FROM RATS TO COWS, 
HEARTS TO HOMES, 
SOME M2M STORIES 
AND ARCHITECTURE PATTERNS

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“Connected Life” forecast $4.5T in 2020

• Connected Life is about everything that is connected and interacts: cars, mobile devices, buildings, sensors and people

• Top Ten in 2020

  1. Connected Car $600 billion
  2. Clinical Remote Monitoring $350 billion
  3. Assisted Living $270 billion
  4. Home and Building Security $250 billion
  5. Pay-As-You-Drive Car Insurance $245 billion
  6. New Business Models for Car Usage $225 billion
  7. Smart Meters $105 billion
  8. Traffic Management $100 billion
  9. Electric Vehicle Charging $75 billion
  10. Building Automation $40 billion

Trends: price, power consumption, network, size, convenience
The Realm of IoT & MQTT

Interconnect with MQTT Server

- Sense and Control
- Visualise and Respond

- Intelligence and Analytics
- Traditional Backend Systems
- BigData

MQTT & HTTP

MQTT-SN

Mobile
Web

Sensor Area Network
- Home Area Network
- Personal Area Network
- Vehicle Area Network

Sensors
Actuators
Controllers

Edge Gateway
Smart Mouse Trap: Motivation

Troublesome Mice

The problem:
- In hard to reach areas of home
- Inconvenient to set and monitor mouse traps
- No cat

The Challenge:
- Create a smart mouse trap that alerts when the trap is triggered
Smart SCADA Mouse Trap

Detect “Trap 1 Event”

Publish “Trap 1 Event”

SMS “Check Trap in bedroom attic”

SAN       WAN
Farmer needs to know when to introduce Freda to Freddy the bull?

**The problem:**
- Time and labor intensive to watch for on heat cows
- Ineffective

**The Challenge:**
- Create a system that alerts the farmer in a timely manner when a cow is on heat
Smart Health

Patients with pace makers have to visit hospitals on a regular basis for a checkup.

The problem:
- Inefficient use of doctors time
- Time consuming and costly for the patient

The Challenge:
- Enable patients to be monitored in their homes
- Providing higher level of patient care and peace of mind
- Better utilising doctors time
Smarter Health: Monitoring in your home and on the go*

- Smart, connected, pacemakers eliminate the need for regular clinic visits
- Problems are detected early, preventing potentially life threatening incidents
- Doctors and clinicians spend most of their time on patients with problems

Smart pacemaker records data
Bedside appliance collects, aggregates and transmits
Analytics looks for anomalies and alerts the doctor
Doctor decides on and performs action
Assisted Living

Worldwide the elderly population is growing!

The problem:
• Cost of caring for the elderly is expensive and labor intensive

The Challenge:
• Enable the elderly to stay in their own homes for longer
• Provide peace of mind to the elderly and their family
Assisted Living

- SAN
- WAN

- Location
- Fall
- Biometrics
- Stairs
- Temp
- Water
- Medicine
- Energy
- Motion

Mobile Network → MQTT → Elderly Analytics

MQTT Server

Live raw data → Aggregated data → Dispatch closest warden

Family Monitoring App

Tele medicine

Control Room

Mobile Warden

Zigbee
Combining Smart Home and Smart Energy

Power generation capability cannot meet demand

The problem:
- Little ability to control demand
- Brown out

The Challenge:
- Create a system that manages load on the grid with minimal impact on home owners
Combining Smart Home and Smart Energy

Virtual Power Plant

Instrumented home

Usage
Energy, Temp...

MQTT

Control
Heating, Appliances

Demand Trend

Capacity

Futures Market

Weather
Smart Home Sample topic space

- A topic forms the namespace
  - Is hierarchical with each “sub topic” separated by a /
  - An example topic space
    - A house publishes information about itself on:
      - `<country>/<region>/<town>/<postcode>/<house>/energyConsumption`
      - `<country>/<region>/<town>/<postcode>/<house>/solarEnergy`
      - `<country>/<region>/<town>/<postcode>/<house>/alarmState`
    - And subscribes for control commands:
      - `<country>/<region>/<town>/<postcode>/<house>/thermostat/setTemp`

- A subscriber can subscribe to an absolute topic or can use wildcards:
  - Single-level wildcards “+” can appear anywhere in the topic string
  - Multi-level wildcards “#” must appear at the end of the string
  - Wildcards must be next to a separator
  - Cannot use wildcards when publishing

- For example
  - `UK/Hants/Hursley/SO212JN/1/energyConsumption`
    - Energy consumption for 1 house in Hursley
  - `UK/Hants/Hursley/+/+/energyConsumption`
    - Energy consumption for all houses in Hursley
  - `UK/Hants/Hursley/SO212JN/#`
    - Details of energy consumption, solar and alarm for all houses in SO212JN
And finally connected car

Smartcar

- Pay as you drive Insurance
- Predicts part failure
- Find my car
- schedules appointment with car owner
- Unlock my car

Smart Home
- Alerts to vehicle

Smarter City
- Events:
  - Anti Lock Brakes
  - Air Bag deployed
  - Vibration detected
  - Location change
Thank you for Listening
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