point communication and use the OLED to display the values being sent.

LoRa uses different frequency bands for its radio communication in order to avoid interference with other radio services and devices. There are several reasons to why LoRa has different frequency band but one reason is that different regions have different regulation and standard radio frequencies.

The assignment has provided use links and sketch examples for both the sender and the receiver however, you still need to install the necessary libraries and set the right frequency to upload the code.

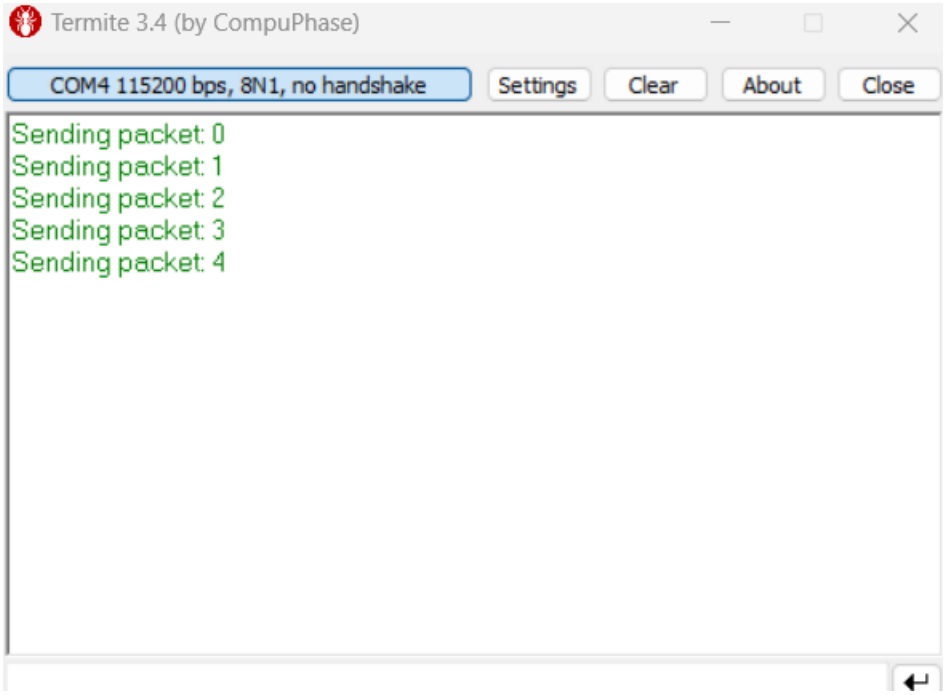

Figure 1 LoRa Sender Serial Monitor

As you can see in the figure above, the counter increments with each packet sent in the serial monitor. While you don't see much information in it, behind the seen the LoRa sender begins encoding the data and divide it into small packets that can be transmitted over the network. These packets are then modulated using a LoRa modulation scheme and then it is ready for transmission.

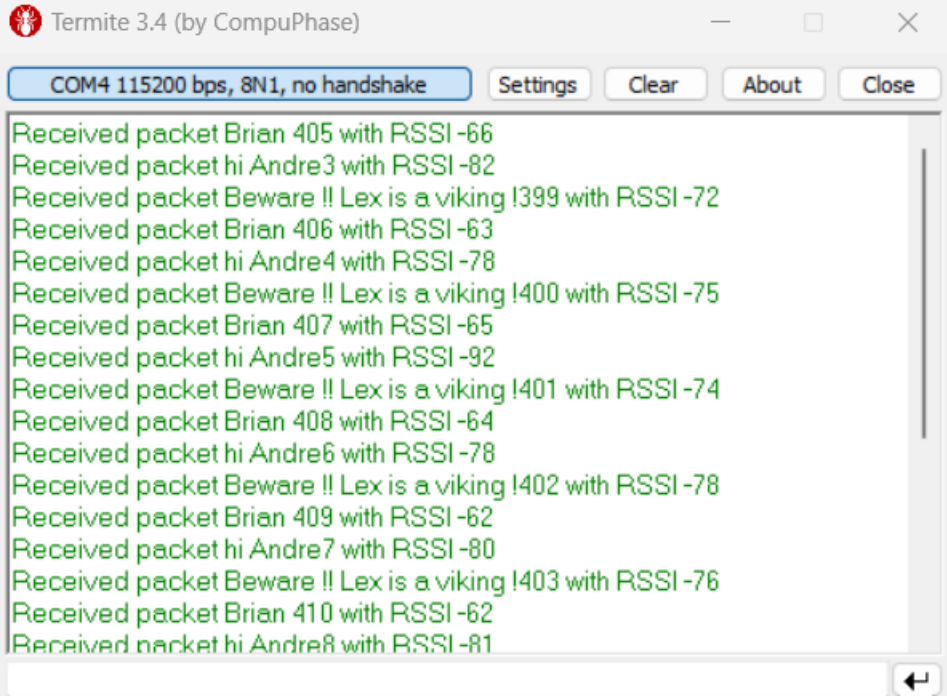

Figure 2 LoRa Receiver Serial Monitor

As you can see in figure 2, at the receiver side, the LoRa signal is being received and converted back into a digital signal. The receiver demodulates the signal to recover the data that is being transmitted and then decoding using the same encoding scheme used at the transmitter side. The decoded data is then checked for errors and these errors are corrected using error correction methods. After the data has passed all these steps, then it is ready to be used for various purposes such display a string message.

At the end of the string message, it shows RSSI with its value. RSSI stands for Received Signal Strength Indication, and it measures the power level of the radio signal that is being received. The RSSI value is usually expressed in dBm (decibels relative to one milliwatt), and it indicates the strength of the signal received by the antenna. A high RSSI value indicates a strong signal while a low value indicates a weak signal. A higher RSSI is less likely to be affected by noise, interference or other factors that can degrade the quality of the signal. There are more factors can determine the received signal and that the RSSI value alone is not always sufficient.

Conclusion

To conclude this assignment, we learned how to connect and transmit data messages using LoRa protocol. The benefit of using the LoRa protocol is that you can use it long distance with low power consumption. It can benefit in situations like large green houses where you monitor the soil of the plants or smart industries for predictive maintenance and remote monitoring. Overall, LoRa is a versatile wireless communication technology that require long-range and low-power consumption. I hope that we can use this learning outcome of this assignment in the upcoming projects

Reference

Strobistar, Santos, S., Tony, NguyenVu, Gilbert, Sergi, K., D., Graham, Larry, Neil, Ralph, Jp, Tomtom, Straw, J., Eulamie, Alvim, E., Seixas, M., Nuno, Tanny, … Jaeil. (2020, November 23). *ESP-mesh with ESP32 and ESP8266: Getting started*. Random Nerd Tutorials. Retrieved March 19, 2023, from https://randomnerdtutorials.com/esp-mesh-esp32-esp8266-painlessmesh/