Midterm Presentation

Team Coyote1

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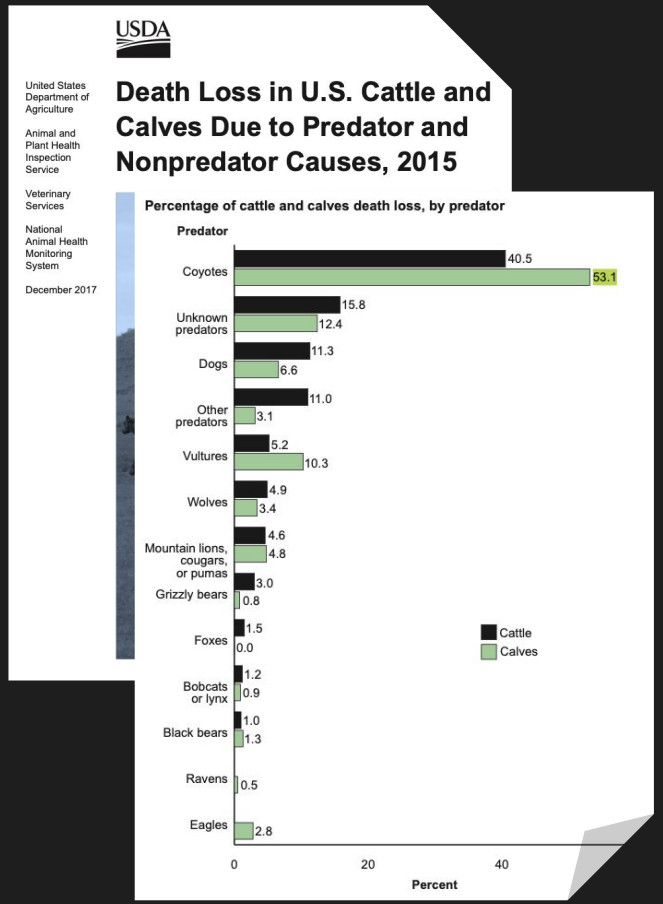
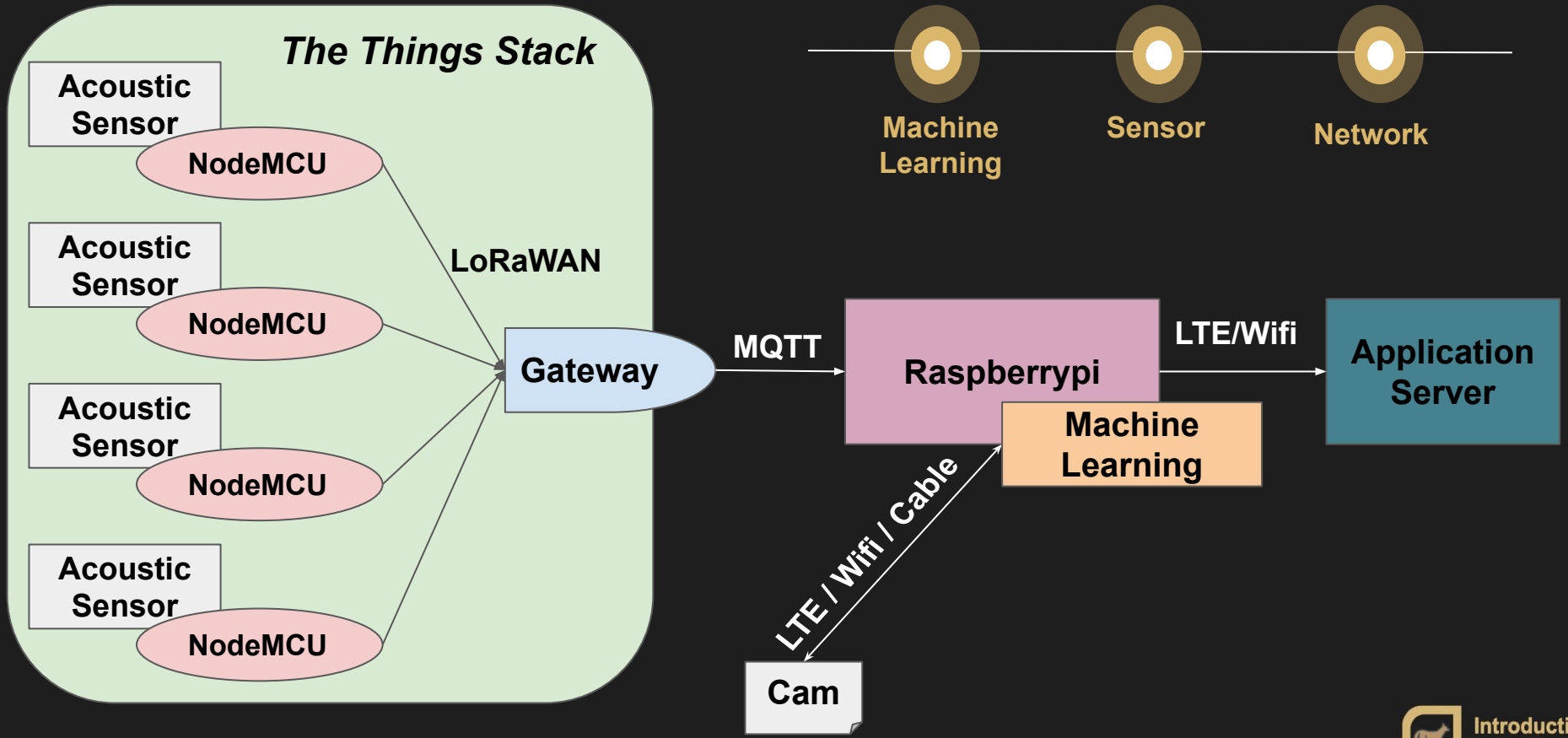
Introduction

1.1 Background



- ✓ Cost-Effective
- ✓ Easy-to-use

1.2 Project Architecture



02

Progress

2.1 LoRaWAN

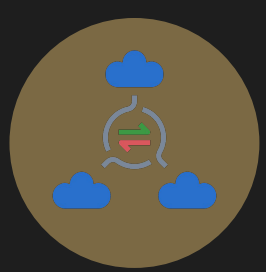
- ✓ Network server stack
- ✓ Open-source components for networks
- ✓ Physical layer process of radio modulation

2.1 LoRaWAN

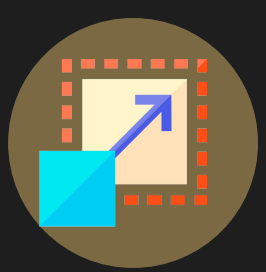
Low Power Consumption

Years of Battery Life

Long-distance



Multi-usable



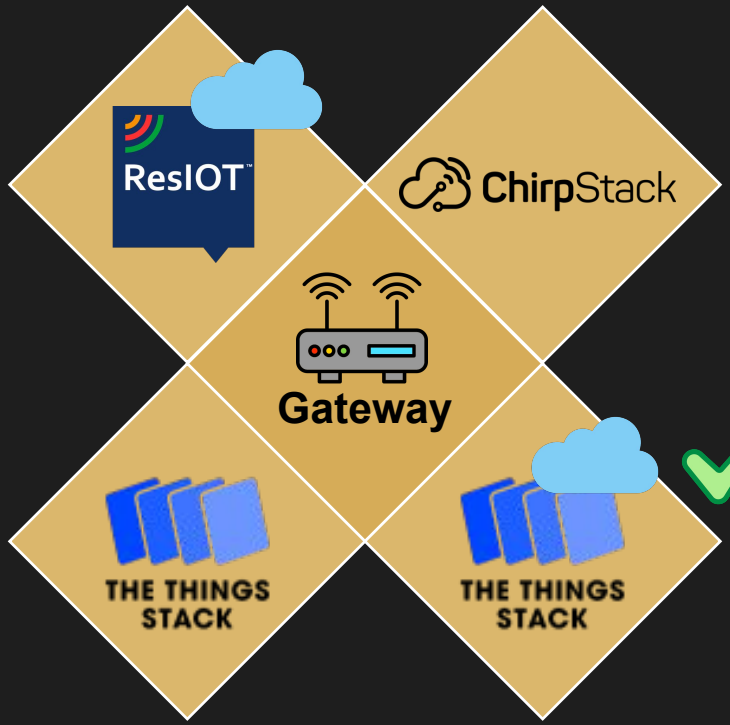
Scalable

Cost-effective

2.2 Gateway

ResIoT

- Failed to install (Insufficient storage Error)
- ResIoT does not support the Rak gateway.



ChirpStack

- Failed to install → Unknown errors
- Authentication problem

The Things Stack

- Can't access the console window
- Authentication problem
- 401, 404 errors occurred
- Multitech gateway → Already registered

Connect Success

- Multitech gateway → Internet disconnect
- Failed to install gateway software(SNET)

- RAK connected to the Internet
  → Connected to the TTS
  → Gateway Connection Success

2.3 Esp32 – Gateway

[Esp32]

Wifi & Bluetooth

Wide Range of applications can be targeted

No need to connect bluetooth - wifi module

Low-cost & Low-power

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

Temperature range

Wide operating temperature (-104℉ ~ 221℉)

2.3 Esp32 – Gateway

[Esp32]

Overview | Applications | Gateways | Organizations

NAM1 Community
Fair use policy applies

Applications > Acoustic Sensors > Live data

Export as JSON | Pause

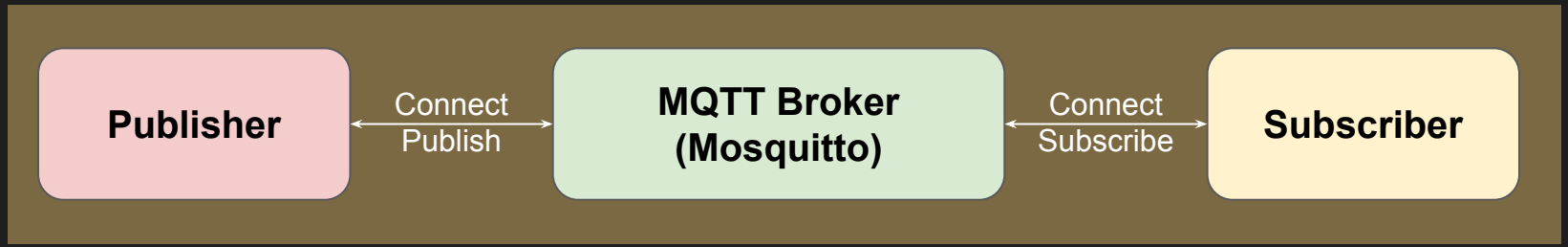
Time	Entity ID	Type	Data preview	
05:50:35	eui-70b3d57ed00565be	Forward uplink data message	DevAddr: 26 0C 58 75	Payload: 07 9F 00 SF9BW125 SNR: 5.25 RSSI: -105
05:50:28	eui-70b3d57ed00565be	Forward uplink data message	DevAddr: 26 0C 58 75	Payload: 07 9F 00 SF9BW125 SNR: 5.5 RSSI: -107
05:50:20	eui-70b3d57ed00565be	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]

- MQ Telemetry Transport
- Light weight
- Machine - Machine Network protocol
- Minimum power & packet

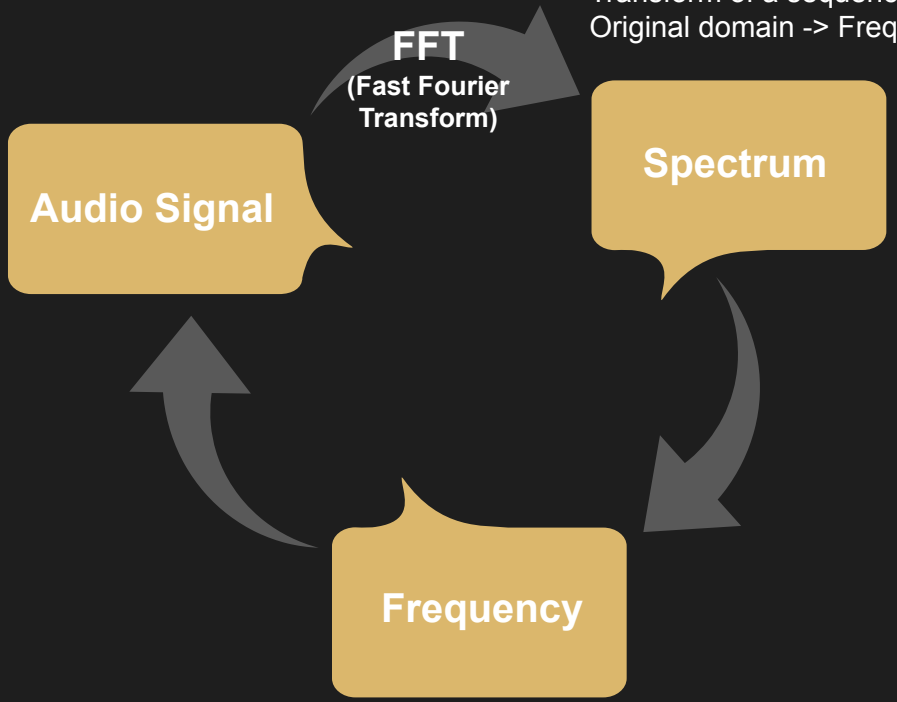


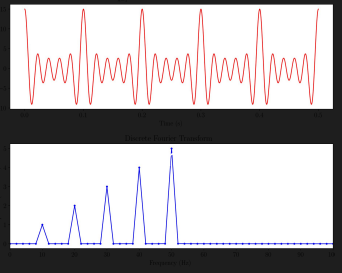
Progress

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

Progress

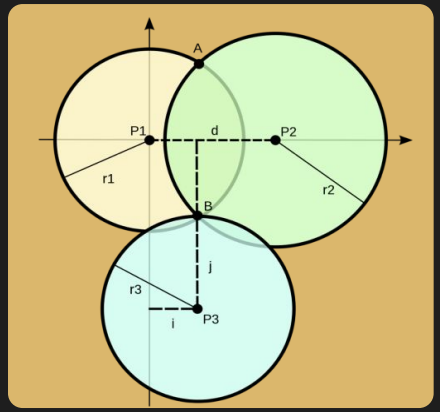
2.1 ~ 2.5 Demo Video

Esp32 — the things stack cloud server — MQTT Broker

Progress

2.6 Localization Directionality

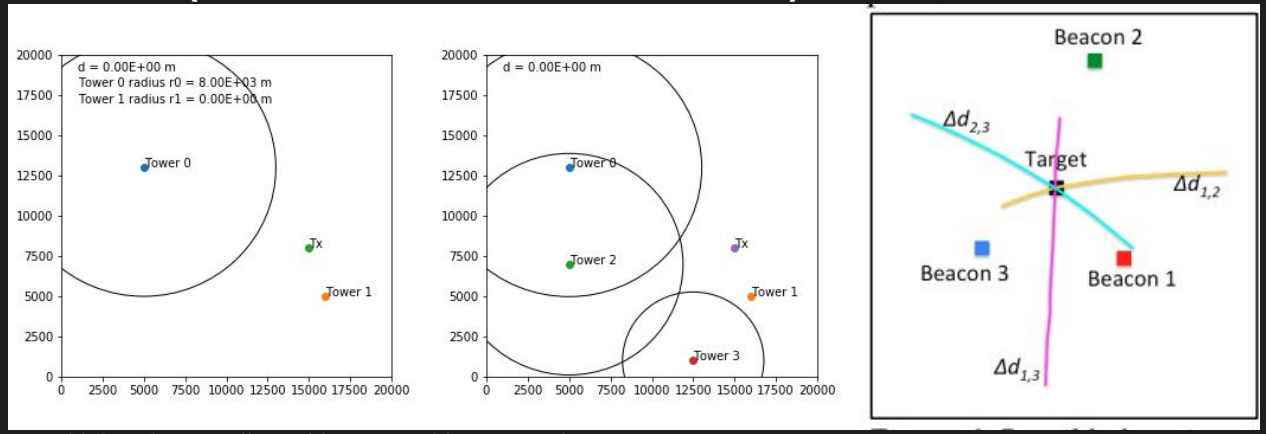
Trilateration



- The length of r2 and r3 could be calculated using the difference in the time when the sound came in

- The N value, the first time the sound came in → could not be obtained
- The length of r1 was not obtained

TDOA (Time Difference Of Arrival)



- Using the parallax with a sound between the two sensors
- Much easier to find the distance by tying two sensors together

- Overlapping parts of the three sides
  → 3 pairs of methods were obtained to draw a line 90 degrees through the center of the sides that connected the 2 sensors
  ⇒ Source of sound !!!

- Sound localization → Triangulation and Hyperbola
- Possible to manage the end node in TTS application at once

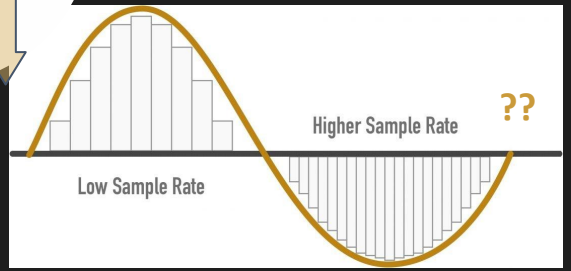
Progress

03

Problem

3. Problem

- Low Power
- Wide Area
- 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												

Q&A

Thank you