

Publish-Subscribe Deployment Option for the Constrained IoT

draft-gundogan-icnrg-pub-iot-01

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Agenda

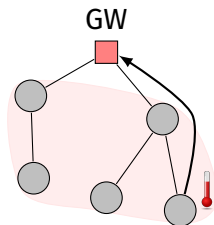
Motivation

Publish-Subscribe Option

Publisher Mobility & Network Partitioning

Wrap Up

Scenario: IoT Sensor and Actuator Networks



Objectives

- ▶ Sensors produce data
- ▶ Immediate data propagation
- ▶ Alert notifications

Naïve approach in NDN/CCN: polling

- ⇒ wakes sleepy devices
- ⇒ superfluous traffic

Problem: Data Propagation

Push is bad

- ▶ breaks flow balance
- ▶ cache poisoning
- ▶ DoS

We should preserve the NDN/CCN request response scheme!

But: How do we get data from sensor to consumers?

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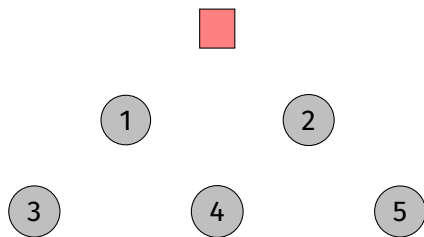
Publish-Subscribe Option

Key Features

- ▶ Data immediately propagated towards content proxy
- ▶ Data is **not pushed**
- ▶ Name advertisements on control plane
 - ▶ link-local signaling
- ▶ Data is replicated hop-wise on data plane
 - ▶ using standard NDN/CCN Interest-Data scheme

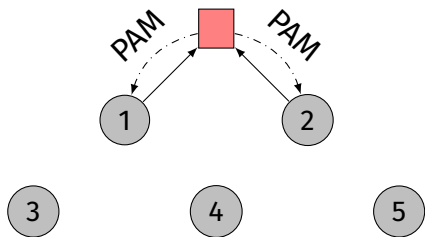
Build & Maintain Routing Topology

Content Proxy



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Content Proxy



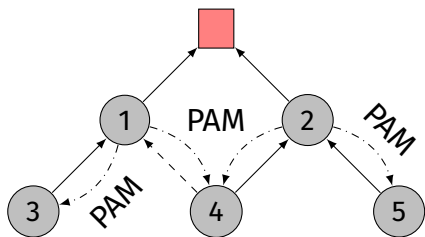
FIB

Prefix	Face
$/\rho$	f_i

PAM: Prefix Advertisement Message
broadcast, link-local scoped

Build & Maintain Routing Topology

Content Proxy



FIB

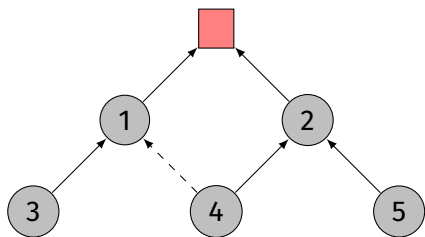
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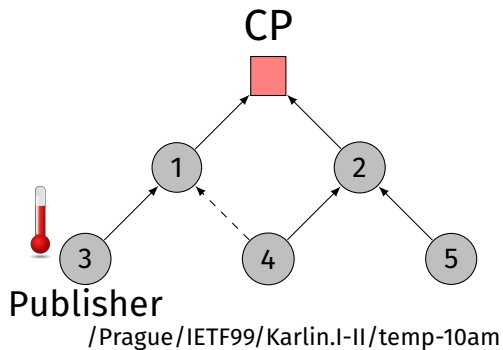
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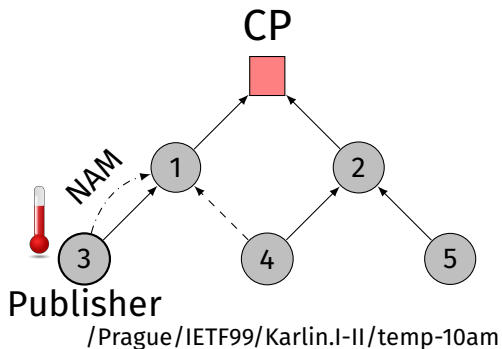
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Publish



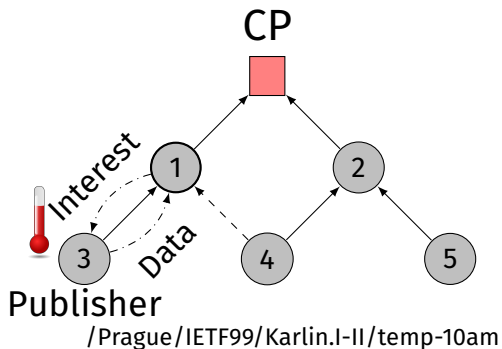
Publish



NAM: Name Advertisement Message

unicast to upstream parent

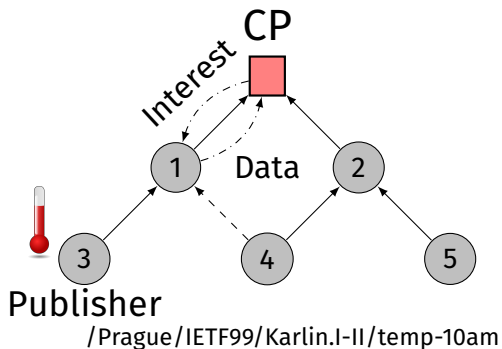
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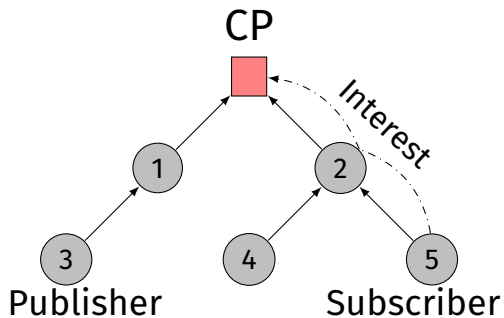
Publish



NAM: Name Advertisement Message

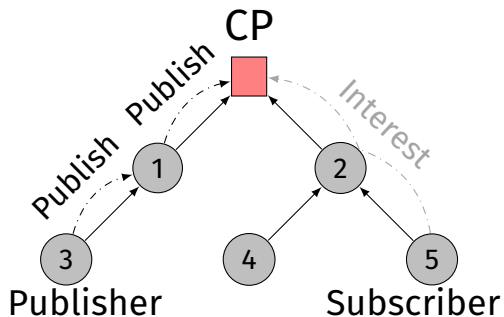
unicast to upstream parent

Subscribe



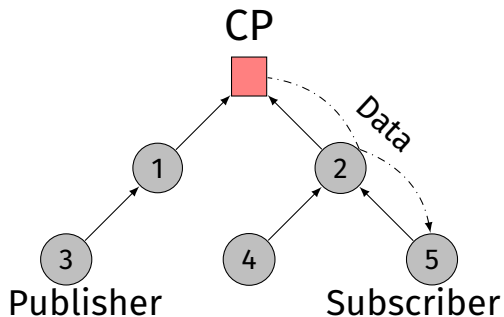
Subscribe

Publish = NAM \rightarrow Interest \rightarrow Data



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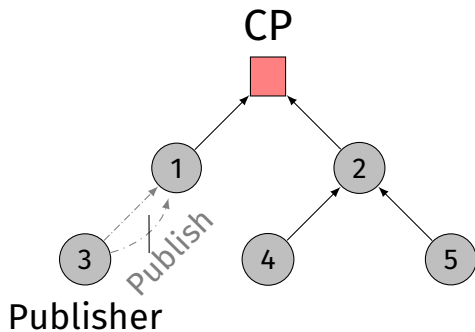
Publish-Subscribe Option

Publisher Mobility & Network Partitioning

Wrap Up

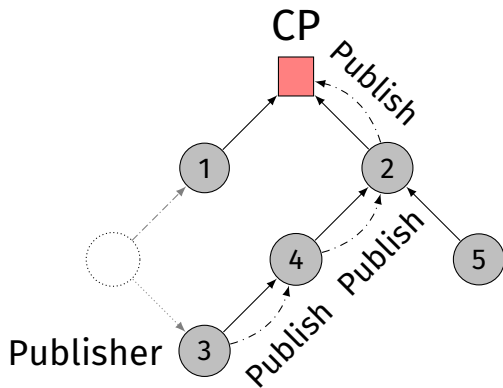
Publisher Mobility

Publish = NAM \rightarrow Interest \rightarrow Data



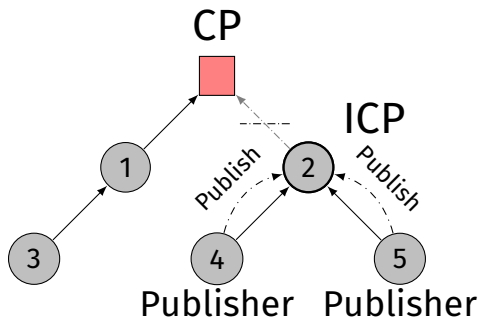
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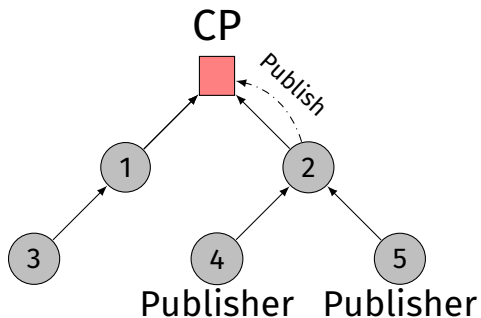
Network Partitioning

Publish = NAM \rightarrow Interest \rightarrow Data



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Summarized highlights

- ▶ Hop-wise data replication **without push**
- ▶ Decoupling (space, time, synchronicity)
- ▶ Data producer mobility
- ▶ Resilience in partitioned networks
- ▶ Minimal FIB state

Experimental Evaluation

- ▶ RIOT & CCN-lite in IoT-Lab testbed
- ▶ Large-scale experiments with > 300 constrained devices

Review of -00 (Dave, 30 June)

Comment

The question of PUSH versus PULL seems deep and complicated, but is marked as a “TODO” in the draft

Answer

Will be addressed in version 02

Review of -00 (Dave, 30 June)

Comment

It really matters whether the Content proxy acts as a “repo” or a “cache”. You waffle on this point.

Answer

The Content Proxy acts as a guaranteed cache with content lifetime.

Review of -00 (Dave, 30 June)

Comment

The prefix advertisement scheme gets a lot of attention compared to other parts, but this devolves essentially to link-state [...] flooding, which is well understood. [...] Are you proposing a protocol like NLSR? Or Chronosync? Or standard LSR to build a tree and then flooding the prefixes over the tree?

Answer

Scheme is not link-state, but distance-vector similar to RPL.
Central: propagation of prefix-specific default routes.

Review of -00 (Dave, 30 June)

Comment

It seems really unsatisfying to put the routing protocol in a control plane that does not reside on top of the existing NDN/CCNx data plane. Even with moderate amounts of traffic, you now have two very different data planes operating in parallel over the same links [...]

Answer

Control plane communication is a specific link-local message exchange. Reusing Interests would lead to semantic overload.

Draft Status

- ▶ Draft still in early state
- ▶ Subscribe needs more elaboration
- ▶ Packet header formats need more elaboration
- ▶ Major update to -02 soon