

DOA and the Internet of Things: Federated ID, Security and Delay Tolerance

George Roussos

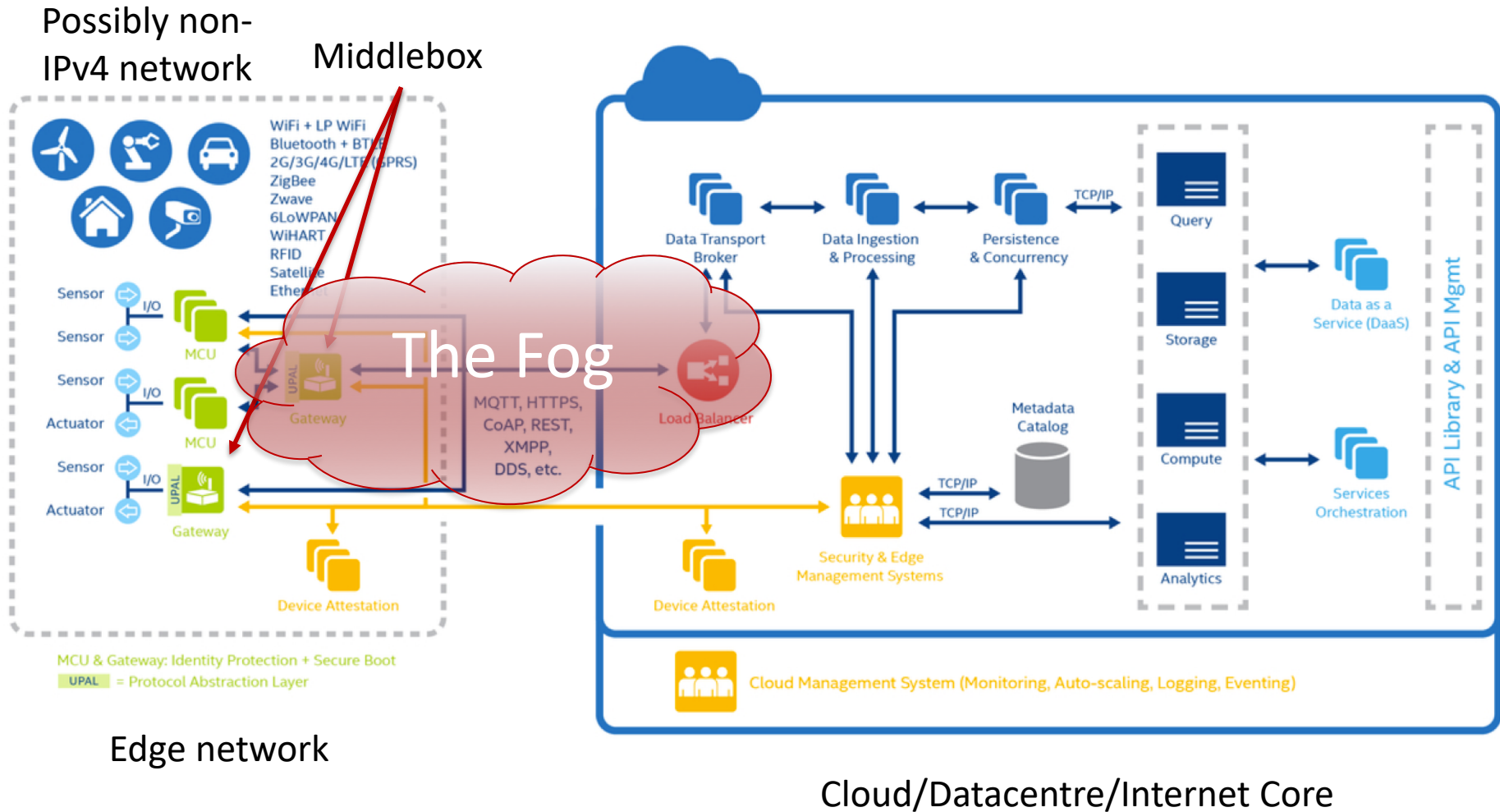
Birkbeck College, University of London

g.roussos@bbk.ac.uk

Overview

- Limitations of current IoT architectures
- Federated UUIDs, delay-tolerance, security
- Product end-of-life case study
- IATA permanent luggage tag case study
- Smart sensor case study

Typical IoT Architecture



Implicit Assumptions

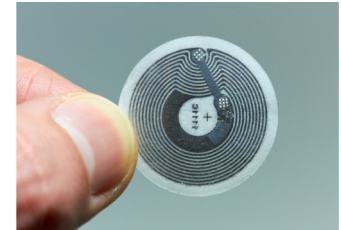
1. Every asset (“thing”), place and animate object can be unequivocally and specifically identified
 - and thus, easily linked to their meta-data
2. Entities (people, places, things) do not move around too much i.e. they change their point of attachment to the network infrequently
3. Entities are always connected to the network

Universally Unique Identifiers

- Plenty to choose from!
 - IPv6 address, LISP IDs (IETF)
 - MAC: wifi, Bluetooth, Zigbee (various)
 - Electronic Product Code (GS1)
 - ISO 15459, 18000
 - ITU mCode
 - Verticals: Odette OSCAR, IATA BIN

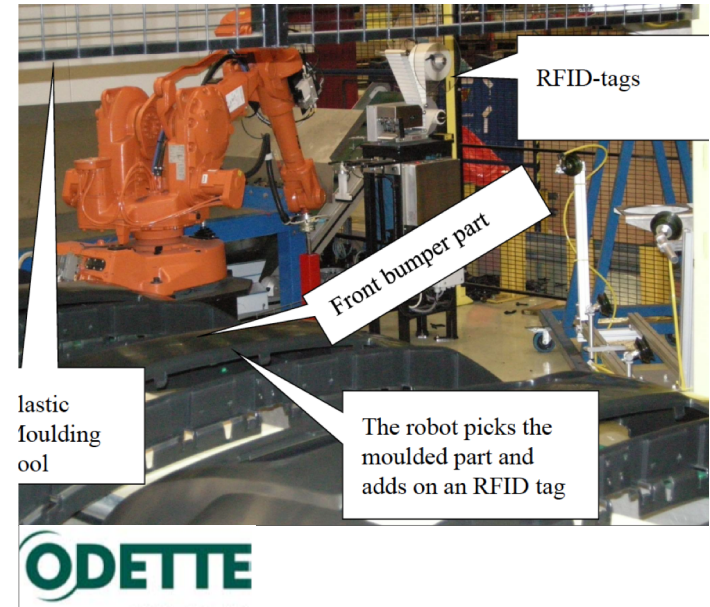
Perpetual connectivity

- Low-power devices often depend on the gateway for communication
 - UHF/HF RFID
 - EnOcean, Z-Wave, Insteon
- Store and forward/data surrogacy
- Mobile gateways (often smartphones)
- Meta-data and credentials at edge



End-of-life Management

- UUID 15459 specification
- IAC: Issuing Agency Code
- Odette: European automotive industry
- OSCAR codes
- Placed on components during manufacturing



Reclaiming components

- Disassembly
- Automated provenance checks
- Automated sorting by component (materials etc)
- Tracking and custodian information located from Handle



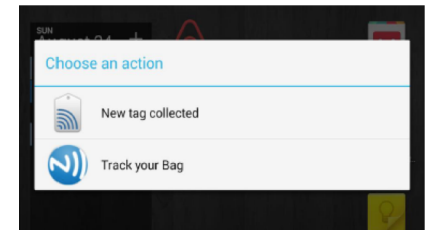
Permanent luggage tag

- UUID 15459 specification
- IAC code: IATA
- 10-digit Baggage Identification Number
 - root-OID 1.0.15961.12
 - relative-OID 1 and
 - compacted data e.g. 1234567890



Passenger app

- DOA 10673/1.1.0.15961.12.1.1234567890
- Store-and-forward app to update tag with check-in information – mobile gateway
- Query Handle to retrieve tracking information



Track your Bag
The wireless luggage tracking system

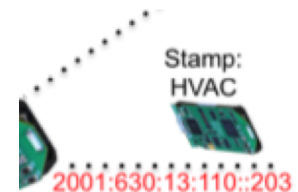
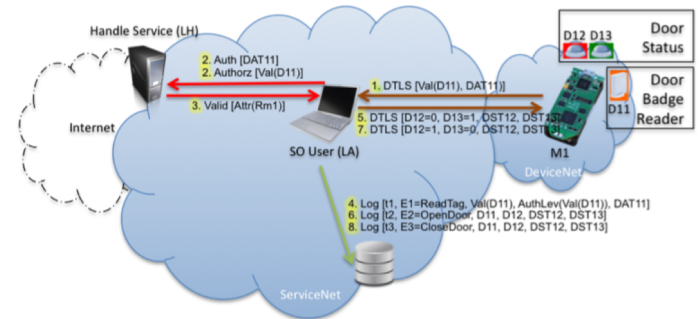
Tag id: 04D5F902842A80

| Time | Location | Comment |
|---------------------------|---------------------------------------|---------------|
| 2014-08-11 23:15:02 +0000 | 55.738728725725725/13.543228725517919 | My NFC Tag |
| 2014-08-09 20:02:18 +0000 | 55.738728725725725/13.543228725517919 | second read |
| 2014-08-09 20:04:06 +0000 | 55.738728725725725/13.543228725517919 | one more test |

Copyright © Trago Call Igna

Edge Security

- IPv6 identifier as Handle
- Associated with Device Security and Authentication tokens
- Used to verify authenticity of sensor measurements and enable actuation
- HVAC case study



Summary

- Low-power devices depend on middleboxes for IoT connectivity
- Federated UUIDs, delay-tolerance, security
- Product end-of-life case study
- IATA permanent luggage tag case study
- HVAC case study