LoRaWAN and The Things Network

Semester 4 IOT

IOT Challenge

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Acronyms

Acronym	*Meaning*
IOT	→ Internet of Things
ESP32	→ Expressif32
TTN	→ The Things Network
LoraWAN	→ Long Range Wide Area Network

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 the previous assignment, we get to know how TTGO LoRa32 SX1276 OLED broadcast messages and learn about the RSSI value means. By using that knowledge acquired in the previous assignment, we are going to extend it by connecting to the TTN. TTN also known as The Things Network is a global ecosystem that creates networks, devices and solutions using LoRaWAN. The Things Network runs The Things Stack Community Edition, which is a crowdsource, open and decentralized LoRaWAN network. This network is a great way to get started testing all sorts of devices, applications and integrations and get acquainted with LoRaWAN.

We first check if we are in range of a LoRa TTN. By using the information provided by one of the links in the assignment. We get to see if our current location is being covered by the network to proceed further in the assignment. (See figure 1)

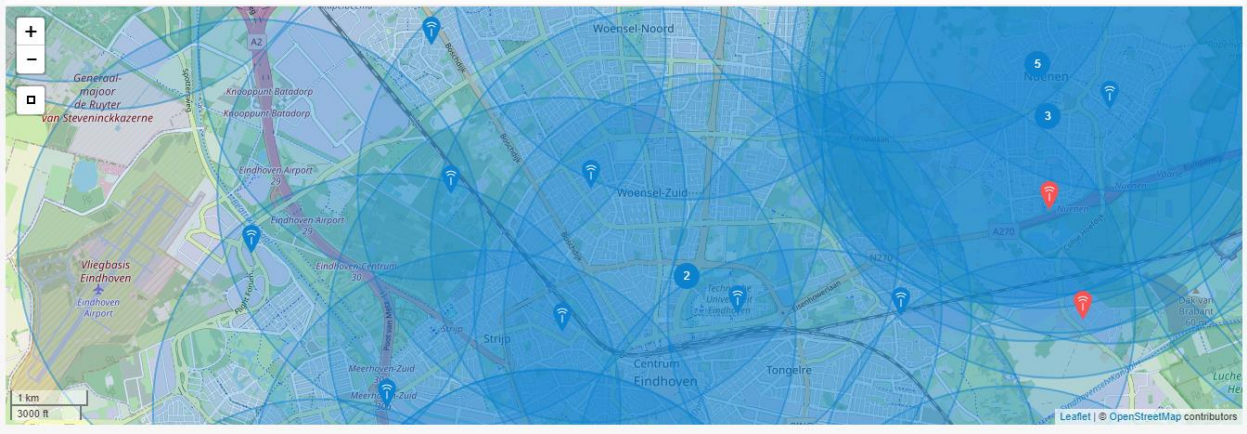

Figure 1 TTN network coverage

Now we see that we have multiple networks in our area, we can proceed further by connecting the LoRa device to the TTN. You will need to create an account first before following a few steps to be able to access the TTN console. After creating an account, you also need to create an application in the TTN network and fill the necessary data for the application name and some keys/IDs generated by the TTN. The configuration for this is also provided by the assignment and it shows the steps that we need to follow.

After successfully creating the application, you need to enter the network, application and device key generated by the application to the LoRa device in the code provided by the assignment. After configuring the code, the frequency plan also needs to be set to the correct frequency of the country. The frequency plan defines the data rates that the device is setup to use. It is important that the device within reach use the same frequency plan to be able to communicate. The device frequency can be located in the library header configs.

Now that everything is configured and uploaded to the device, we should be seeing data's being sent to the TTN by running the code. The device will send a string message periodically to the TTN application. (See figure 2)

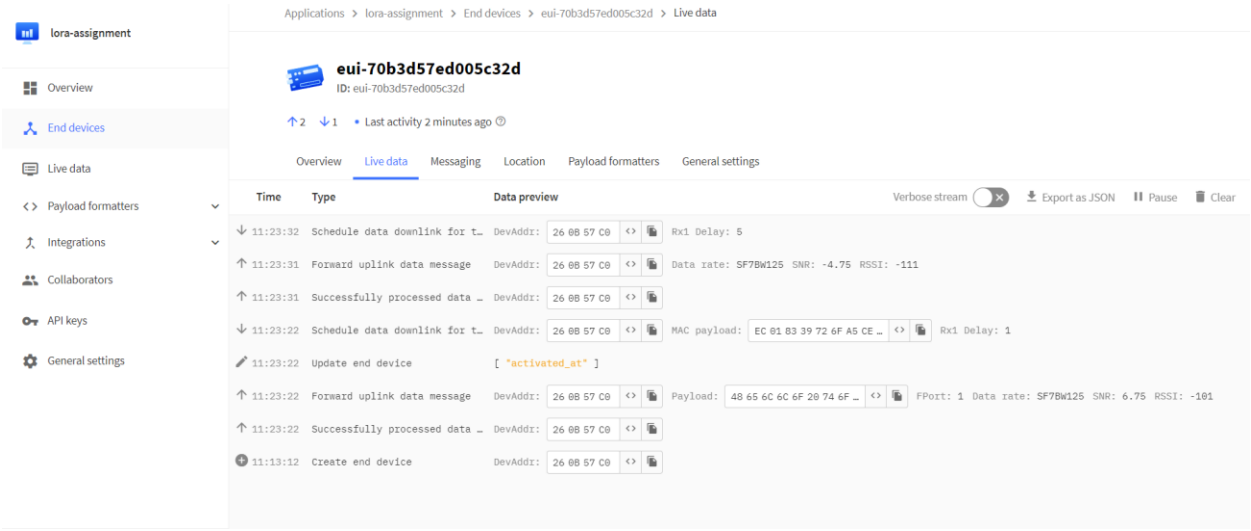

Figure 2 TTN Console

As you can see on the figure above, live data is being received in the console application. The data sent by the device is converted into hexadecimal payload due to several reason:

- LoRa is a low-power, long-range wireless communication protocol designed for IoT devices and therefore data efficiency is essential to transmit data due to limited power and bandwidth.
- Hexadecimal payloads are less prone to errors and data corruption during transmission compared to plain text strings. Using this method, the receiving device can easily perform error detection and correction to ensure the integrity of the transmitted data.
- Hexadecimal payloads ensure combability with various types of data including binary data.

Now that we received the data message, we need to convert the message using an online converting tool to convert hexadecimal into ASCII characters. (See figure 3)

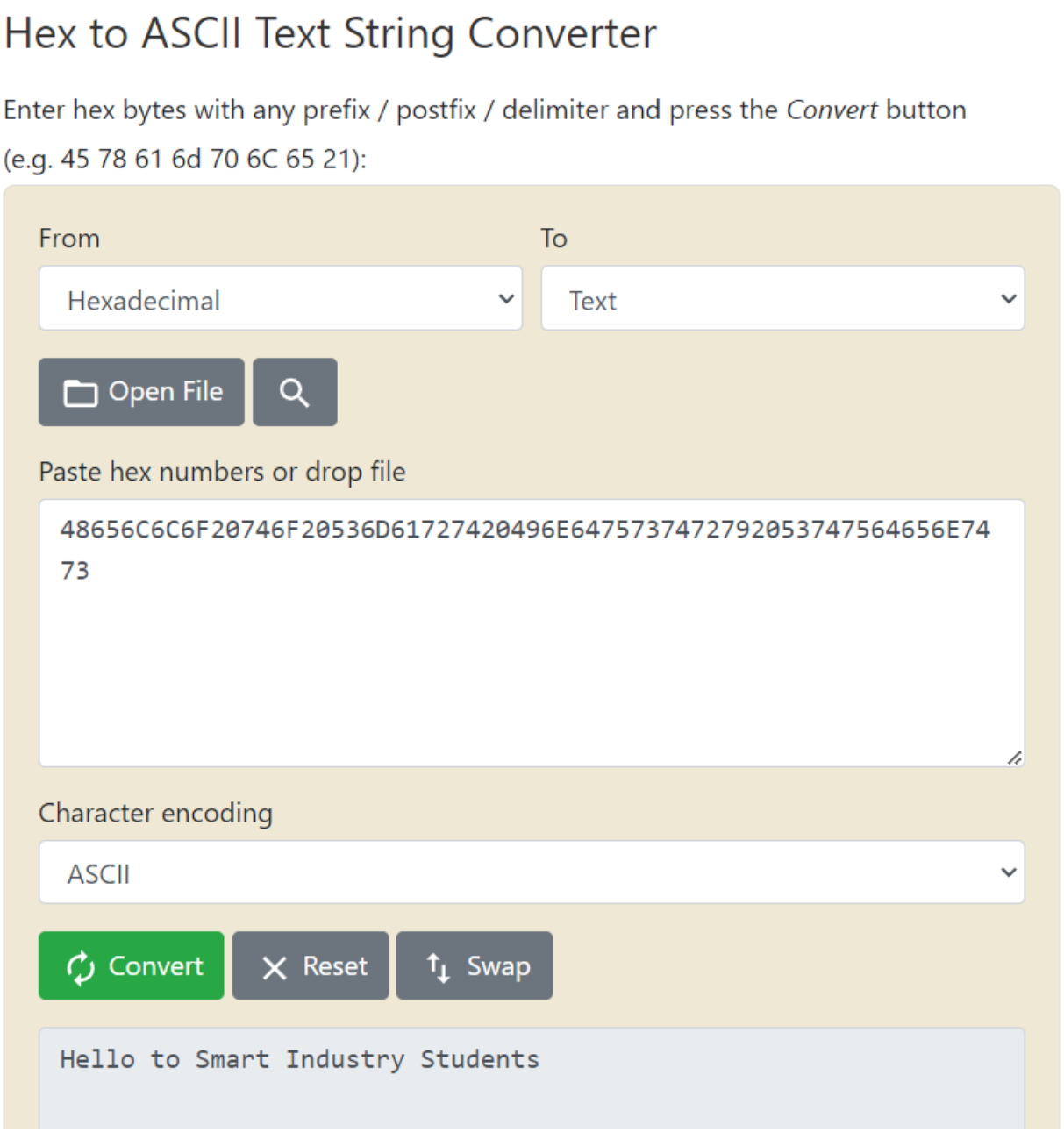

Figure 3 Online Converting Tool

After conversion of the data, you can see the message that we sent from the device.

Conclusion

To conclude this assignment, we gained knowledge about The Things Network and how can we use our devices to communicate to the IoT network. This assignment shows us how we can secure our broadcasted data using keys/IDs generated by the application and also received also have an extra layer of security for data transmission. LoRaWAN is great way to learn about TTN due to its open-source and it is community driven that provides decentralized LoRaWAN infrastructure. I hope that we can use the learning outcome of this assignment in future projects.

Reference

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