

*Because every life has a purpose...*



# Towards an ICN-powered Industrial IoT

Michael Frey – ICNRG interim meeting – 29<sup>th</sup> September 2017

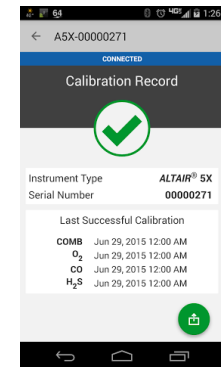
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# Agenda

- Use case
- Towards an ICN-powered Industrial IoT
- Intermediate results
- Outlook

# MSA Safety - Mission and Products

- Improve worker's and facilities safety
- Main customer segments
  - Oil, gas, chemical industries
  - Fire fighters and first responders
- Core product groups
  - **Gas detection**
  - PPE and SCBAs
  - Fall protection



# Use case

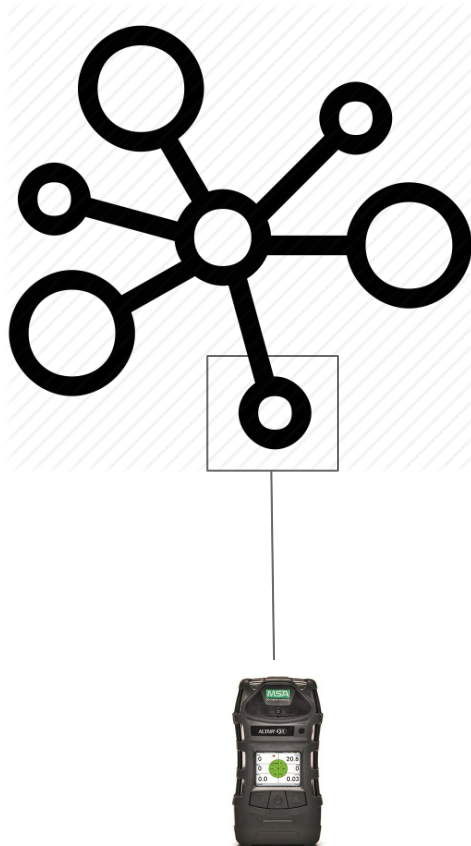


# Use case in a nutshell

- Workers in industrial process plants
  - Perform maintenance tasks in safety-critical environments
  - Dangerous events may occur any time
    - exposure to toxic/combustible gases
    - oxygen depletion in confined spaces
    - gas leaks/sudden outbursts of fire

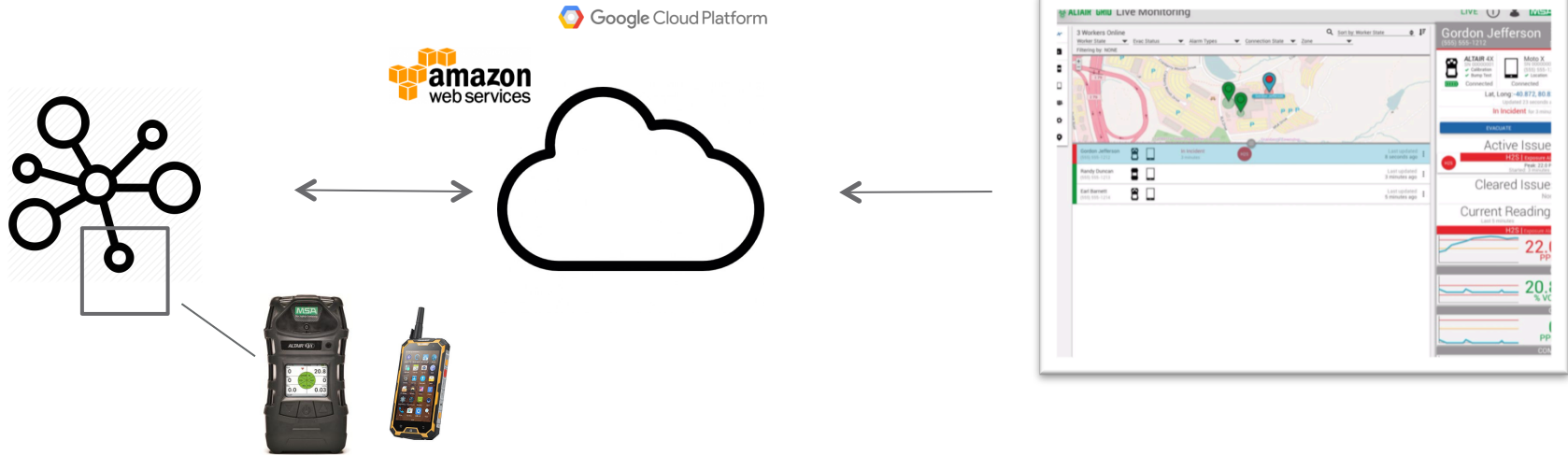


# Use case as a sketch



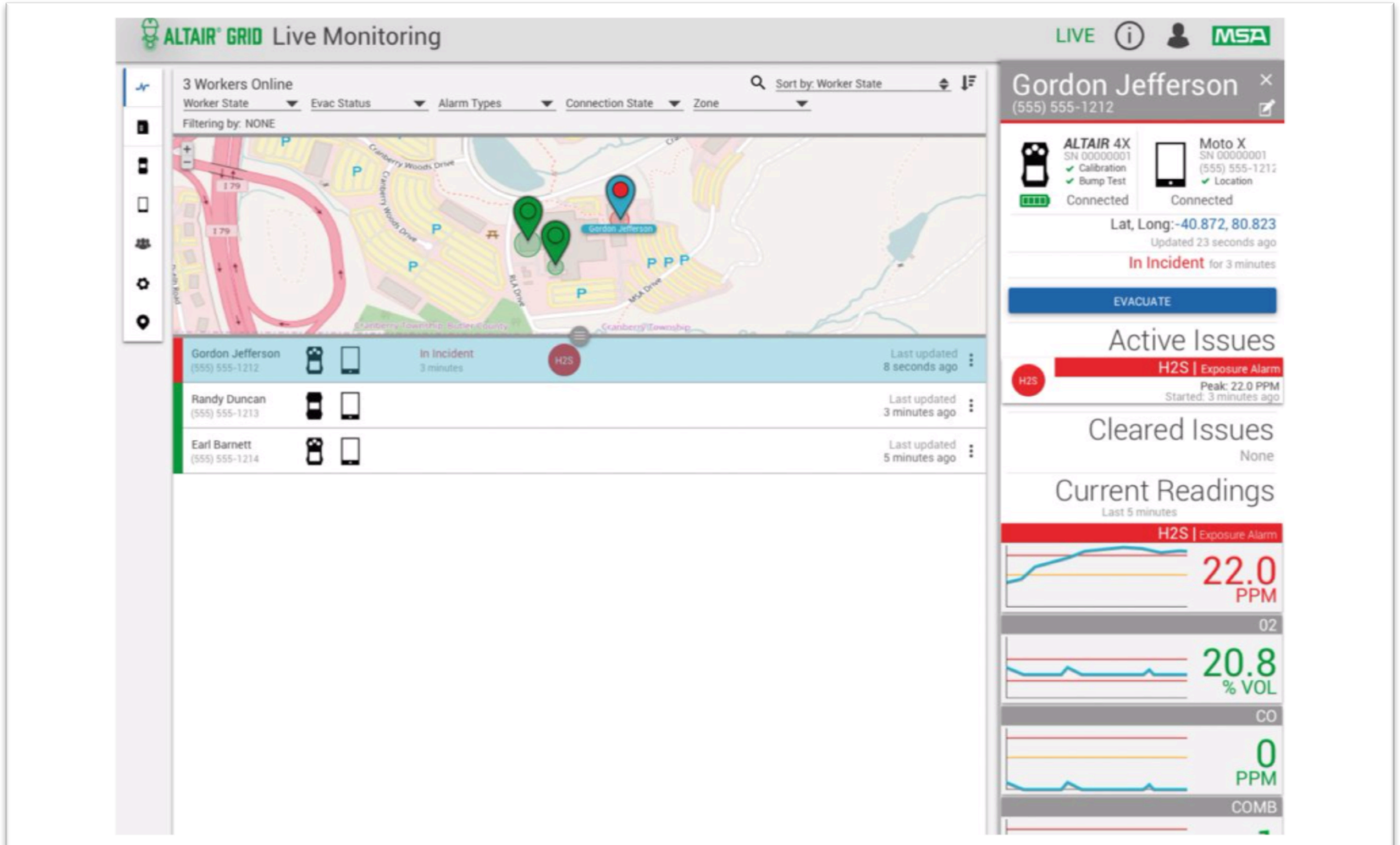
- Protocols
  - Alarm
  - Mission log
  - Configuration
  - Management
- Communication via border gateway to the cloud

# Safety as a Service



- Altair Grid provides a “virtual control room”
  - Alarms: exposure, man down, worker-activated
  - Evacuation progress
  - Incident reports
- API for customers

# Safety as a Service



**ALTAIR GRID Live Monitoring**

3 Workers Online  
Worker State | Evac Status | Alarm Types | Connection State | Zone  
Sort by: Worker State  
Filtering by: NONE

**Gordon Jefferson**  
(555) 555-1212

**ALTAIR 4X**  
SN 00000001  
✓ Calibration  
✓ Bump Test  
Connected

**Moto X**  
SN 00000001  
(555) 555-1212  
✓ Location  
Connected

Lat, Long: -40.872, 80.823  
Updated 23 seconds ago  
**In Incident** for 3 minutes

**EVACUATE**

**Active Issues**

**H2S | Exposure Alarm**  
Peak: 22.0 PPM  
Started: 3 minutes ago

**Cleared Issues**  
None

**Current Readings**  
Last 5 minutes

**H2S | Exposure Alarm**  
22.0 PPM

02  
20.8 % VOL

CO  
0 PPM

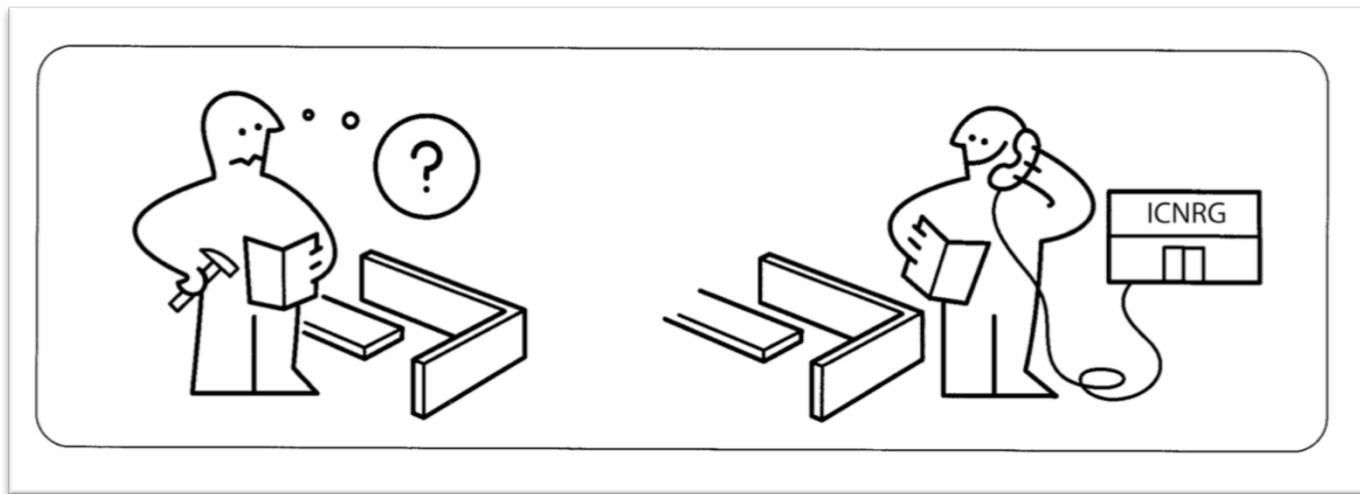
COMB

Worker Name	Phone Number	Status	Alarm	Last Updated
Gordon Jefferson	(555) 555-1212	In Incident	H2S	8 seconds ago
Randy Duncan	(555) 555-1213	Offline		3 minutes ago
Earl Barnett	(555) 555-1214	Offline		5 minutes ago

# Towards an ICN-powered Industrial IoT

# Towards an ICN-powered Industrial IoT

- Consider current setup with gas detectors, smartphones, cloud services in an industrial environment
- How would an ICN-powered setup look like?





## Removing smartphone dependency:

- Provide wireless network interface in gas detectors
  - How do we provide reliable communication?
    - ◆ TSCH for ICN?
  - How do we provide secure communication?
    - ◆ Protect data instead of channel?
  - How do we handle prioritized traffic?
  - How do we implement alarms?
  - What about long range networks?

# Towards an ICN-powered Industrial IoT (cont.)

- How to combine ICN and the “IP world”?
- How does a deployment with ICN-powered devices in a safety-critical environment look like?
- How do we manage keys? Can we have “trustworthy” devices out of the box?



# Intermediate results

- Publish/subscribe scheme for NDN
  - adopts PANINI approach
  - advertisement of names on control plane
  - content requests on the data plane
- pyICN2mqtt
  - translates between NDN packets/MQTT messages
    - interests correspond to MQTT subscribe messages
    - publishes NDN data via MQTT

## Information-Centric Networking for the Industrial IoT

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Versions: [00](#) [01](#)

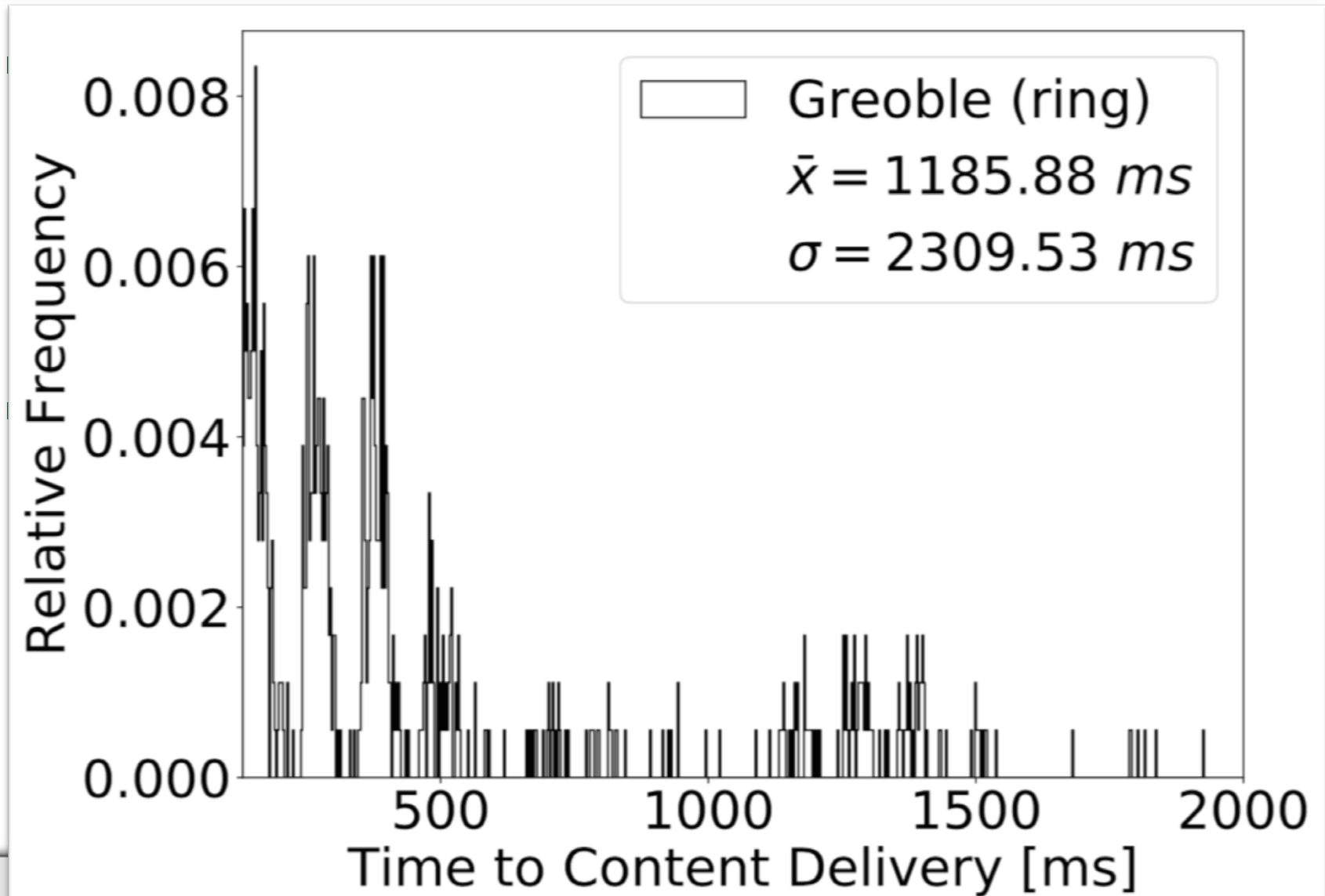
ICN Research Group  
Internet-Draft  
Intended status: Experimental  
Expires: September 14, 2017

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T. Schmidt  
HAW Hamburg  
M. Waehlisch  
link-lab & FU Berlin  
March 13, 2017

Publish-Subscribe Deployment Option for NDN in the Constrained Internet  
of Things

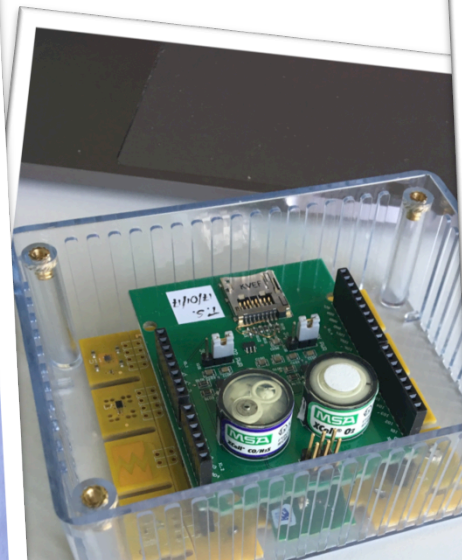
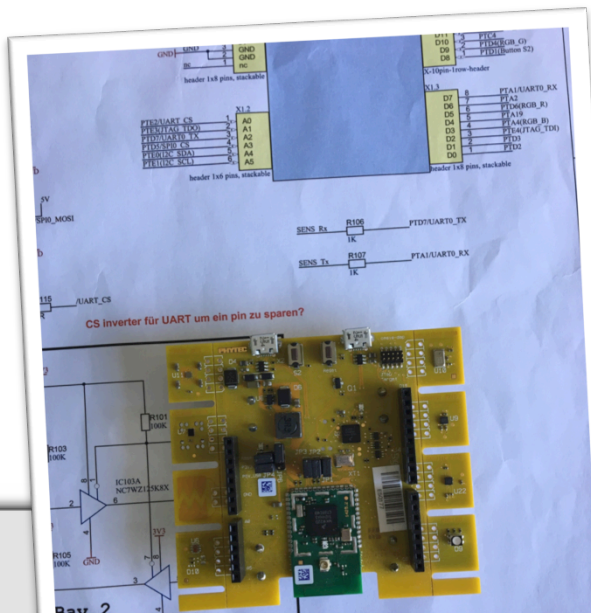
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# Intermediate results (cont.)



# Intermediate results (cont.)

- ICN testbed at MSA
  - deployed 15 (20) control/sensor nodes
  - ARM Cortex M4 platform, IEEE 802.15.4 @ 2.4 GHz
  - powered by RIOT and CCN-lite



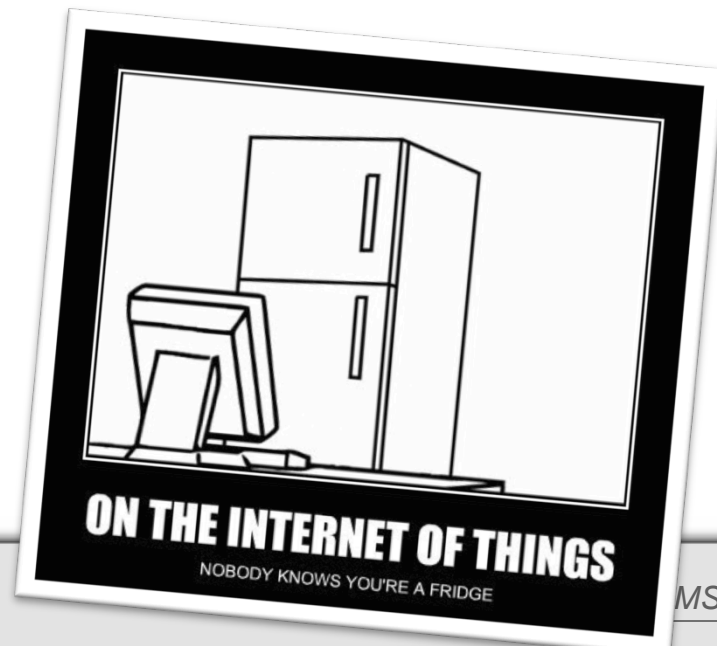


# Outlook

- Identify problems & challenges in ICN management
- Use testbed as primary object for study (for now)
  - How to manage an ICN network using ICN primitives and mechanisms?
    - Discovery/synchronization
    - What to monitor?
    - Caching strategies
    - Update mechanisms

# Summary

- Interconnected (industrial) devices will be the standard and will be managed in the cloud
- Providing/guaranteeing secure operations of these devices is critical (of success)
- ICN is a promising approach to tackle a lot of the challenges



*Because every life has a purpose...*



**Thank you! Any Questions?**