PAE STEMLab - LoRaWAN IoT Workshops

Introduction

Session Format: 5x 50 min prepared workshop, around tables
Participants: 8 (max)

- All materials supplied
- Participants can purchase and bring their own equipment after the first session (details will be supplied)

Additional Sessions
After the workshop, allow another hour for an open workshop session

- Opportunity for participants to ask additional questions, and work on individual projects.
- Purely optional
- Open, others may join in.
- Soldering station and other tools available.

Library sessions/workshops/courses are provided free of charge.

Materials

Per Participant

- Jaycar LoRaWAN IoT Node Kit (to be specified)
- Windows 10 Laptop with
    - Internet Access
    - Chromium Browser (to access TTN)
    - Arduino IDE (for programming devices)
    - MQTTspy (for monitoring MQTT data)

  (After the first session, participants are encouraged to bring their own Laptop and equipment to use in workshops. There will still be a Laptop available for use if required.)
- Attendee folder and resources (Handouts and USB Stick)

Per session

- LoRaWAN uGateway device
- The Things Network Workshop Application (preconfigured)
- Powerboards

Session 1 - Adding a Node to The Things Network

Format: Workshop, 50 mins

Tasks

- Introduction to Workshop
    - Aims/Goals
    - Laptop software we will be using
    - Hardware we will be using
- Create a TTN account, and be added as a collaborator.
- Register an IoT device/node.
- Install Arduino IDE (or use online version)
- Download the sensor sketch, open and edit in IDE
- Upload sketch to the Arduino device.
- See sensor sending data to the TTN network.

Equipment

- Laptop (with Web, Arduino IDE)
- Arduino UNO, LoRaWAN Shield, USB Cable
- USB Stick for saving sketches, notes and resources
- Attendee folder and resources

Optional Tasks before next Session

- Before the next session purchase a LoRaWAN IoT kit from Jaycar (as specified)

Session 2 - Uploading Sensor Data to The Things Network

Format: Workshop, 50 mins

Tasks

- Modify the Arduino sketch to transmit customised data.
  Advanced tasks
    - Add custom filters/decoders for data (take turns)
    - Create a new TTN Application
- Introduction to MQTT (Install MQTTspy)
- Introduction to types of sensors which are available.
    - Describe the sensor to be used in next workshop

Equipment

As before:

- Laptop (with Web, Arduino IDE, MQTTspy)
- Arduino UNO, LoRaWAN Shield, USB Cable
- USB Stick for saving sketches, notes and resources
- Attendee folder and resources

For the group:

- Collection of sensors and their details (data sheets)

Session 3 - Adding sensor hardware

Format: Workshop, 50 mins

Tasks

- Attach an environmental sensor to the TTN node and collect data via MQTT
    - Wire up environmental sensor
    - Modify Arduino sketch to query sensor
    - Transmit data to TTN Application
    - Add filter/decoder for data
    - Observer data messages with MQTT

Equipment

As before:

- Laptop (with Web, Arduino IDE, MQTTspy)
- Arduino UNO, LoRaWAN Shield, USB Cable
- USB Stick for saving sketches, notes and resources
- Attendee folder and resources:

Plus:

- Breadboard, lead wires
- Sensor module and data sheet

Optional Tasks

- Attach another sensor type
- Modify Arduino sketch and add some additional functionality (eg. Make LEDs flash)

Session 4 - Adding Network Feedback

Format: Workshop, 50 mins

Add local feedback (LEDs) and support for data reception from the network

Tasks

- Brainstorm/Discussion on what applications various sensors could be used for. How could downloaded data be useful?
- Add status LEDs
    - Connect three status LEDs
    - Modify Arduino sketch to display sensor status (non-blocking, asynchronous)
    - Modify Arduino sketch to display downloaded data (non-blocking, asynchronous). Use TTN Website to test sending data to node.

Equipment

As before:

- Laptop (with Web, Arduino IDE, MQTTspy)
- Arduino UNO, LoRaWAN Shield, USB Cable
- USB Stick for saving sketches, notes and resources
- Attendee folder and resources:
- Breadboard, lead wires
- Sensor module and data sheet
- LEDs, Resistors

Optional Tasks

- Connect up and control an additional 6 LEDS, via analog pins
- Solder up on Arduino Prototype Shield

Session 5 - Where to from here?

Format: Workshop/Discussion, 50 mins

Tasks

Discussion

- Discuss more software examples
    - Collecting data
    - Graphing and analysing data
    - Sending download data (other formats, encoding etc.)
- Locating Gateways with TTNmapper
    - Setup of TTNmapper on Android Phone
- Data format / encoding
- Radio considerations - ACMA, Legalities, Frequencies, Power considerations

Questions and Feedback

Equipment

As before:

- Laptop (with Web, Arduino IDE, MQTTspy)
- Arduino UNO, LoRaWAN Shield, USB Cable
- USB Stick for saving sketches, notes and resources
- Attendee folder and resources:
- Breadboard, lead wires
- Sensor module and data sheet
- LEDs, Resistors