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Summary

The goal of this week was to build the network environment for the project. To solve several issues *454P* encountered while configuring the network, team members tried to figure out how to connect the gateway to the LoRaWAN network server. There was a discussion with Professor Smith and Professor Hands about the network and security issues that may arise during the project.

What 454P completed this week:

- Figured out devices to build local LoRaWAN network [1] and built local LAN

  Conduit with a pre-installed LoRa accessory mCard and mDot Box are the devices included in the 'MultiConnect Conduit IoT Starter Kit for LoRa Technology' for constructing the LoRaWAN network. Conduit serves as a network server and a gateway for the LoRaWAN network. The MDot Box serves as a client. For this research, setting up a local LoRaWAN network is required. Since the local LAN is constructed by the team, the application server can access the network server via SSH and use the IP address to communicate with each other. However, a connection between the conduit and the application server via LoRa connection was not established. In this project, ResIoT is chosen to be the application server. However, as ResIoT is hard to set up on the conduit, team members decided to change the application server to ChirpStack[2], and will try to set it up next week.

- Constructed LoRaWAN network server and application server

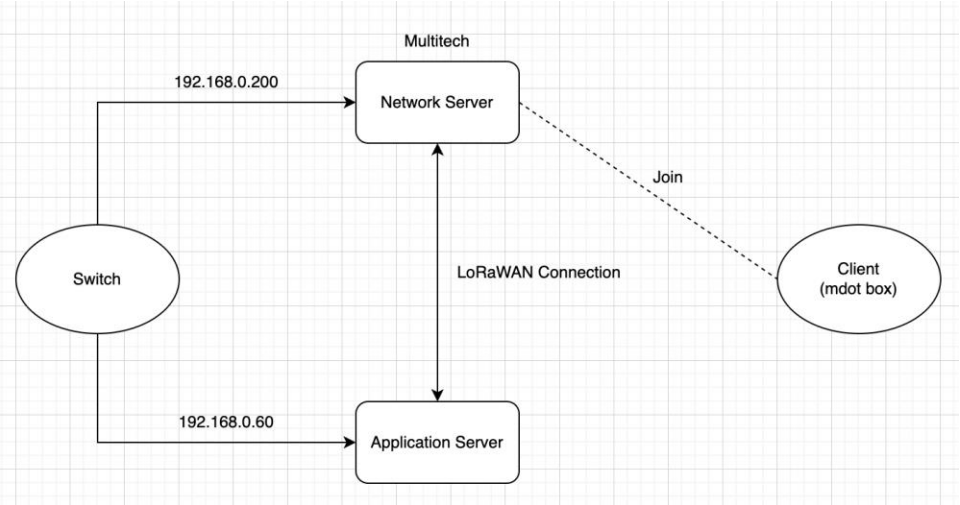

Fig. 1. LoRaWAN network architecture designed this week

In order to build the experimental environment for the project, the LoRaWAN network should be constructed locally. Fig.1. describes the LoRaWAN network architecture designed for this project. There was an issue with the network components since LoRaWAN has to get their mandatory information from the LoRa alliance database [3]. Therefore, it should be connected to the Internet in order to access the database.

- Research on LoRaWAN security

  To protect against financial losses caused by LoRaWAN hacking, reliability and security guarantees are vital[4]. There have been numerous attack trial examples of LP-WAN such as Proof of Concept(PoC) and Denial of Service(DoS). By analyzing the vulnerabilities of LP-WAN from the papers[5], team members figured out security risks for off-the-shelf LoRaWAN services. For this reason, plans had been made to hack the LoRaWAN referring to these methods after constructing a network server.

- Solve the problem related to mDot Box

  Analyzed[1] and disassembled the mDot Box to figure out the reason why it did not work. There was a problem with the battery cable in the device. Replacement of the part that was in damage has been executed.

Things to do by next week

- Set up the local LoRaWAN network with another platform.
- Learn details about ChirpStack[2].
- Organize the contents of the paper and make a draft of the introduction and literature review.

Problems or challenges:

In this project, a local LoRaWAN network should be set up because this research will conduct dangerous hacking. It should be sure that it is safe to conduct hacking. However, while figuring out the devices to build the local network, there was a big problem that manuals are not updated.[6] Therefore, professor Anthony Smith gave us another method to set up a local LoRaWAN network, which will be performed next week.

References

[1] Multitech, "Dot box and EVB Software.", *multitech.net*, http://www.multitech.net/developer/software/dot-box-and-evb-software (accessed Sep. 19, 2022).

[2] ChirpStack, "ChirpStack Gateway Bridge.", *chirpstack.io*, https://www.chirpstack.io/docs/ (accessed Sep. 23, 2022).

[3] LoRa Alliance, "LoRaWAN Security Whitepaper.", *lora-alliance.org*, https://lora-alliance.org/resource_hub/lorawan-security-whitepaper/ (accessed Sep. 22, 2022).

[4] X. Yang, E. Karampatzakis, C. Doerr and F. Kuipers, "Security Vulnerabilities in LoRaWAN," *2018 IEEE/ACM Third International Conference on Internet-of-Things Design and Implementation (IoTDI)*, 2018, pp. 129-140, doi: 10.1109/IoTDI.2018.00022.

[5] F. L. Coman, K. M. Malarski, M. N. Petersen and S. Ruepp, "Security Issues in Internet of Things: Vulnerability Analysis of LoRaWAN, Sigfox and NB-IoT," *2019 Global IoT Summit (GIoTS)*, 2019, pp. 1-6, doi: 10.1109/GIOTS.2019.8766430.

[6] Multitech, "Multitech Developer Resources MPower. ", *multitech.net*, https://www.multitech.net/developer/software/aep/. (accessed Sep. 23, 2022).