Soil Moisture in Urban Areas

Caribbean IoT

Implementation Issues

Hands On Session

Context

- Food security
  - High Food Import Bill + Static Income
  - Urban: Grow your own
- Water shortage (AgroMET)
  - Extended dry season + low reservoirs
  - Hosepipe/Irrigation bans

  Efficient watering solution?

- Flooding (ODPM)
  - "When rain falls for a
    prolonged period of time,
    the soil can become saturated."

  Better precision forecasts?

Proposed IoT Solution

- Do we have an immediate need/use for data?
  - Query whether water is required
  - Alert when/where water is required
- Is data useful when aggregated/analysed?
  - Urban Gardener/HydroMET
    - Estimated (total) water usage
    - Moisture levels vs. crop yield
  - HydroMET/AgroMET Data User
    - Where/When is rain falling?
   - Moisture levels vs. flooding

Technology Profile

- A) Platform
- B) Data Collection + Handling
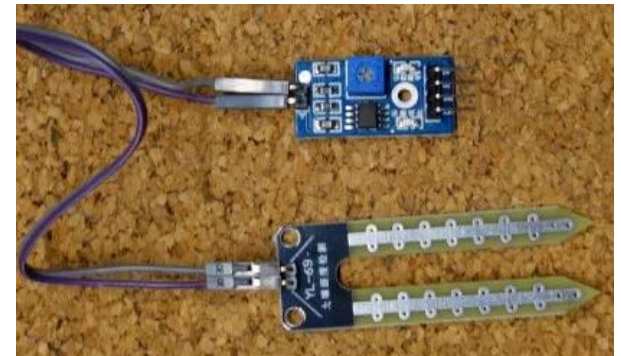- C) Cloud Computing
- D) Semantic Technologies

A) Platform

- ## Open Design
  - "development of physical products, machines and systems through use of publicly shared **design** information ... involves the making of both free and **open**-source software (FOSS) as well as **open**-source hardware." - *https://en.wikipedia.org/wiki/Open_design*

- ## Onion Omega 2(+)
  - MIPS32 Processor
  - Linux-based kernel
  - Built in WiFi
 - Digital I/O
  - Battery Power (3 - 5Vdc)

  https://docs.onion.io/omega2-docs/index.html
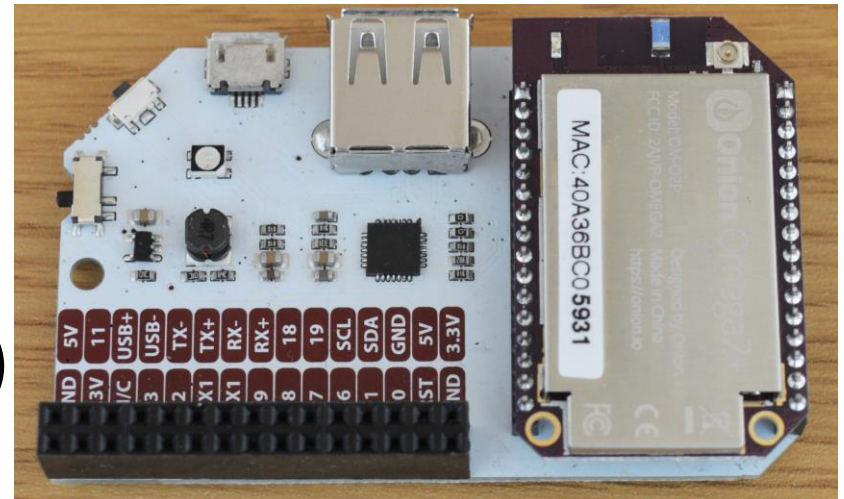
B) Data Collection + Handling

- Open Data
  - "data that can be freely used, shared and built-on by anyone, anywhere, for any purpose." - *https://blog.okfn.org/2013/10/03/defining-open-data/*
  - AgriHack, AgriNeTT, CodeJam : regional initiatives
- HydroMET
  - Typically coarsely aggregated/low density sampling
    - METOffice: Daily rainfall and temp'e at Airport sites '08 – '15 – CSV *http://data.tt/dataset/piarco-rainfall-data*
  - SM2RAIN: *http://hydrology.irpi.cnr.it/research/sm2rain/*
- YL-39/YL-69 Moisture Sensor
  - Digital Output
  - Pot to set threshold
  - Data: Timestamp + ID/Location

C) Cloud Computing

- MQTT "*a machine-to-machine (M2M)/"Internet of Things" connectivity protocol. It was designed as an extremely lightweight publish/subscribe messaging transport. It is useful for connections with remote locations where a small code footprint is required and/or network bandwidth is at a premium*" - http://mqtt.org/

  - Publisher – Onion Omega

  - Broker – IBM Iot Watson   https://internetofthings.ibmcloud.com

  - Subscriber - MyMQTT

- App Keys
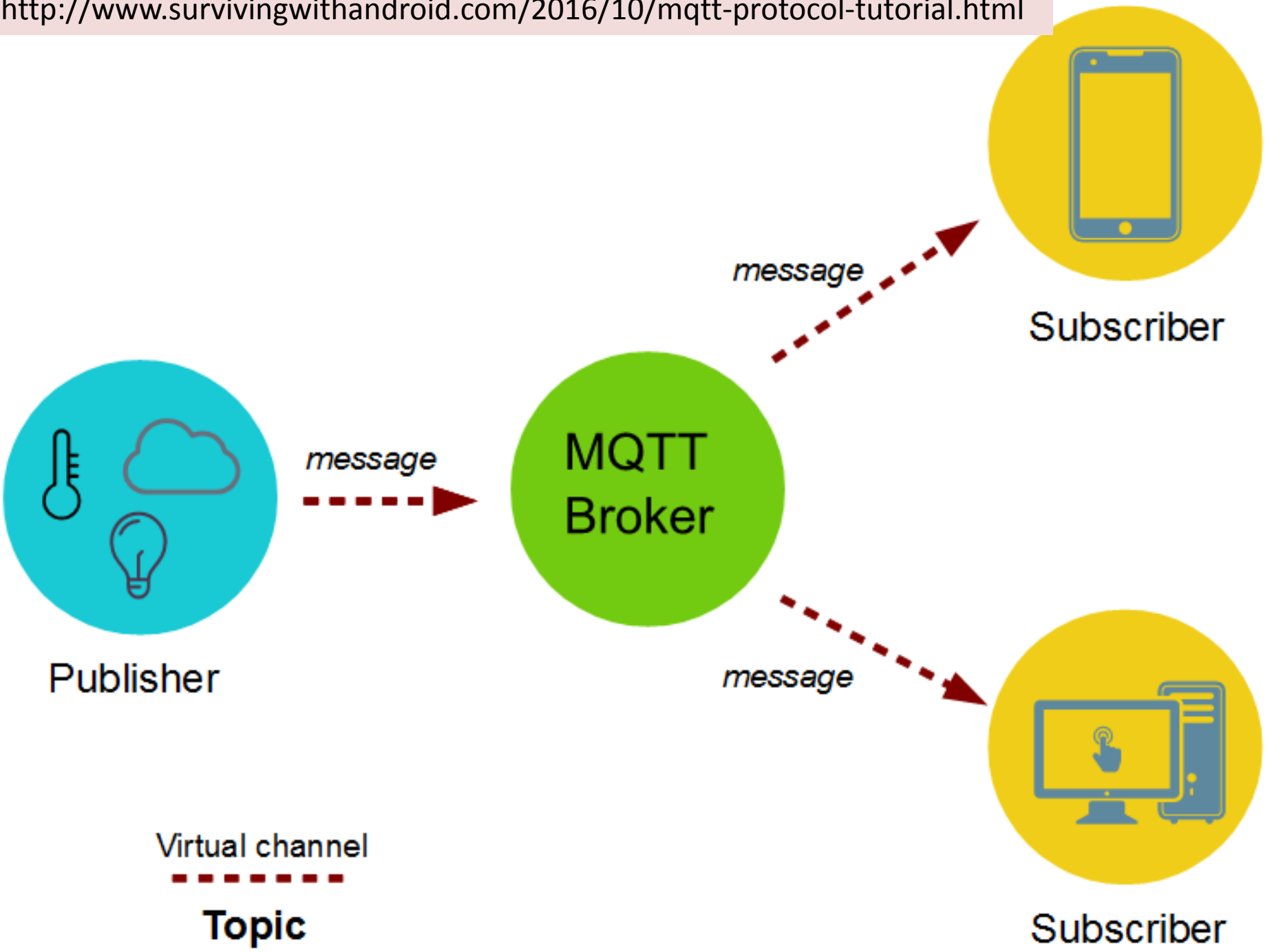
D) Semantic Technologies

- Map Based Visualisation

- Charts

- Merging Data-sets

Application Constraints

- Scale: min'm #/density users for meaning?
- Cost(s): What would Urban Gardener pay?
- IP Licensing: Open Source License? WiFi?
- Obsolescence: Cloud Services?
- Bandwidth/Spectrum: WiFi available?
- Security/Privacy: praedial larceny?

Build Session

- Sample Application – Moisture Sensor
- Think about:
  - Cyber Attack: how to disrupt data?
  - Energy Management: battery life on node?
  - Crowd-sourcing: multiple/unreliable sources?

IoT Case Study Q's (1)

- Application Context
- IoT Solution Problem/Goal [Use Case]
- Technology Profile - A) Platform
  - Software/Operating System: Standard SW/OS
  - Hardware/Sensor Technology: Standard HW/Sensor
  - Power Technology: Standard Voltage/Watts; Sleep/Recharging
  - Are any platform elements custom-created for the Application? Please detail …
  - Are any platform elements Open Source? Please detail …

IoT Case Study Q's (2)

- B) Data Collection and Handling
  - Sensor <-> Platform: Standard TX Name, Frequency/Latency (Reading/TX)
  - Platform <-> Server: Location, Redundancy/Filtering, and Aggregation
  - Server <-> Internet: Security/Privacy, Obfuscation
  - Are any elements of data available to authorised users via API? Please detail …
  - Are any elements of data available to the public as Open Data? Please detail …

IoT Case Study Q's (3)

- C) Cloud Computing
  - Big Data: Analysis, Storage Requirements/Formats, and Encryption/Assurance
  - Visualisation: Data Access/Retrieval, Types of graphic, Refresh/Update protocols
  - Payments: In-App Currency + Conversion, Payment Validation, Payee Identification
  - Are any functions carried out using "edge" or "fog" computing? Please detail …
  - Are any elements of the Cloud utilised to provide other services? Please detail …

IoT Case Study Q's (4)

- D) Semantic Technologies
  - Query/Metadata: Types of queries, Metadata formats and requirements
  - Analytics: IoT/Watson, Google DashBoard
  - Are users able to specify semantic queries using the data set? Please detail …
  - Are additional patterns/information derived by combining data sets? Please detail …

IoT Case Study Q's (5)

- Were any choices in the 4 aspects of the IoT solution constrained by:
  - Connectivity: Bandwidth/Spectrum? Please detail
  - Technology/Operating Costs? Please detail …
  - IP Licensing requirements? Please detail …
  - Scale? Please detail …
  - Obsolescence? Please detail …
  - Security/Privacy? Please detail …