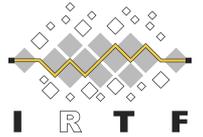# ICNRG @ IETF-106
Singapore

Information-Centric Networking Research Group
## Wednesday, November 18th, 2019

Chairs' Slides

Dirk Kutscher
Börje Ohlman
Dave Oran

Note Well – Intellectual Property

- **The IRTF follows the IETF Intellectual Property Rights (IPR) disclosure rules**

- By participating in the IRTF, you agree to follow IRTF processes and policies:

  - If you are aware that any IRTF contribution is covered by patents or patent applications that are owned or controlled by you or your sponsor, you must disclose that fact, or not participate in the discussion

  - The IRTF expects that you file such IPR disclosures in a timely manner – in a period measured in days or weeks, not months

  - The IRTF prefers that the most liberal licensing terms possible are made available for IRTF Stream documents – see RFC 5743

  - Definitive information is in RFC 5378 (Copyright) and RFC 8179 (Patents, Participation), substituting IRTF for IETF, and at https://irtf.org/policies/ipr

Note Well – Privacy & Code of Conduct
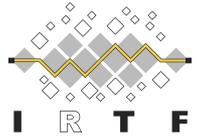
- As a participant in, or attendee to, any IRTF activity you acknowledge that written, audio, video, and photographic records of meetings may be made public

- Personal information that you provide to IRTF will be handled in accordance with the Privacy Policy at https://www.ietf.org/privacy-policy/

- As a participant or attendee, you agree to work respectfully with other participants; please contact the ombudsteam (https://www.ietf.org/contact/ombudsteam/) if you have questions or concerns about this

- See RFC 7154 (Code of Conduct) and RFC 7776 (Anti-Harassment Procedures), which also apply to IRTF
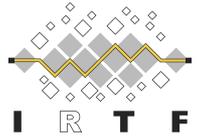
Goals of the IRTF

- The Internet Research Task Force (IRTF) focuses on longer term research issues related to the Internet while the parallel organisation, the IETF, focuses on shorter term issues of engineering and standards making

- **The IRTF conducts research; it is not a standards development organisation**

- While the IRTF can publish informational or experimental documents in the RFC series, its primary goal is to promote development of research collaboration and teamwork in exploring research issues related to Internet protocols, applications, architecture, and technology

- See "An IRTF Primer for IETF Participants" – RFC 7418

ICNRG Administrativia

- IRTF RG on Information-Centric Networking
- Mailing list: icnrg@irtf.org
- Web: http://irtf.org/icnrg
- Wiki: http://trac.tools.ietf.org/group/irtf/trac/wiki/icnrg
- Github: https://github.com/icnrg
- Chairs
  - Dirk Kutscher (University of Emden)
  - Börje Ohlman (Ericsson Research)
  - Dave Oran (Network Systems Research Design)
- This meeting
  - **Marie-Jose Montpetit (Merci beaucoup!)**
  - Etherpad: http://etherpad.tools.ietf.org/p/notes-ietf-106-icnrg
  - Meeting
    Materials: https://datatracker.ietf.org/meeting/106/session/icnrg

ICNRG Monday Agenda

- **Chairs Intro:** Agenda Bashing, Minutes taker, Bluesheets, (15 min)
    - Report from interim meeting in Macau
    - ICN over LoRa - update from side meeting in Macau
    - ICNRG Drafts - Status overview
- **Presentation/Discussion on Flow Balance draft** - Dave Oran (15 min)
- **Updated File-Like ICN Collection (FLIC) draft** - Dave Oran (10 min)
- **NRS documents: Updates** - Jungha Hong (10 min)
- **New draft: Path Steering in CCNx and NDN** - Dave Oran (10 min)
- **New draft: TimeTLV** - Thomas Schmidt (10 min)
- **Update: ICN Adaptation to LowPAN Networks** - Thomas Schmidt (10 min)
- **Update: IPoC: IP over CCN for seamless 5G mobility** - Greg White (10 min)
- **New draft: Internet Services over ICN in 5G LAN Environments** - Dirk Trossen (10 min)
- **Update: Hop-by-Hop Authentication in CCN / NDN** (10 min)
- **Presentation of results from Hackathon in Singapore** (5 min)
- **Chairs Wrap-up:** (5 min)
    - Planning for next ICNRG meetings
    - Possible future Hackathon topics?
    - Interim or Hackathon at IETF 107 Vancouver?

ICNRG Macau Interim Meeting Summary

Agenda

- **TouchNDN Workshop Debrief** - Jeff Burke
- **ICNLoWPAN** - Cenk Gündoğan
- **QoS for IoT** - Cenk Gündoğan
- **ICN over LoRa** - Dirk Kutscher
  - Introduction: Opportunities for ICN/LoRa -- Dirk Kutscher
  - NDN for a Smart Water Meter Collecting IoT System -- Xiaoyu Zhao
  - LoRa support in RIOT -- Peter Kietzmann
- **Push it - update 2: a P2P protocol for Append-only Push** - Christian Tschudin

Touching the Future Internet

Creating Distributed Media Experiences with TouchDesigner and NDN

23 September 2019, 10am-4pm

School of Creative Media

City University of Hong Kong

# "Plz, I can haz video for 2019, not 1950?"

- World is moving away from analog broadcast way of thinking about moving images. Are we?

- Seeking usual NDN benefits plus:

- Application-level framing for consumers to fetch **selectively** and non-sequentially based on:
  - semantics (pick prefix)
  - specific time intervals (pick frame)
  - quality (pick layers)
  - space (pick tile)

- Unified historical / live playback + transparent storage

- Hybrid abstraction for app developers
 - Bus, stream, and k-v store

Example NDN video packet name format:
`/<video-name>/<version>/`**`<time>`**`/`**`<space>`**`/`**`<quality>`**`/<chunk>`

`/video/v3/1/1,0/0/*`

q=2
q=1
q=0

s=0,0   s=1,0

s=0,1   s=1,1

t=0

t=1

t=2
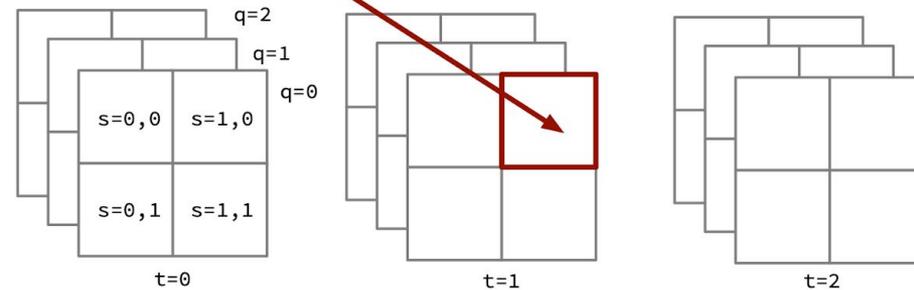
TouchNDN Alpha

- Integration of NDN with Derivative's TouchDesigner realtime 3D engine via the NDN-CNL/CCL stack (C++ and Python).

- Video streaming using the NDN-RTC library.

- General messaging and obj transport via NDN-CNL. No need to code Interest / Data.

- Platform for experimenting with data-centric media: oriented towards real-time and random access.
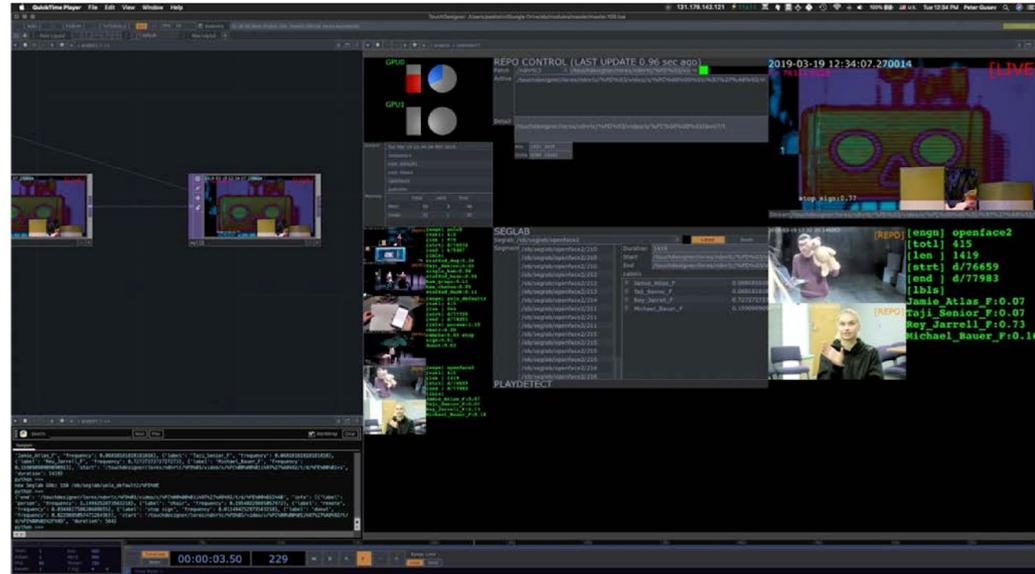
Gusev, Thompson and Burke. "Data-centric Video for Mixed Reality," ICCCN 2019, Valencia, Spain.

ICN LoWPAN

draft-irtf-icnrg-icnlowpan-05
ICNRG Interim, Macau

Cenk Gündoğan[1]   Thomas Schmidt[1]   Matthias Wählisch[2]

Christopher Scherb[3]   Claudio Marxer[3]   Christian Tschudin[3]

[1]HAW Hamburg

[2]Freie Universität Berlin

[3]University of Basel

September 27, 2019

Quality of Service for ICN in the IoT

draft-gundogan-icnrg-iotqos-01
ICNRG Interim, Macau

Cenk Gündoğan[1]   Thomas Schmidt[1]   Matthias Wählisch[2]

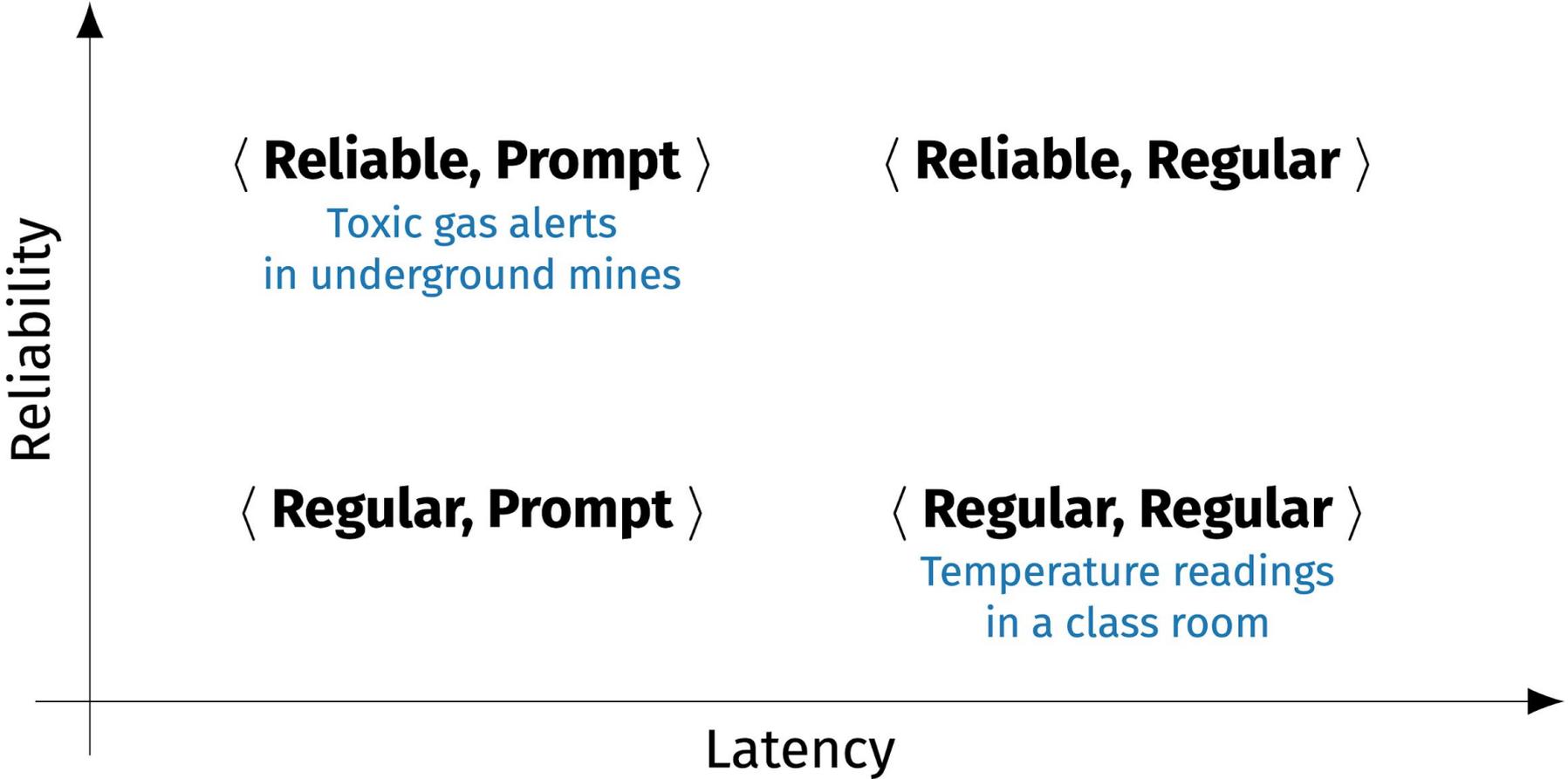Michael Frey[3]   Felix Shzu-Juraschek[3]   Jakob Pfender[4]

[1]HAW Hamburg

[2]Freie Universität Berlin

[3]Safety IO

[4]VUW

September 27, 2019

Quality Dimensions

Reliability (vertical axis)

Latency (horizontal axis)

⟨ **Reliable, Prompt** ⟩
Toxic gas alerts
in underground mines

⟨ **Reliable, Regular** ⟩

⟨ **Regular, Prompt** ⟩

⟨ **Regular, Regular** ⟩
Temperature readings
in a class room

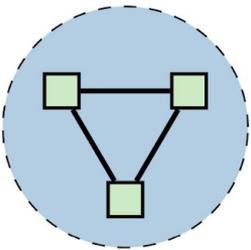# Resource Management Rules

1. Isolated Decisions
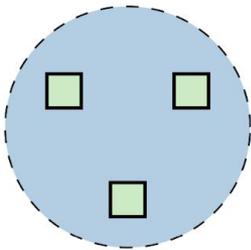
Forwarding Queue
Delay *regular* traffic

Pending Interest Table
Evict *regular* for *prompt*
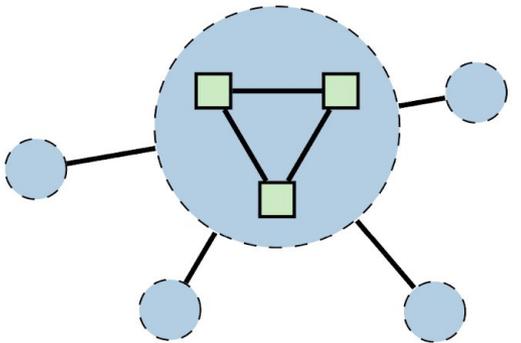
Content Store
Evict *regular* for *reliable*

2. Resource Correlations

CS—PIT Correlation
Prompt Data meets no PI
$\Rightarrow$ cached with priority

CS—Forward. Correlation
Prompt Data dropped
$\Rightarrow$ cached with priority

3. Distributed Coordination

PIT Coherence
Same config. at all nodes
$\Rightarrow$ *Regular < Reliable < Prompt*

CS Efficiency
Same config. at all nodes
$\Rightarrow$ *Regular < Prompt < Reliable*

HOCHSCHULE Networked
EMDEN·LEER Systems

LPWAN Compared to LowPAN

- Low-Power, local/personal Area (802.15.4 etc.)
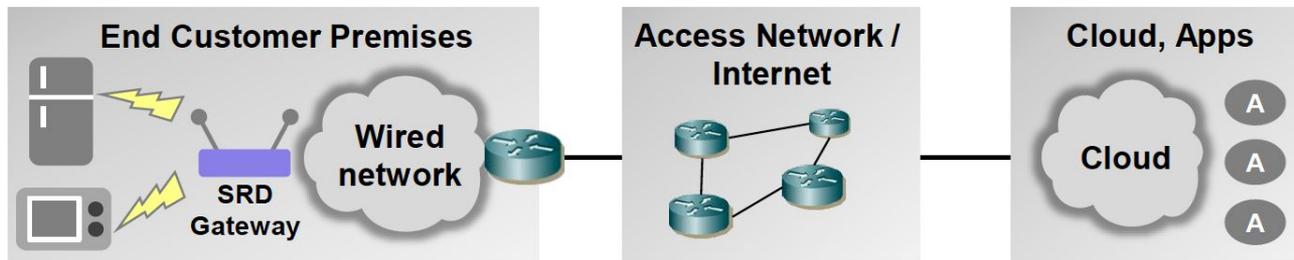
- Low-Power Wide Area
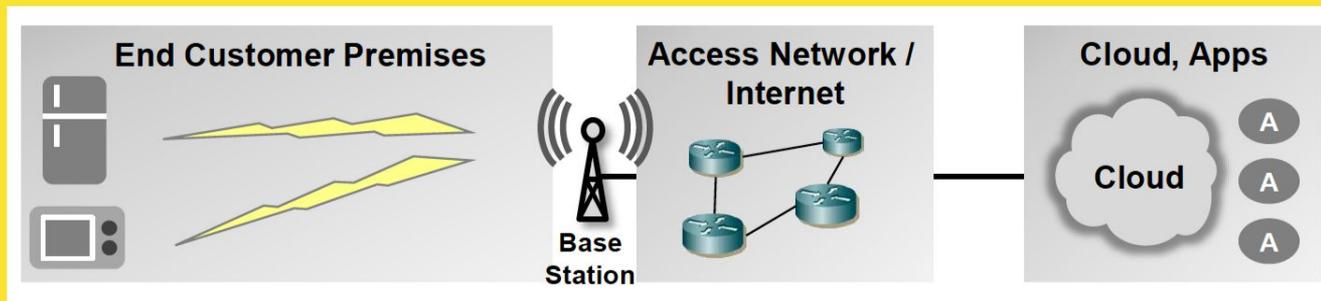
Named Data Networking(NDN) for IoT System (Smart Water Meter Collecting System)
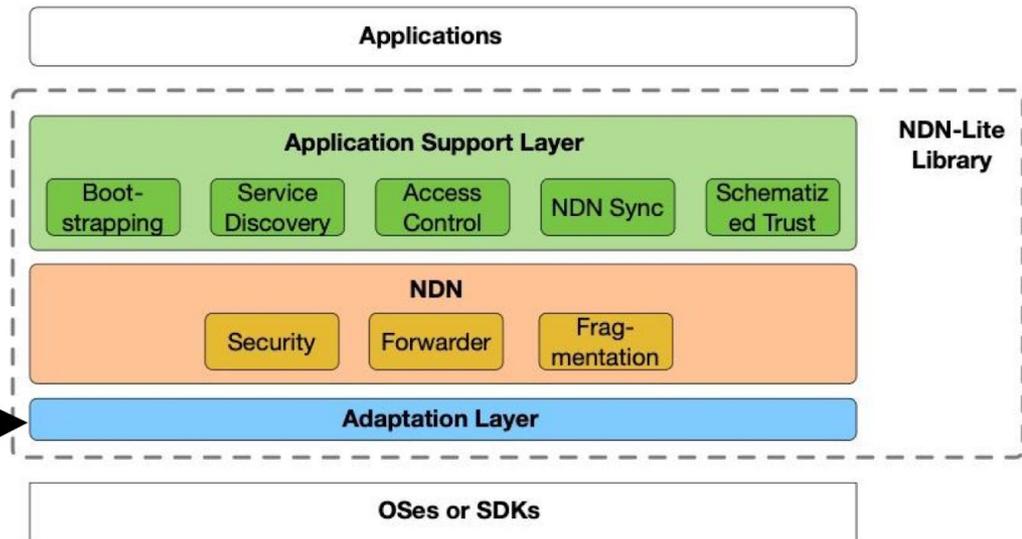
Integration of LoRa

ICNRG Interim Meeting

Macau, 27.09.2019

Peter Kietzmann

✉ peter.kietzmann@haw-hamburg.de

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iNET AG, Dept. Informatik, HAW Hamburg

Semtech Package in RIOT (since 2017.10)

- Reference implementation by vendor provides MAC

    - Class A – C

    - OTAA & ABP join procedures

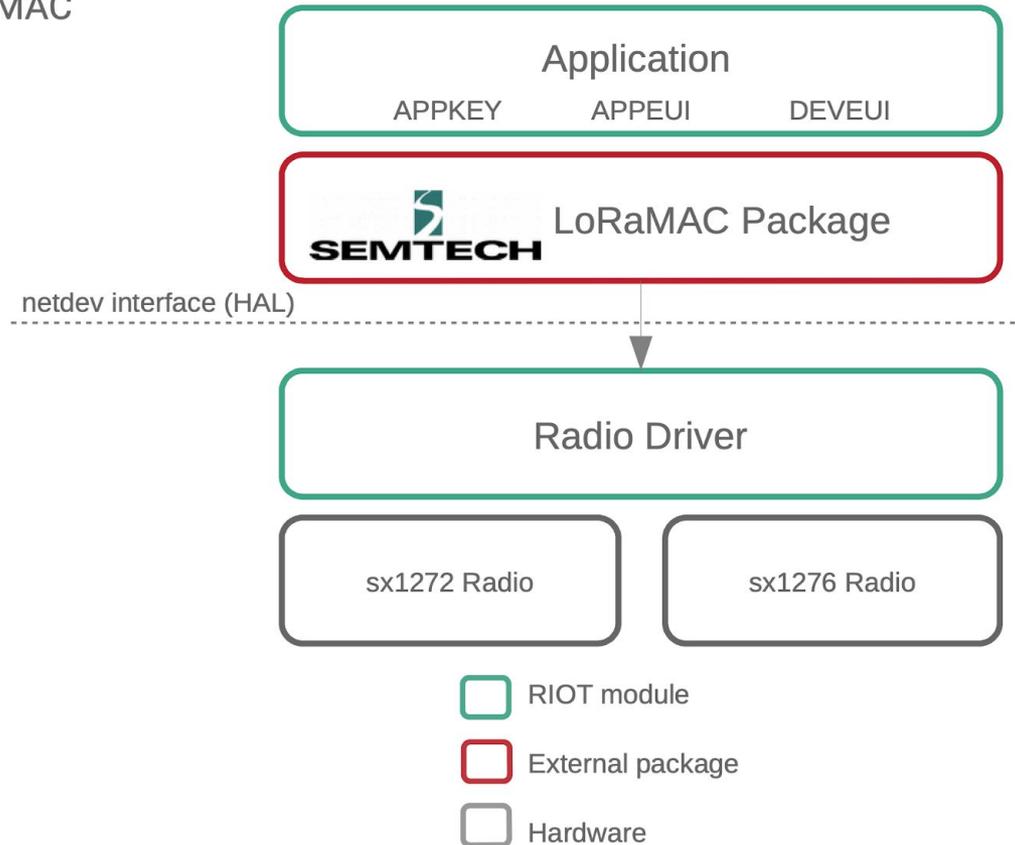   - EUI storage (EEPROM)

- Directly uses RIOT radio driver (sx127x)

- Asynchronous MCPS/MLME API (IEEE-like)

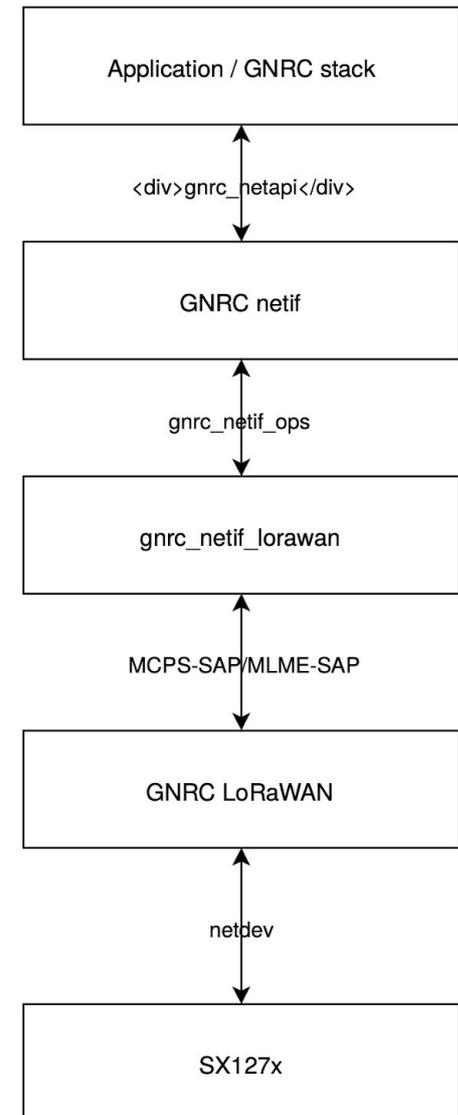- Optimization potential for OS integration

w/o LoRaMAC

- *netdev* as a generic network device API

- Access pure radio

gnrc_lorawan in RIOT (WIP)

- Integrated into GNRC network infrastructure

  → Allows transparent re-utilization of existing modules:
  netif, ifconfig, netreg, ...

- **Asynchronous** send/receive with notifications from MAC
  (was not always the case with Semtech ...)

- MCPS/MLME API (IEEE-like)

  - Request-confirmation based

  - Handling data & management (set key, link check, …)

  - Bidirect. communication between MAC and upper layer

- Requires 4,5kB less ROM, 1,5kB less RAM than Semtech

Application / GNRC stack

<div>gnrc_netapi</div>

GNRC netif

gnrc_netif_ops

gnrc_netif_lorawan

MCPS-SAP/MLME-SAP

GNRC LoRaWAN

netdev

SX127x

ICN & LoRa

- Interest to investigate ICN over LoRa(WAN) opportunities
- Had some more discussion in Macau
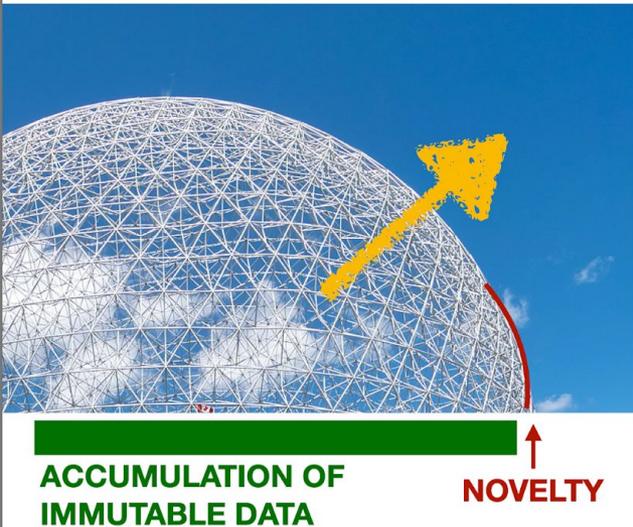- Want to resume it -- and have more discussion at IETF-107

Push it - update 2:
a P2P protocol for Append-Only Push (AOP)

Christian Tschudin, U of Basel, Switzerland

ICNRG interim meeting in Macao, China
September 27, 2019

Context

ACCUMULATION OF IMMUTABLE DATA   **NOVELTY**

- Accumulative information, items typically named by some hash

- Global broadcast-only semantics: novelty is replicated everywhere, eventually

- History:
  - Sep 2018 / panel at ICN18
  - Mar 2019 / ICNRG Prague: broadcast-only
  - Jul 2019 / ICNRG Montreal, update 1: problems of pull (e.g., "recursion corridor")

- Today's update 2: zoom-in to the protocol level

6) Status and Conclusions

AOP is a pushified version of a replication protocol for event streams

- AOP is *not* SSB: perhaps SSB will adopt it?

- AOP is *not* a general pub/sub:
    - strict (crypto-enforced) log discipline
    - reliable
    - producer-centric (e.g., no N:1 sending to a "topic channel")

- AOP is *not* TCP, but includes similar mindset

AOP: running Python Proof-of-Concept
for connection-less settings (UDP, ethernet)

Wrap-up

- Future ICNRG meetings
    - Planning for next ICNRG meetings
    - Possible future Hackathon topics?
    - Interim or Hackathon at IETF 107 Vancouver?
- AOB?