LoRa-based Mesh Network for Remote Sensing

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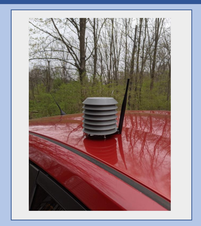
Introduction

As the data science industry evolves, the demand for new data collection techniques becomes increasingly sought after. Whether it be different techniques or different hardware, there has been a perpetual need for a precise but cheap data collection system.

Our project addresses these issues with an inexpensive, customizable, wireless transmission system can transmit data from anywhere using a gateway and Arduino sensors.

Implementation



- Implemented multi-node system to read and send data from Arduino sensors
- Data can be sent to gateway which then gets stored on The Things Network
- Low power consumption means that

Figure 1: Fully implemented system

Advantages

- Cheap
- Customizable
- Modular
- Power Efficient
- Easily Implemented
- Easily Expandable

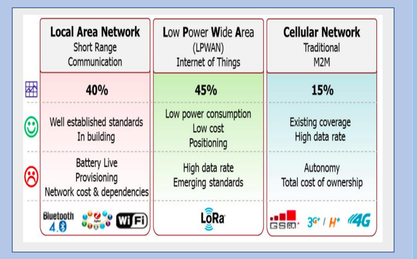


Figure 2: Power consumption charts

Next Steps

- Enhance usability for inexperienced users
- Speed up data collection
- Expand networking range
- Offer use of system to farmers or researchers

Acknowledgments

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Further thanks to **MD Mahmud Shaad** for guiding us through our research.

Approach

- Our project's aim is to create a cheap but effective system to wirelessly transmit data from an IoT-enabled sensor to a gateway
- The system is composed of an Arduino MKR WAN 1300 and BME280 sensor, an UG87 gateway, and TTN database
- Core components of the system (Arduino, gateway, sensors) need minimal modification from project to project
- Sensors can read temperature, pressure and humidity

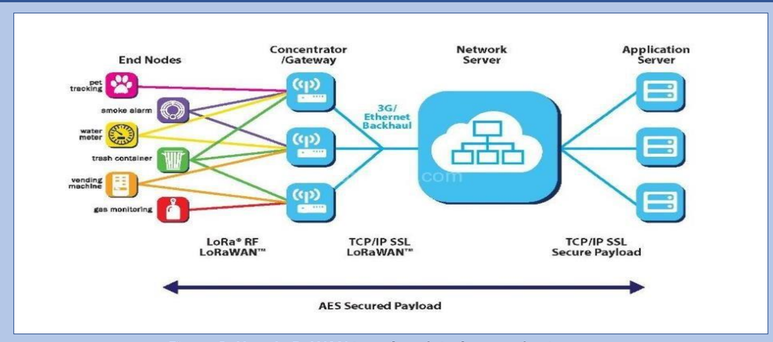

Figure 3: How LoRaWAN transfers data from nodes to server

Design

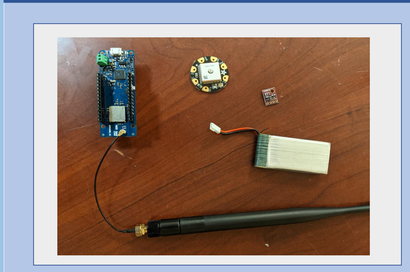

Figure 4: Arduino ready to be put together

Phase 1: Arduino & Sensor

Sensor collects data until the Arduino is ready to send packets to parent node or gateway.

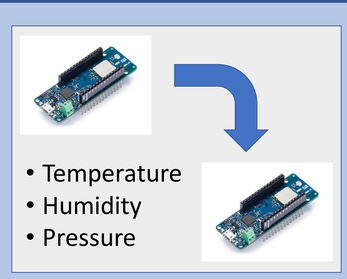

Figure 5: Parent node ready for data

Phase 2: Transmit to Node

Data collection is stopped and is sent to parent node.

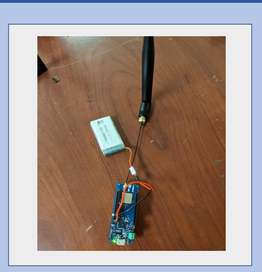

Figure 6: Parent node ready to transmit

Phase 3: Transmission to Gateway

Parent node sends data package to the gateway from its location using LoRa.

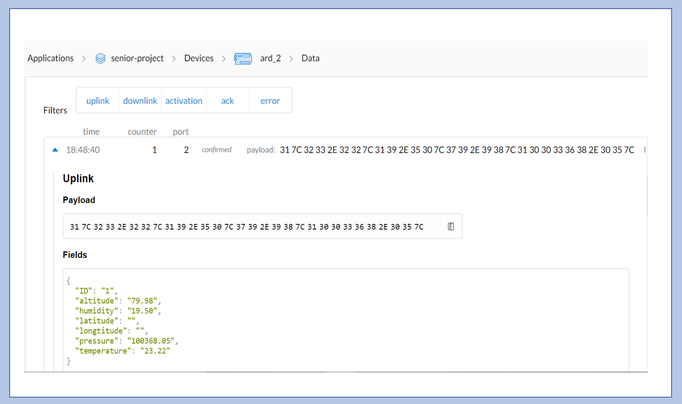

Figure 8: TTN website interface

Phase 5: Server Database

Using The Things Network's website, the data can be viewed in a browser and the packet decoder can be reprogrammed so the data is shown differently

Rfch	Direction	Time	Ticks	Frequency	Datarate	Coderate	RSSI	SNR
0	up	22:55:03	353556260	904.3	SF10BW125	4/5	-73	9.0
0	down	-	265596236	926.9	SF10BW500	4/5	-	-
1	up	22:53:27	257596236	905.1	SF10BW125	4/5	-72	9.2
0	up	22:52:42	212482123	904.1	SF7BW125	4/6	-113	-11.8
0	up	22:52:32	202679419	904.3	SF7BW125	4/6	-112	-12.5

Figure 7: Traffic shown on the gateway from nodes

Phase 4: Gateway Database

Gateway collects the data package from nodes and the data is sent to the server