



LoRaWAN Multi-Channel Gateway

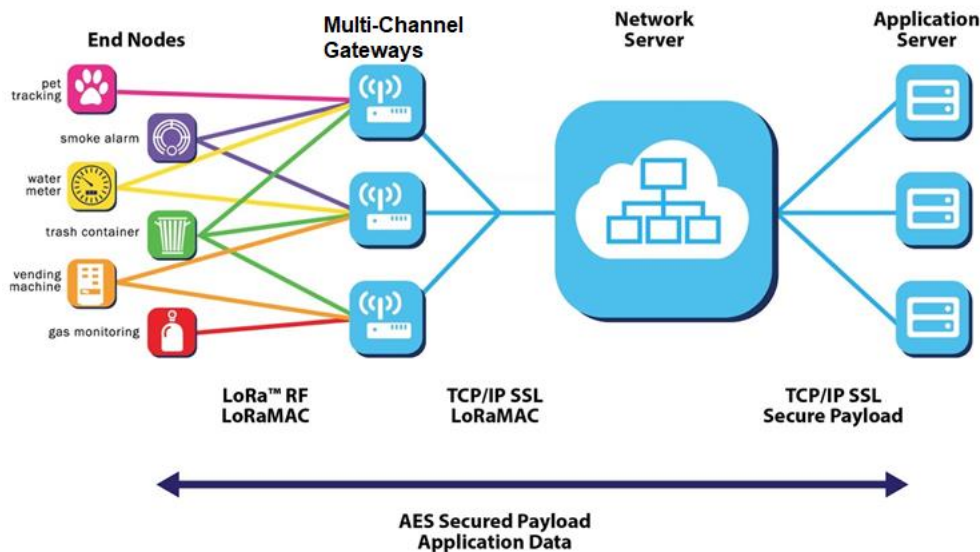
Abstract:

Low-power WAN (LPWAN) is a wireless wide area network specification that interconnects low-bandwidth, battery-powered sensors with low bit rates over long ranges.

Created for machine-to-machine (M2M) and internet of things (IoT) networks, LPWANs operate at a lower cost with greater power efficiency than traditional mobile networks. They are also able to support a greater number of connected devices over a larger area. Most LPWANs have a star topology where each sensor connects directly to common central access device called Gateway.

To meet the challenges of long range, low power consumption and secure data transmission, the sensors are based on LoRa Technology and on LoRaWAN media access control (MAC) layer protocol that manages communication between LPWAN sensors and the Gateway.

In very large areas, LPWAN is likely separated to clusters and have a LoRa Multi-Channel Gateway per cluster. Each cluster Gateway relays the LoRaWAN messages up to the LoRa Network Server.



Goals:

1. Learn about LoRa and LoRaWAN.

Refer to:

<https://www.lora-alliance.org/>

<https://www.link-labs.com/blog/what-is-lorawan>

<https://books.google.co.il/books?id=iSE6DwAAQBAJ&pg=PT108&lpg=PT108&dq=LoRaWAN+system+s+can+receive+eight+messages+simultaneously&source=bl&ots=4uDTCW0rVm&sig=IlcolgkwCe0EiSRtFfqegns2cy0&hl=iw&sa=X&ved=0ahUKEwje2qS777nZAhVP26QKHU4pCbiQ6AEIjAA#v=onepage&q=LoRaWAN%20systems%20can%20receive%20eight%20messages%20simultaneously&f=false>



<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5038744/>

2. Bring-up the LoRaWAN development and working environments (sensor-gateway-server) based on P-NUCLEO-LRWAN1 Single-Channel Gateway . Refer to instructions in: <https://gitlab.cs.technion.ac.il/lccn/S2018-LoraWan>
3. Bring-up new Multi-Channel Gateway based on RAK-831 board. Refer to instructions in: <https://www.hackster.io/naresh-krish/getting-started-with-the-rak-831-lora-gateway-and-rpi3-e3351d>
4. Connect Nucleo expansion board with Humidity/Temperature sensing capabilities to the Lora end-node sensor board and get results on application server.
5. Implement end-node firmware upgrade.
6. Implement code in server to approximate end-node location according to RSSI and SNR
7. Demo end-node frequency load balancing on a single multi-channel Gateway.
8. Analyze the battery usage on various actions.

Requirements:

Introduction to Networking (236334)

C Programming

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