LORA SENSOR AND GATEWAY STATION

Introduction

The LoRa sensor and gateway is a cost effective solution for large-scale, low-power wireless deployments. It is capable of collecting data from up to 100 sensors which can be used for different use cases and applications.

LoRa Technology

LoRa is a wireless technology that has been developed to enable low data rate communications to be made over long distances by sensors for Internet of Things (IOT) applications. It uses unlicensed radio spectrum in the Industrial, Scientific and Medical (ISM) bands to enable low power, wide area communication between remote sensors and gateways connected to the network. It uses spread spectrum technology with a wider band. Its frequency-modulated chip utilizes coding gain for increased receiver sensitivity.

LoRaWAN is an open source LPWAN infrastructure protocol specification built on top of the LoRa technology developed by the Lora Alliance that allows other companies to create their own IoT networks based on its technology specifications. This standard-based approach to build a LPWAN allows for quick set up of public or private IoT networks anywhere using hardware and software that is bi-directionally secure, interoperable and mobile, provides accurate localization and works the way you expect.

A LoRa network can be arranged to provide coverage similar to that of a cellular network. Indeed, many LoRa operators are cellular network operators who will be able to use existing masts to mount LoRa antennas. In some instances, the Lora antennas may be combined with cellular antennas as the frequencies may be close and combining antennas will provide significant cost advantages. The key features of LoRa are that it covers long range of 15-20 Kms, can connect to millions of nodes and its battery life lasts for more than 10 years.
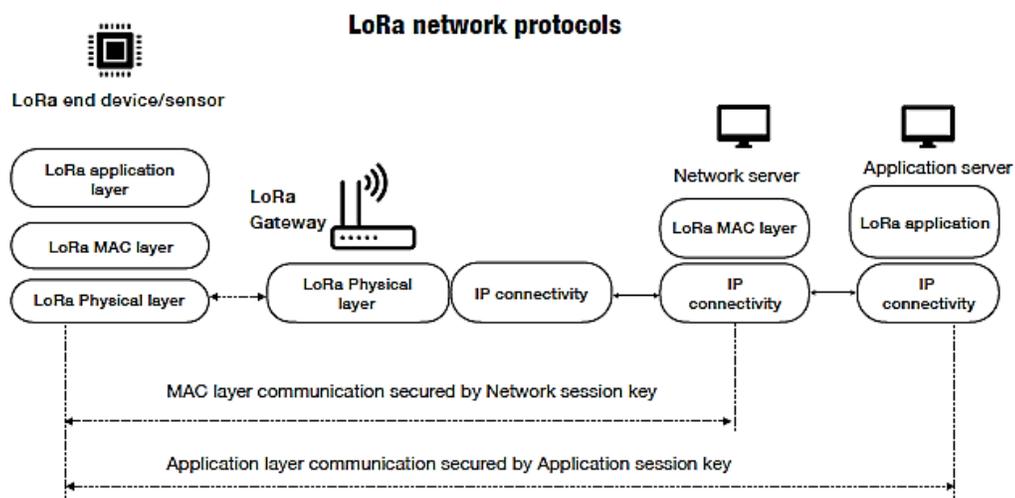
Client Need

The client wanted us to design and develop prototypes for both LoRa based sensor and gateway station. The primary goal of LoRa sensor was to collect information from the sensor unit, store it in the memory and transmit it to the gateway station which is pre-programmed no. of times each day while maintaining more than 5 years of battery life and good LoRa range. The client wanted access to modify and enhance the firmware in order to add special functions to handle the sensors chip and prepare package of data for transmission. The gateway receives information from multiple sensors (LoRa and BLE based), package them into appropriate form and send them using AT commands. The client wanted Avench to work on the hardware as well as embedded software for the solution.

Project Scope

Avench Systems Pvt. Ltd. would develop the hardware and firmware for LoRa Sensor and Gateway station.

The identified scope for this project is listed below:
   A. Design & development of LoRa sensor board
       1. Schematic capture
       2. Layout
       3. Firmware

   B. Design and development of Gateway board
       1. Schematic capture
       2. Layout
       3. Firmware

   C. Component Procurement, Manufacture, Assembly and delivery of 5 prototype units.
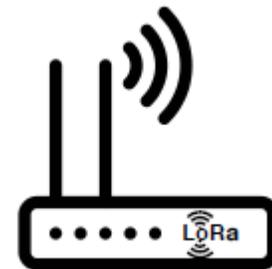
Solution Offered

The solution offered can accommodate all the technical specifications of the client. The idea was to develop a LoRa sensor and gateway station. The target market for this device was supposed to be a U.S. and hence all the modules used were FCC pre- certified so that the client saves time in the pre- certification process. The design activity and firmware development were done in parallel for different PCBs.

LoRa based sensor

The proposed LoRa based device receives information from sensor chip, store it in the memory and transmit it to the LORA based gateway station.

The gateway station shall receive data from multiple sensor PCBs, package them into the appropriate form and send them using modem AT commands. The gateway station was powered by an AC/DC power supply or wall adapter. The MCU receives data from LORA and BLE and communicates to a remote server using cellular communication. This device is best suitable for IOT projects having a complex architecture wherein if one wants to receive information from a single or multiple LoRa based sensors and send it to the cloud (online mode) or store it in the SD card (offline mode). The BLE has a range of 10m and if in case the distance is more than that, the LoRa Gateway solves the problem and bridges the distance by roaming mobile data connection. Thus, the LoRa Gateway offers you permanent access to your data. The device has external antennas for increased range and connectivity. The BLE module, LoRa module and LTE modem have external antennas. The accessory of the gateway station device is a standard barrel connector. The device shall be IP67 water-resistant and it would protect the device from

dust too. We procured the project based on a fixed cost engagement model. As we completed the project before the expected timeline we were able to save 15% of the entire engineering cost. Basic electrical testing and functional & application testing was conducted to check for any errors before delivery of the product.
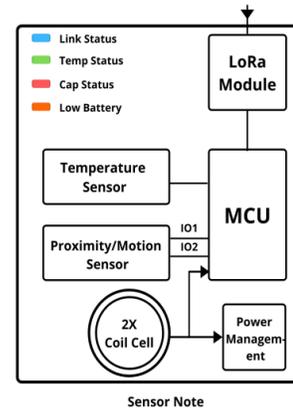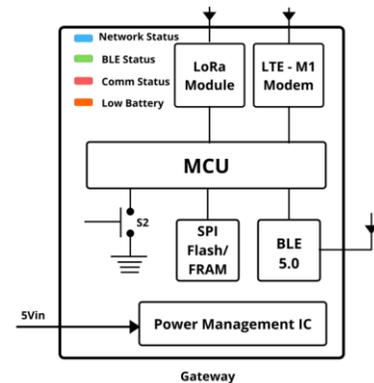
3 weeks time & 15% Engineering Cost saved

"The project management team performed beyond my expectations and saved 3 valuable weeks of the customer."
—SANDEEP G
(VP, OPERATIONS)

"We put our best foot forward and made sure that this engagement was a fruitful one. I am extremely happy about that. "
—SAJITH KANDIYIL (VP,GLOBAL SALES)

The hardware and software tools used in this project are mentioned below:

Hardware Tools

- Schematic Design
- Hardware Design
- PCB Design

Software Tools and technologies

- Micro-controller SDK& IDE
- LoRa SDK
- BG96 LTE modem AT command specification

Post attaining the product, client tested the device in the field. The client was satisfied with the results and wanted to add a set of new requirements to make the device a bit user friendly for the target audience. We implemented the all features and even supported them for 1 month for ensuring the proper functioning of the device.

The device applications are listed below:

Applications
1. Automated meter reading
2. Home and Building automation
3. Wireless alarm and security systems
4. Industrial monitoring and control
5. Long range irrigation systems

Conclusion

ASPL could deliver the project as per the defined timeline and requirements. The client has successfully completed field trials of the product and device could perform with almost zero errors yielding extremely satisfying results. After initial field trials, the customer came up with a set of additional requirements which was completed, ensuring complete client satisfaction.

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