IOT OVER ICN - MOTIVATION

- Low Power Wide Area; >20km for “things,” battery life >10 years, challenging radio environments (ISM bands)
  - E.g. LoRa, Weightless, Telensa, Ingenu...
  - Primarily private/Enterprise/Challenger SPs. Very low ARPU
  - No requirement for IP on device

- 3GPP NB-IoT; 3GPP’s attempt to provide LPWA-like services over LTE (re-purposed PRB, goals same as LPWA)
  - Promised as a “software upgrade” to existing eNB
  - Reality – encumbered by existing EPC; could be a “heavy” backhaul impacting device characteristics (still in discussion)
  - Late-to-market; at least 2017.
  - BUT OPERATORS ARE HOLDING OUT FOR NB-IoT

- Very small CPU/Memory footprint and requirement to minimise OTA cycles leads to the possibility of using ICN directly over LPWA air interface
- Could caching/name-to-device in ICN map to needs of IoT?
- Other benefits? Smaller stack?
AEP Service (LoRaWAN Components and User Entitlement/Access Control)

Access Point Control Plane

User Access Control

IP Domain

Consuming App 1

Consuming App 2

Consuming App 3

IP <-> Name

Mote

LoRa Access Points

Access Point Control Plane

IP Domain

Consuming App 1

Consuming App 2

Consuming App 3

IP <-> Name

Mote

LoRa Access Points

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IOT OVER ICN – PROGRESS REPORT

• Building a PoC with Arduino UNO + LoRa radios, RaspberryPI with Libelium LoRa radio
• IMST.de iM880a-L Cortex-M3 based devices; goal to run CCN-lite with LPWA stack (20mm x 25mm)

Issues:
• Mapping of LoRa network addresses & sensor identity to names
• Registration of devices to network (interactions between FIB and LoRa potentially via AEP)
• Broadcast nature of LPWA (need to select based on OTA metadata, e.g. RSSI, BER, selected modulation scheme, etc).
• Polling mechanism used by Things does not map well to ICN (need a “local-store”)
• Don’t even want to start thinking about Security, Data Presentation, etc.
...AND FUTURES...

- Core Network:
  - Built on VMs running Cisco ICN forwarder
  - Various hacks in place to position URIs from LoRa air-interface (bit clunky)

- ICN compiled down to Motes
  - CCN Lite
  - Various problems (mostly layer 1, programming, etc.)
  - Other stacks ?
  - Security ? (eUICC on a Mote. Could map to OneM2M architecture)

- Need to solve multicast/path selection issues
  - RSSI based, policy-based (e.g. SLA).

- Potential to integrate with AAU Banana PI Testbed being built a UoSurrey
  - Lab network being built by “willing” student over the summer

- Introduce NB-IoT/LTE-M2 to PoC
  - No LI issues in ISM – situation is different in NB-IoT on licensed spectrum.
  - Would require changes to PDCP on UE & beNB to support non-IP traffic.

- What other air-interfaces ?
CONCLUSIONS

• ICN seems to be well matched to IOT due to:
  • Small stack
  • Inherent name support
  • Security model
  • Potential de-dupe by local caching

• Need to solve various issues around multicast, choosing paths
• Collaborate with other interested groups

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