IOT OVER ICN WITH LPWA

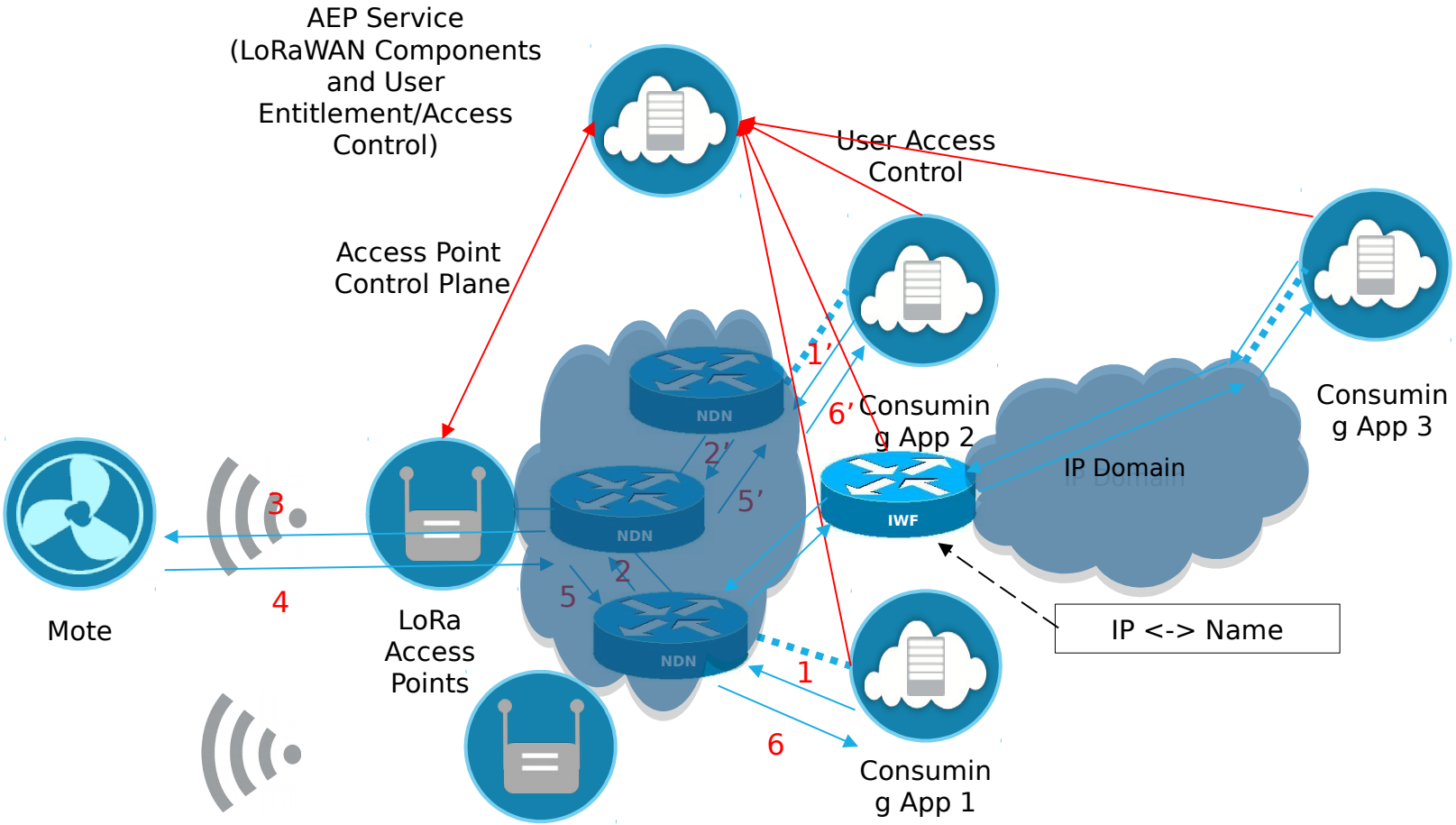
David Lake

Cisco/University of Surrey 5GIC

IRTF 96 ICNRG, July 2016

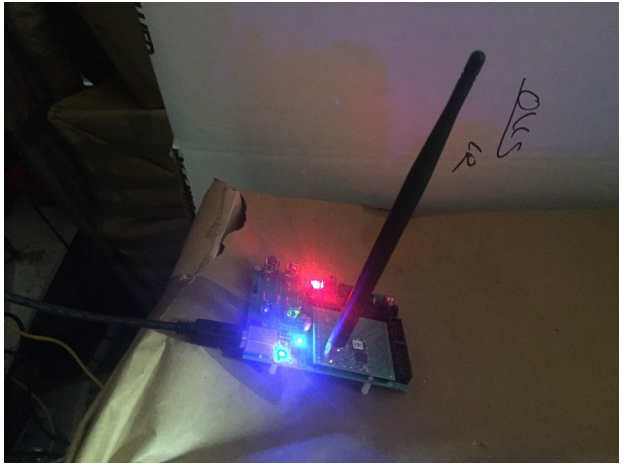
IOT OVER ICN - MOTIVATION

- 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)
User Access
Control
Access Point
Control Plane
NDN
NDN
NDN
IWF
IP Domain
Consumin
g App 2
Consumin
g App 3
Consumin
g App 1
IP <-> Name
Mote
LoRa
Access
Points
1'
2'
5'
6'
3
4
5
2
1
6

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, programing, 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

dlake@cisco.com

d.lake@surrey.ac.uk