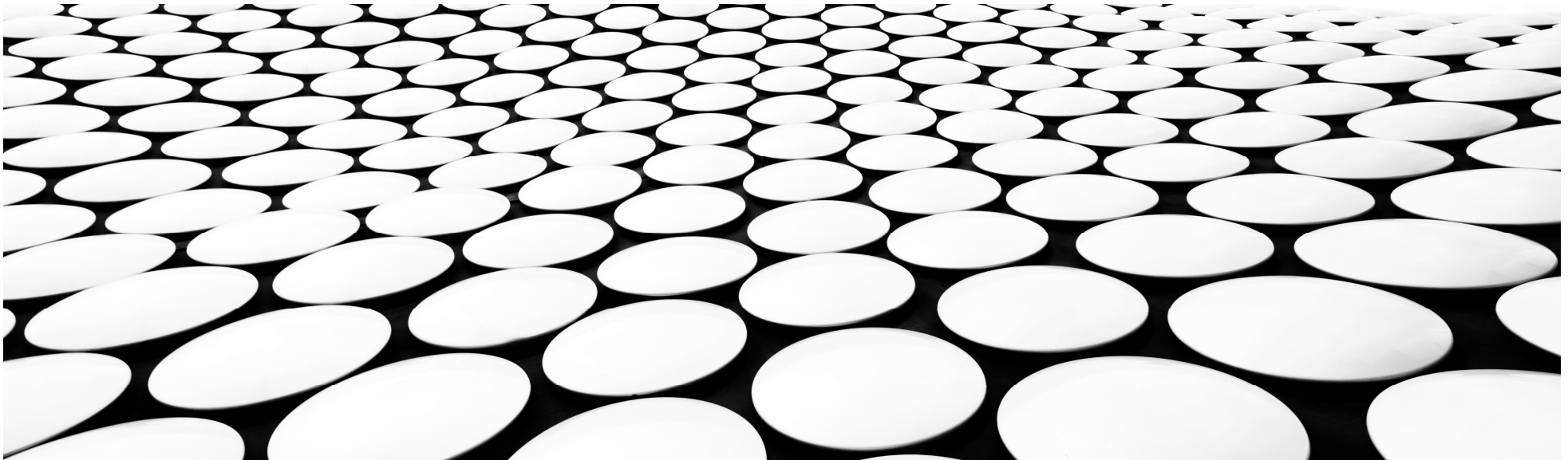

IoT Project – LoRaWAN Weather Station

Dan Ochs 2/24/2020





Overview

- Why did Dan build this crazy thing?
- What is LoRaWAN?
- System Overview
 - Edge Device (Temperature / Humidity sensor node)
 - Gateway
 - The Things Network (TTN)
 - Database
 - Web Application
 - Client Website

but before we dive in ... check out the final product

<https://weather-station-app.azurewebsites.net>

username guest

password demo



Why did Dan build this crazy thing...

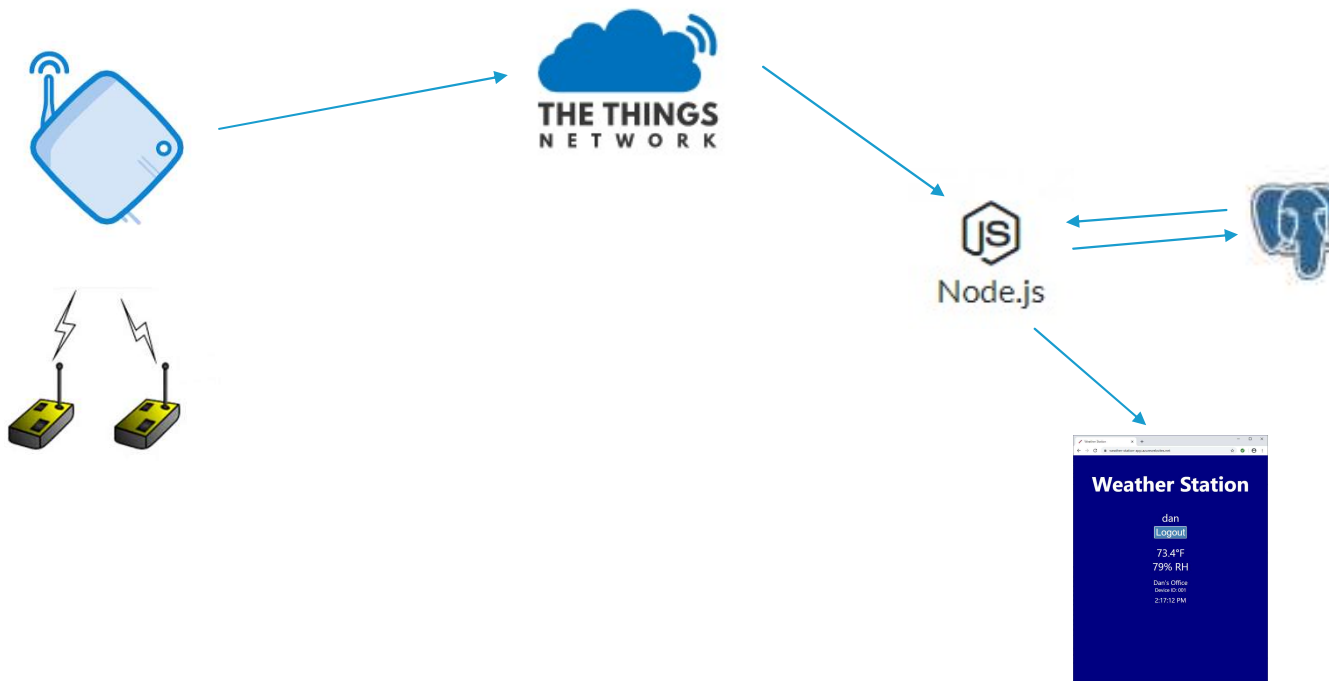
- Have played with Arduino components in the past and had some of this kit lying around
- Heard about LoRaWAN at the IoT meetup at the Cannon and wanted to try it out
- My wife frequently wants to know what the temperature is wherever she is right now and see it on her phone

What is LoRaWAN?

Long Range Wide Area Network

- Communications standard maintained by the LoRa alliance
- Uses various frequencies around the world, in the US operates on the 915 MHz frequency band which is designated as a license-free ISM (industrial, scientific, and medical) band.
- Communications are encrypted between the edge-device and the network server
- LoRaWAN is for long distance (2 – 15 km), low power (edge devices often operate on batteries), low bandwidth (i.e. this application has a data payload of 8 bytes at 0.003 Hz) communication

System Overview



Edge Device

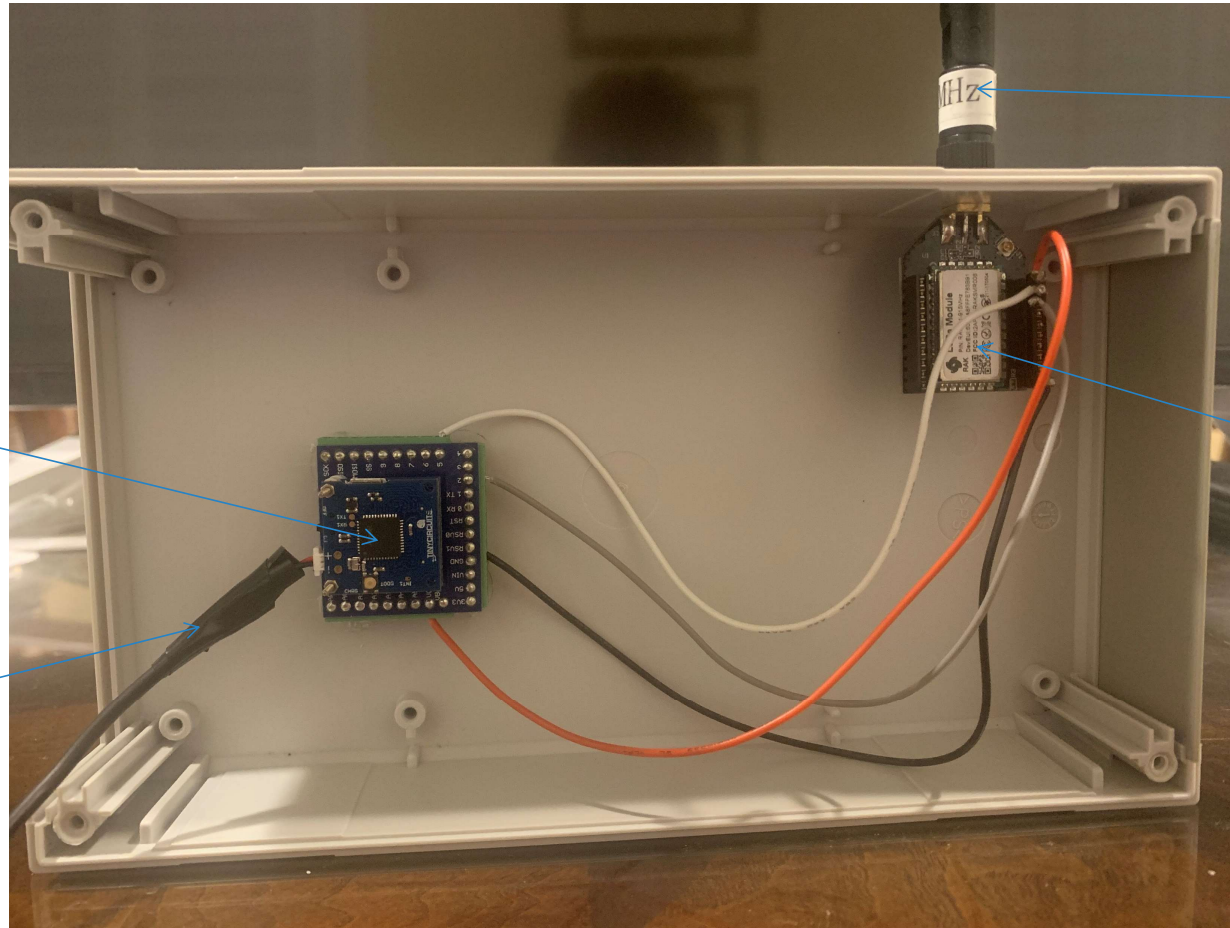
- Temperature / Humidity sensor
- sends a reading every five minutes



Edge Device

Microcontroller
and Sensor

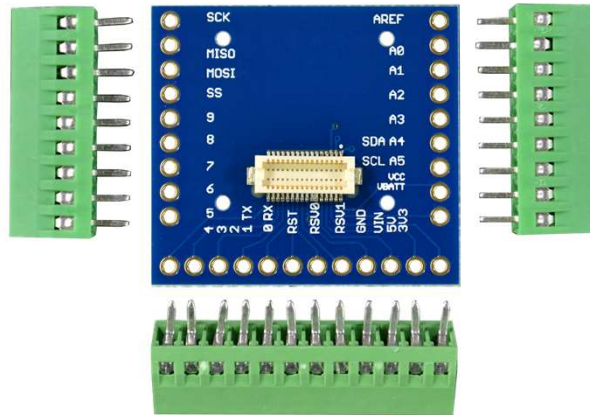
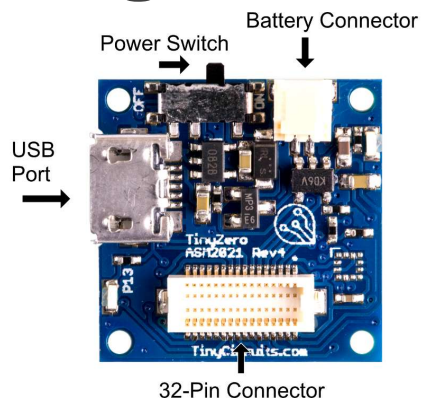
5 volts power



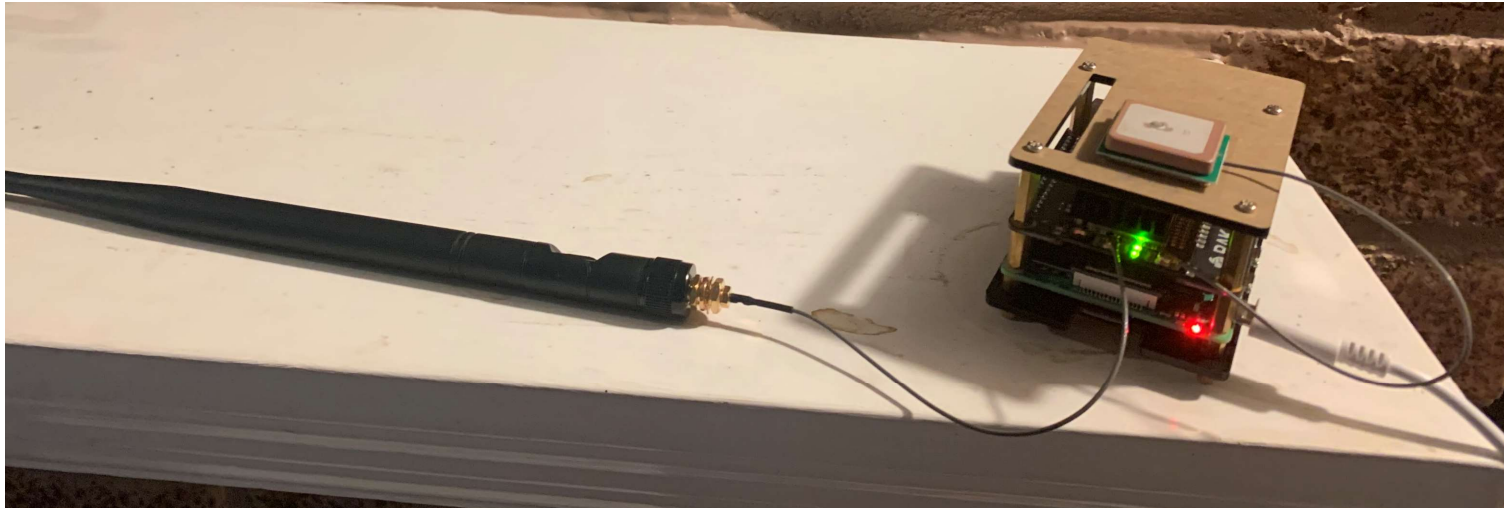
915 MHz
antenna

LoRaWAN radio
module

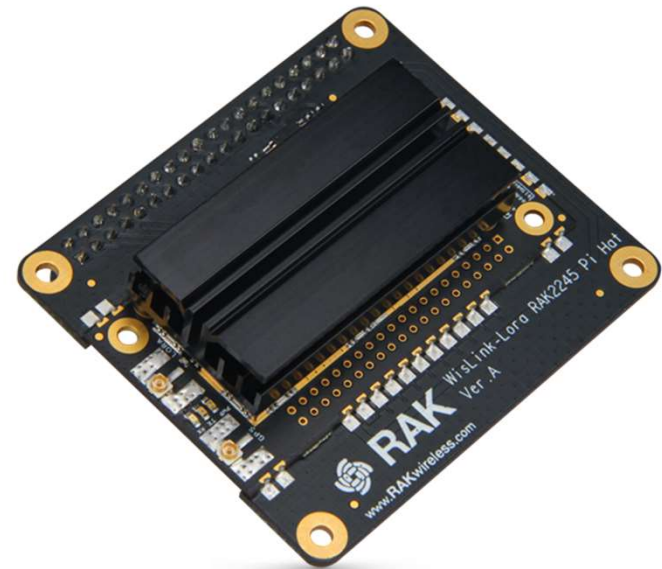
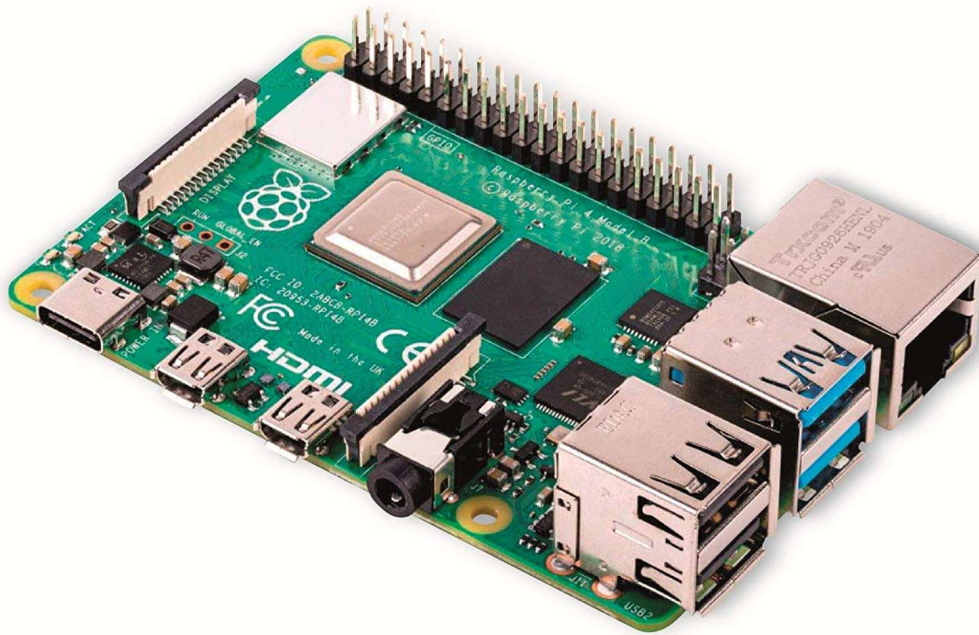
Edge Device



Gateway



Gateway





The Things Network (TTN)

- Cloud service provider connected to almost 11,000 gateways worldwide, around 60% European. 11 scattered around Houston (including mine).
- Gateways transmit received messages to TTN over the internet.
- Applications provide facility for decoding encrypted message payloads and a node.js (as well as several other) API to retrieve data received by the network.

The Things Network (TTN)

At this moment, there are 10936 gateways up and running



100907
MEMBERS

10936
GATEWAYS

149
COUNTRIES

Database

- PostgreSQL database hosted on ElephantSQL
- users
- devices
- usersdevices
- readings

Web Application

- 1) collects sensor data from TTN and adds to PostgreSQL database
 - 2) handles user registration / login / authentication
 - 3) serves latest sensor reading to an authenticated client
-
- Node / Express web application hosted on Azure
 - Dependencies: express, ttn, pg-promise, dotenv, cors, bcrypt, jsonwebtoken

Client Website

- Static website built using React and Redux
- Hosted on Azure
- Allows user to Register, Login, and view latest sensor reading in the database

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