

Information-Centric Networking for the Industrial IoT

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Scenario

- Workers perform maintenance tasks in safety-critical environments
- Every worker is equipped with an low-power battery-operated portable gas detector
- Gas detector monitors gas levels and alerts workers locally in case of danger
- Dangerous events may occur any time and include
 - gas leaks or item exposure to toxic or combustible gases
 - sudden outbursts of fire

Requirements

- Alarms have to be recognized and propagated in a timely manner, in order to alert
 - workers performing tasks on-site or nearby
 - safety managers via a cloud service
- Robust communication due to mobility induced intermittent connectivity



Implementation

Publish-Subscribe Scheme

- Adopts PANINI [1] in order to build/maintain a spanning tree rooted at the gateway
- Publish: Content is advertised on the control plane using unicast link-local signaling
- Subscribe: Unsolicited name advertisements result in NDN Interests on the content plane

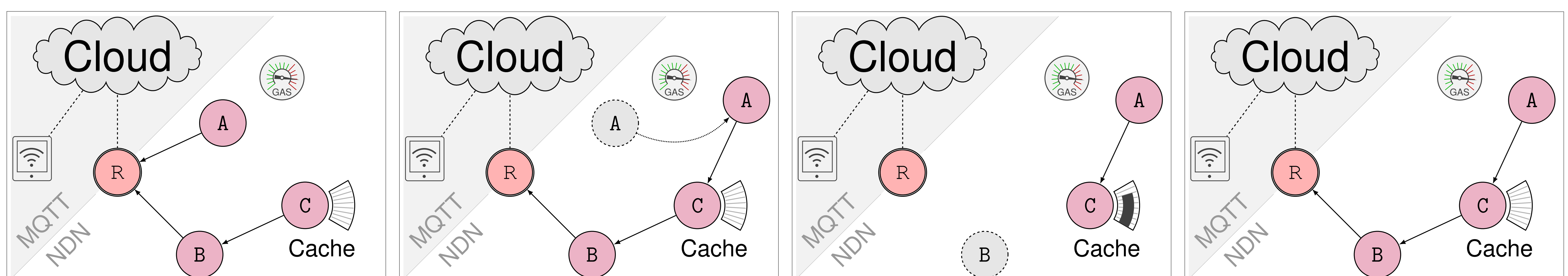
ICN MQTT Gateway

- Translates between NDN and MQTT
- Re-publishes Data under a MQTT topic
- MQTT subscribe message maps to NDN Interest
- Topics are based on pre-defined content naming scheme

Platform

- Gas detectors are powered by RIOT
 - ARM Cortex-M4 MCU, 32 kB RAM, and 256 kB ROM
 - MSA XCell O2 Sensor
- Multi-hop topology enforced via RIOT's link layer filtering
- NDN is provided by CCN-Lite for RIOT

Mobility and Dependability with ICN in Harsh Environments



Demo in a Nutshell

- Workers perform maintenance operation in designated area
- Alarm is triggered and propagated through the network to other workers and border gateway
- Border gateway forwards alarms received via NDN towards an MQTT-powered cloud service

Contributions

- Robust and dependable communication with publisher mobility in harsh environments
- Novel publish-subscribe scheme [2] for NDN enabling unsolicited publish from an NDN IoT device to a cloud service
- Features ICN MQTT gateway which translates between NDN packets and MQTT messages

References

- [1] T. C. Schmidt, S. Wölke, N. Berg, and M. Wählisch, "Let's Collect Names: How PANINI Limits FIB Tables in Name Based Routing," in *Proc. of 15th IFIP Networking Conference*. Piscataway, NJ, USA: IEEE Press, May 2016, pp. 458–466.
- [2] C. Gundogan, T. Schmidt, and M. Waehlich, "Publish-Subscribe Deployment Option for NDN in the Constrained Internet of Things," IETF, Internet-Draft – work in progress 01, July 2017.