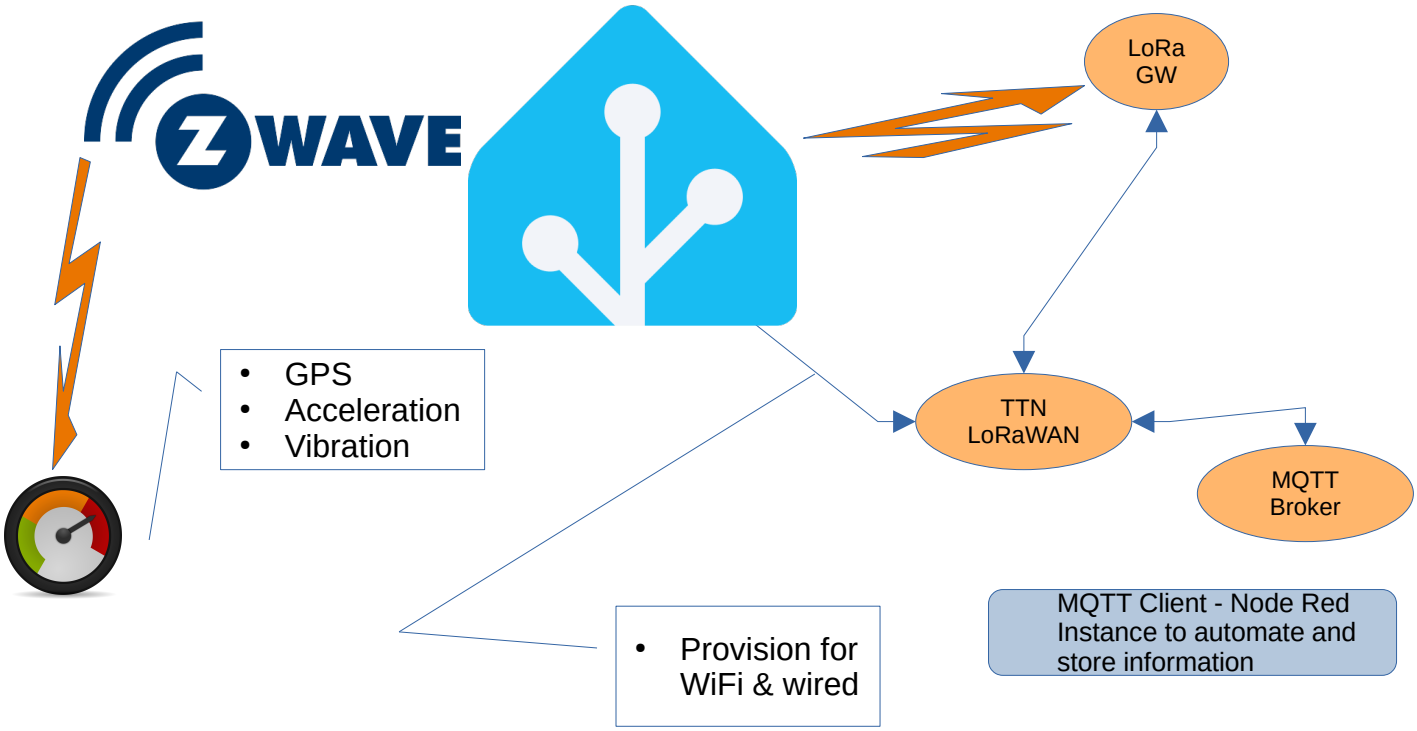
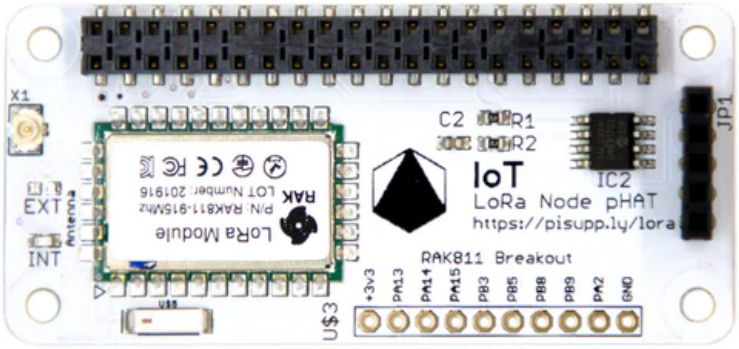
Home Assistant Integration



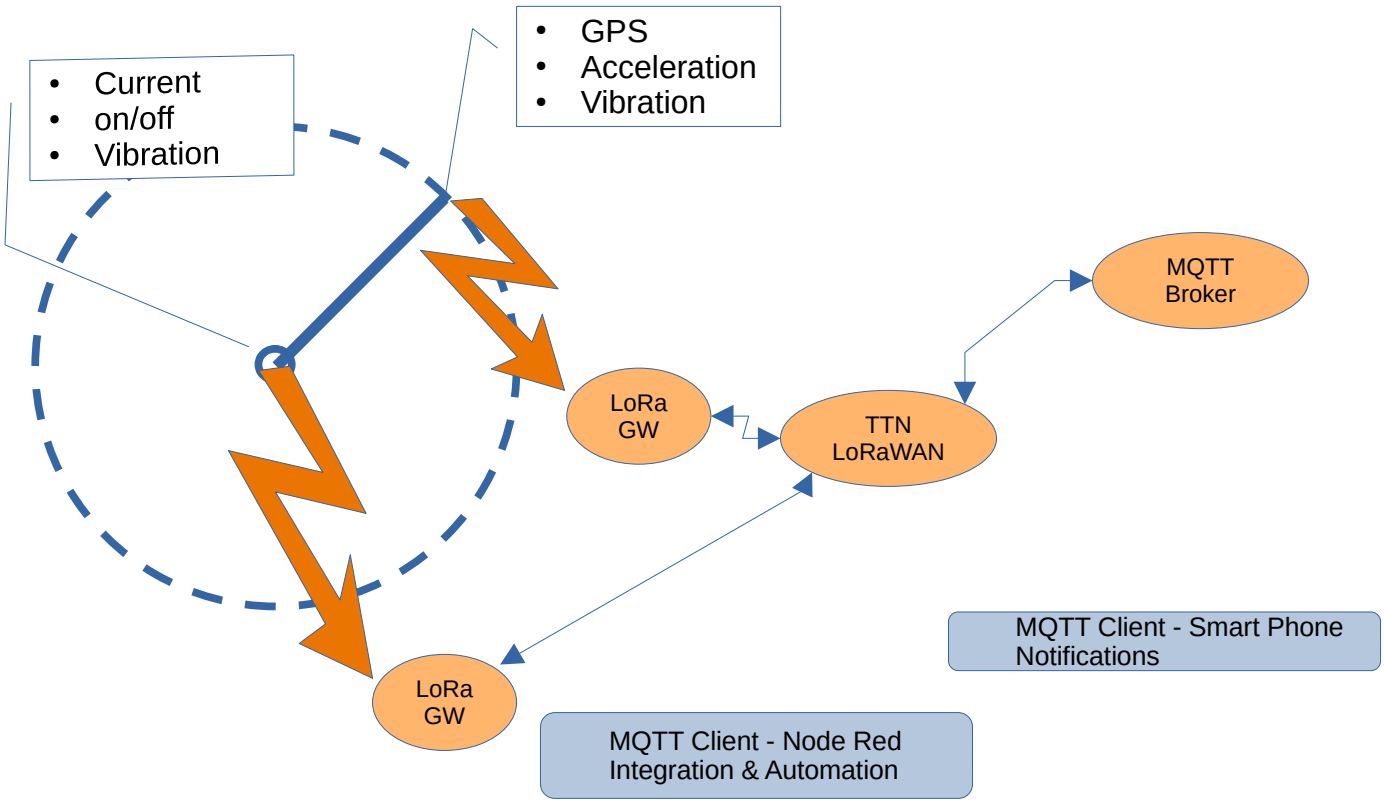
- Objective:Provide Home Assistant, Open Hab, or similar IoT controller Internet network access via LoRaWAN communications
  - Monitor temperature, motion, humidity or any other sensors that connect to these IoT controllers
  - Using LoRaWAN as the primary communications means allowing it to provide remote data as long as a gateway is within range.
- Approach
  - Add several standard zwave temperature sensors to an instance of Home Assistant (HA)
  - Use Node Red (location TBD) to send topics such as alerts to an MQTT
  - Pick up data using MQTTX and store the data in JSON or YAML format

IoT Familiarity



- Objective:Demonstrate some tools that will help the IoT users understand the architecture and technology.
  - Gain a better technical understanding of the system
- Approach
  - Utilize the pi-supply IoT LoRa NODE PHAT 868MHZ/915MHZ that fits on a Raspberry Pi Zero
  - Write a bash script that will publish a message to The Things Network
  - Retrieve that topic on an MQTT client; desktop and smart phone
  - Have a Node Red instance that prints out to a screen log the topics generated from the bash script into a data analysis friendly format
  - Review the data's level of "Modality"
  - Experiment with distance vs. speed capability including the spreading factor

Irrigator Passive Sensor



- The 2 sensor groups, hub & end, can either be networked together. Or they can be independent sensors
- Multiple LoRa gateways may be receiving the sensor packets. The LoRa protocol determines which set of packets to send to the TTN or whichever LoRaWAN network is chosen.
- Sensors such as current and vibration can have a threshold to generate an alert.
- Node Red to determine the alert level and send out the alerts to MQTT where a cell phone and a desktop will monitor.
- A second phase would allow controls to be sent to the irrigator, likely using Node Red
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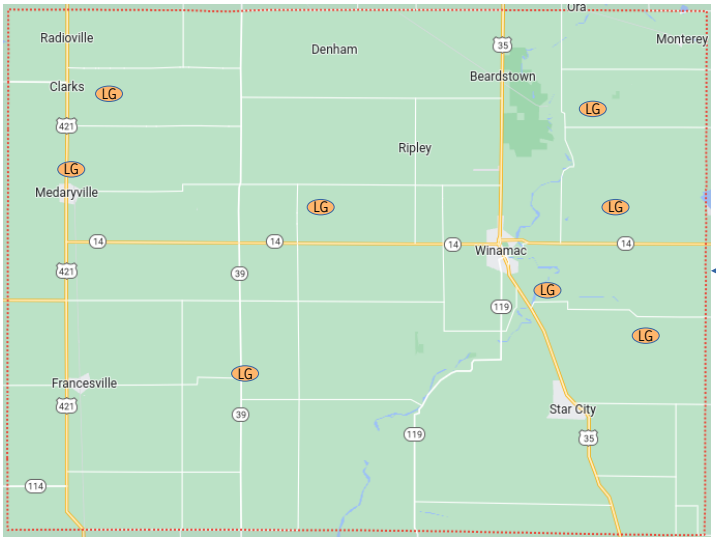
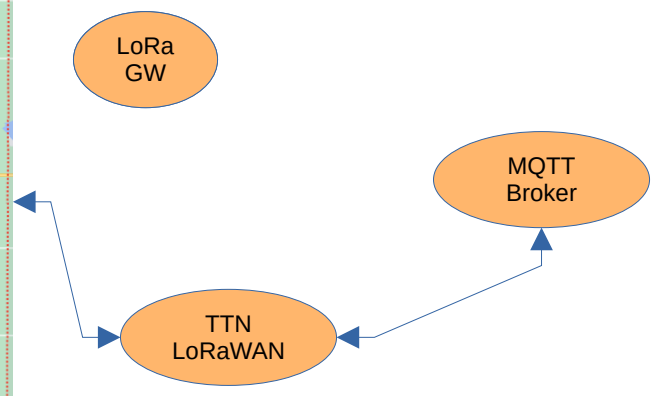
LoRa Tracking - ExpLoRation

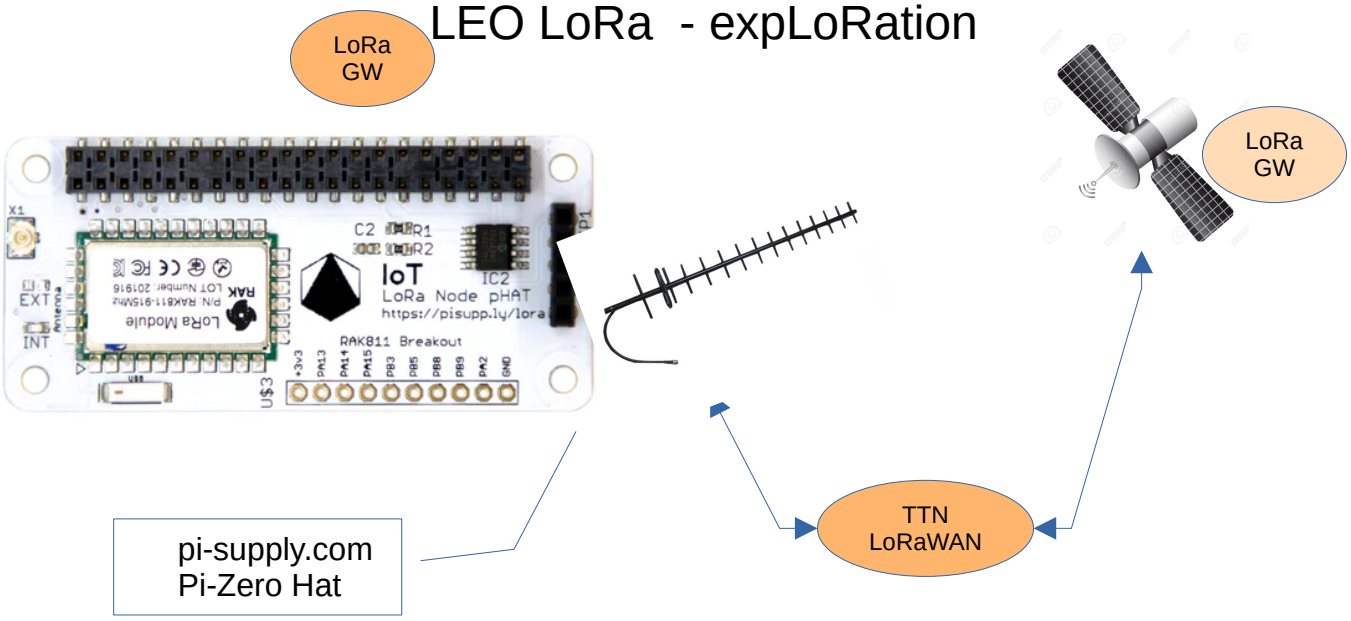




- MQTT Client - Node Red Instance to automate and store information
- Qgis package to plot either path of tracker && calculated LoRa Gateways
- R to calculate the data

- Objective: Determine the feasibility of mapping the LoRa gateways in a geographical area.
  - Provides a coverage map and will highlight ‘dead’ zones
- Approach
  - Utilize the RAK5205 96BOARDS LoRa SMA 915MHZ
    - Onboard GPS
    - LoRa radio
    - WiFi
    - Blue Tooth
  - Record the RSSI (Received Strength Signal Indication)
  - Use Node Red to parse the RAK data and store it in a data friendly format such as JSON or YAML
    - Using the radios’ RSSI data what level of location finding can be done with this architecture
    - If possible extract the lat/long of the communicated gateways

LEO LoRa - expLoRation



- MQTT Client - Node Red Instance to automate and store information
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- Objective: Learn the technology required for reliable LoRa terrestrial to Low Earth Orbit
  - Communicate,preferably both directions, with an open source LoRa satellite
- Approach
  - Utilize a common LoRa board using either 450 or 900 MHz
  - LoRa LEO satellites: preferably open source, need to estimate link budget. Some possibilities are:
    - Myriota
    - Kinéis
    - Orbita
    - Wyld
    - ICEYE
  - Antennas: try an omnidirectional stationary antenna and a hand-held yagi