Midterm Presentation

Team Coyote1

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Introduction

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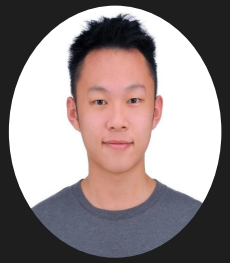
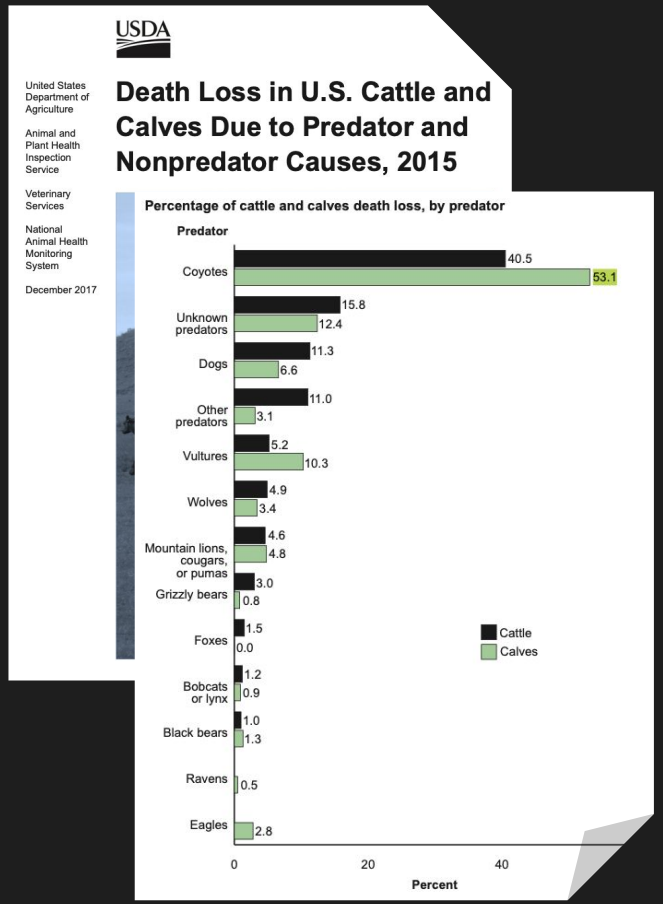
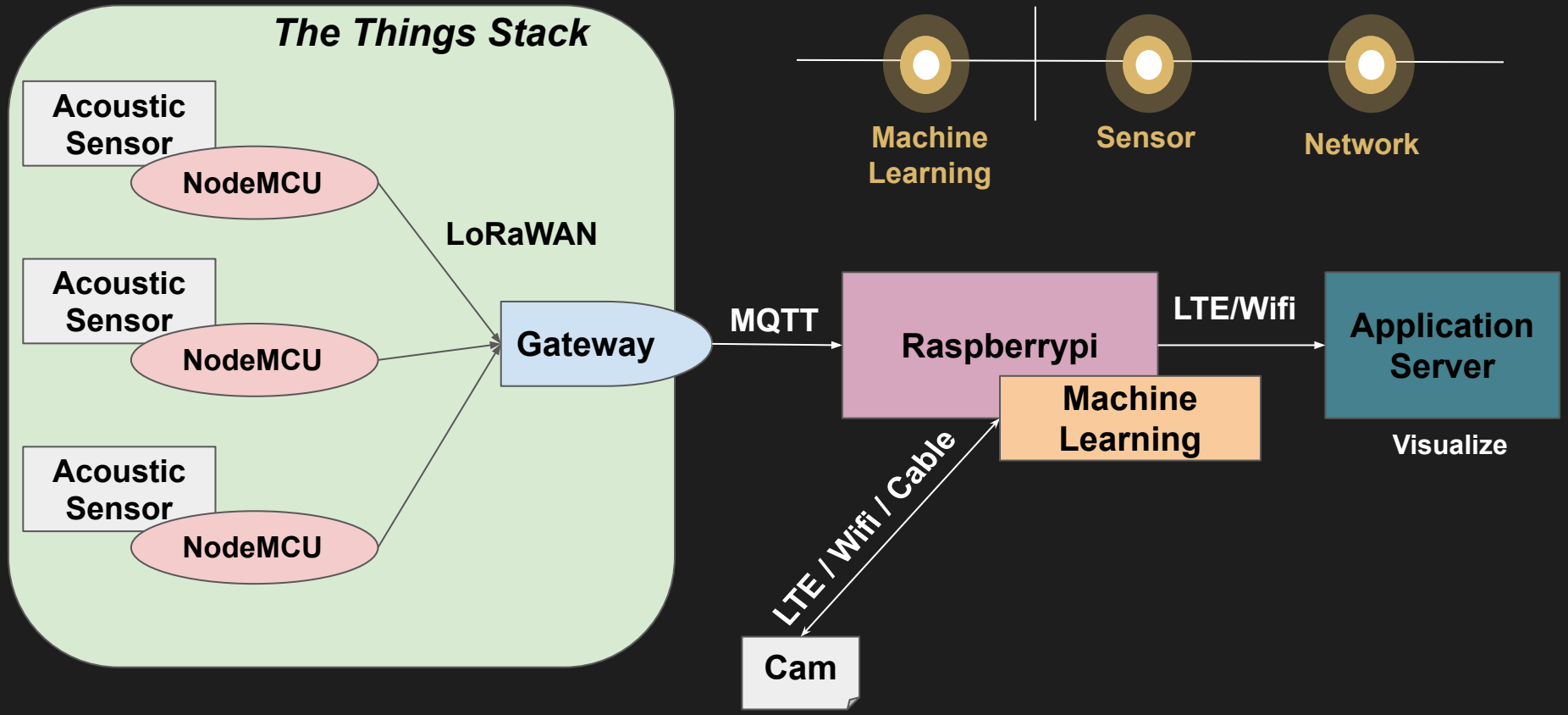


1.2 Background



- ✓ Cost-Effective
- ✓ Easy-to-use

1.3 Project Architecture



02

Progress

2.1 LoRaWAN

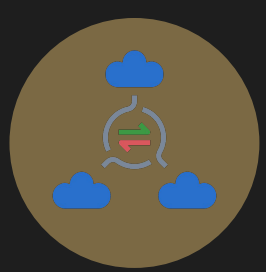
- ✓ Network server stack
- ✓ Open-source components for networks
- ✓ Physical layer process of radio modulation

2.1 LoRaWAN

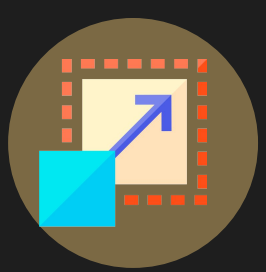
Low Power Consumption

Years of Battery Life

Long-distance



Multi-usable



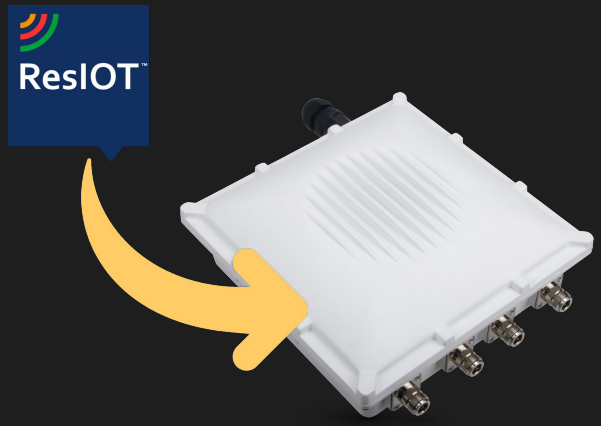
Scalable

Cost-effective

2.2 Gateway

To connect the gateway to the ResIoT,
The program provided by the ResIoT had to be installed on the gateway.

- ✗ Memory error that the multi-tech gateway lacked storage
- ✗ When we looked at how much storage was left on the mLinux terminal, there was enough storage



Rak7249 Gateway

- ✗ ResIoT did not support the Rak gateway

Multi-tech gateway

Progress

2.2 Gateway

Local Server VS Cloud Server

ChirpStack

Failed to install it due to unknown errors

configuration files

uploaded

docker

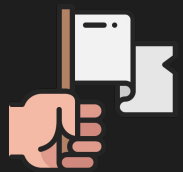
The application server could be created

Connection failed due to an authentication problem

2.2 Gateway

THE THINGS STACK

- ✓ The process of building the server went smoothly
- ✓ If clients are connected to the same network access to the application server through the static IP address was successful
- ✗ It was necessary to access the console window to register the gateway, but it was not possible to access the console window
- ✓ Re-created the certificate and tried registering
- ✗ The same authentication problem occurred such as 401 and 404 errors



multi-tech gateway had been previously registered.

Progress

2.2 Gateway

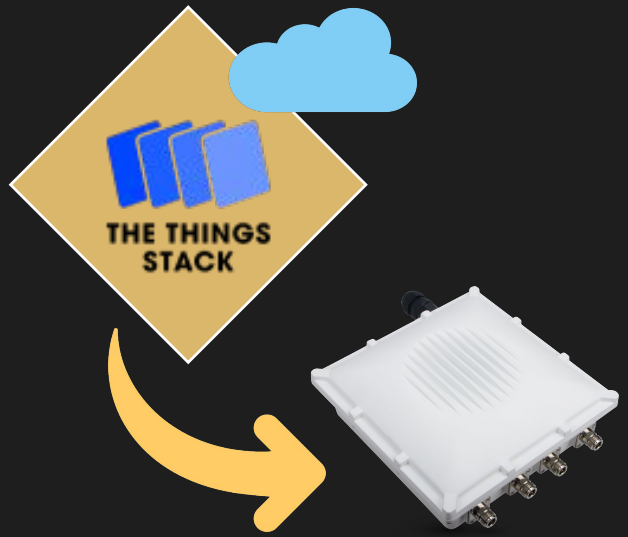
Decided to turn our attention back to the cloud server.

An attempt was made to register a different multi-tech gateway with the SENET cloud server.

The multi-tech gateway could not connect to the Internet, so the gateway software provided by SENET could not be installed.

2.2 Gateway

Tried to connect the RAK7249 gateway to The Things stack



But it always show disconnected

Debugged the Rak's Internet connection

Connected to The Things Network again,
the gateway's status said connected-!!

2.3 Esp32 – Gateway

[Esp32]

Wifi & Bluetooth

Wide Range of applications can be targeted

Low-cost & Low-power

Low-cost & Low-power system on a chip microcontrollers

Temperature range

Wide operating temperature (-104℉ ~ 221℉)

Progress

2.3 Esp32 – Gateway

[Esp32]

Overview | Applications | Gateways | Organizations

NAM1 Community
Fair use policy applies

Applications > Acoustic Sensors > Live data

Export as JSON | Pause

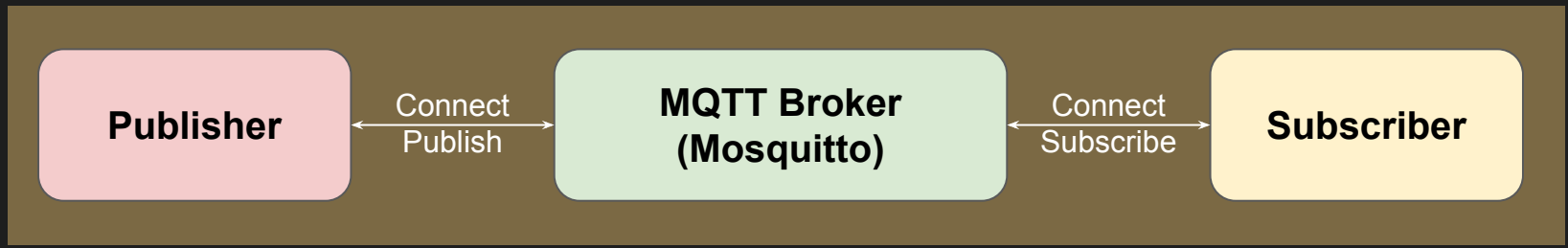
Time	Entity ID	Type	Data preview	
05:50:35	eui-70b3d57ed00565be	Forward uplink data message	DevAddr: 26 0C 58 75	Payload: 07 9F 00 SF9BW125 SNR: 5.25 RSSI: -105
05:50:28	eui-70b3d57ed00565be	Forward uplink data message	DevAddr: 26 0C 58 75	Payload: 07 9F 00 SF9BW125 SNR: 5.5 RSSI: -107
05:50:20	eui-70b3d57ed00565be	Forward uplink data message	DevAddr: 26 0C 58 75	Payload: 08 47 00 SF9BW125 SNR: -0.5 RSSI: -106
05:50:13	eui-70b3d57ed00565be	Forward uplink data message	DevAddr: 26 0C 58 75	Payload: 07 A3 00 SF9BW125 SNR: 6.5 RSSI: -106
05:50:06	eui-70b3d57ed00565be	Forward uplink data message	DevAddr: 26 0C 58 75	Payload: 07 B0 00 SF9BW125 SNR: 3.25 RSSI: -110

Progress

2.4 Gateway – Raspberry pi

[MQTT]

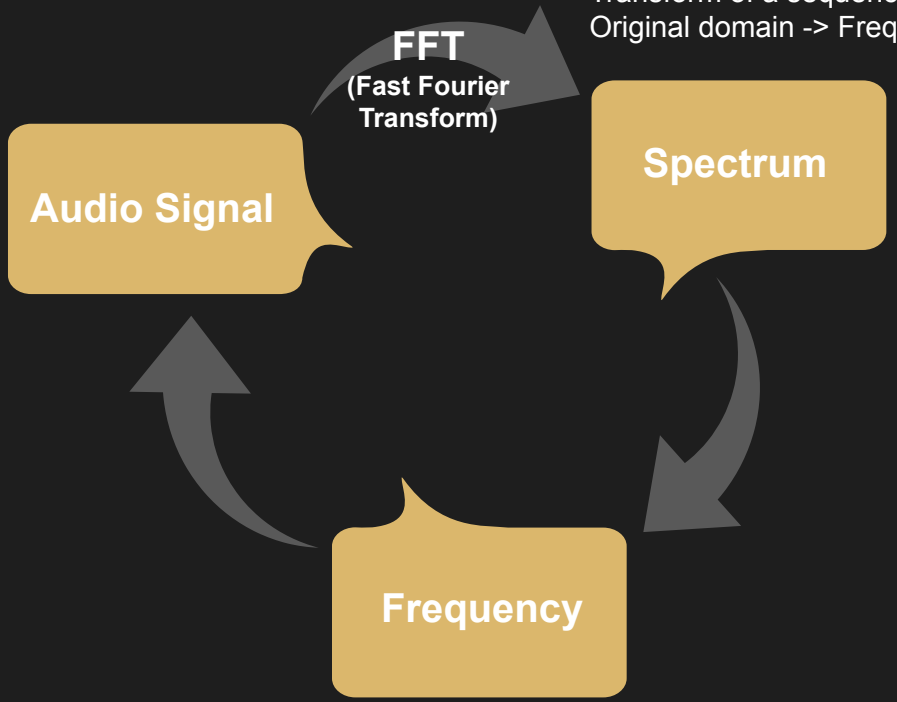
- ✓ Message Queuing Telemetry Transport
- ✓ Light weight Machine - Machine
- ✓ Minimum power & packet

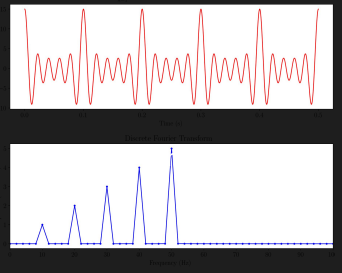


2.5 Acoustic Sensor

[max4466]

FFT (Fast Fourier Transform)
: an algorithm that computes the discrete Fourier Transform of a sequence, or its inverse.
Original domain -> Frequency domain





Frequency

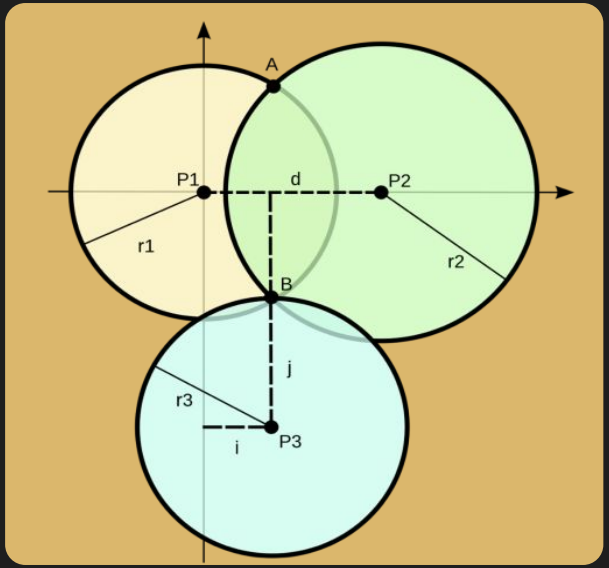
2.1 ~ 2.5 Demo Video

Esp32 — the things stack cloud server — MQTT Broker

Progress

2.6 Acoustic Localization

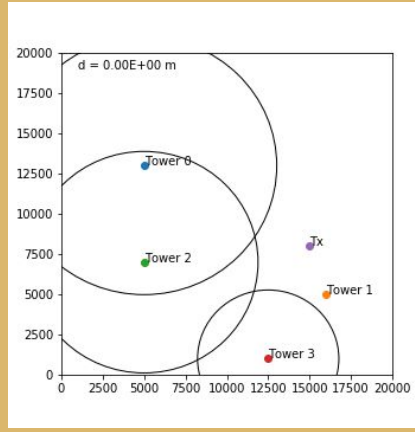
[Trilateration]

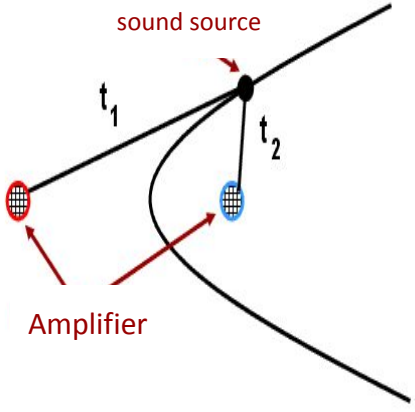


r1 ✕ N

- r1, r2, r3: distance between the source of the sound and three acoustic sensors
- N: the first time when the sound came in

[Triangulation] - hyperbola





- The process of acoustic localization using forming triangles to the point from know points
- Three hyperbola ⇒ the source of the sound

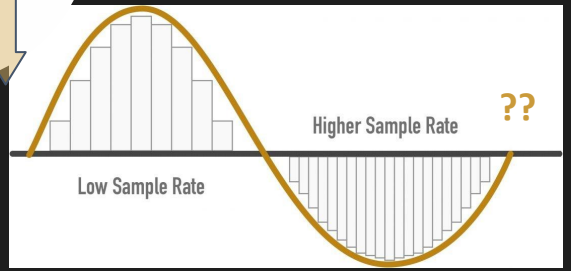
Progress

03

Problem

3. Problem

- Low Power
- Low Bit Rate Networking Protocols



04

Weekly Plan

4. Weekly Plan

	Sep 4th	Oct 1st	Oct 2nd	Oct 3rd	Oct 4th	Nov 1st	Nov 2nd	Nov 3rd	Nov 4th	Dec 1st	Dec 2nd	Dec 3rd
LoRaWAN Setting ✓												
NodeMCU - Acoustic Sensor Code ✓												
AcousticSensor - GW Connect ✓												
Sound Filtering & Data Compress												
MQTT Connection ✓												
Raspberrypi-MachineLearning												
Camera Sensor Code												
GW - CameraSensor Connect												
Test												
Paper												
PR												

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Q&A

Thank you