RAW/DetNet muti-domain use cases and solution consideration

draft-bernardos-detnet-raw-multidomain-00

IETF 118 – QoS & TE side meeting

Carlos J. Bernardos

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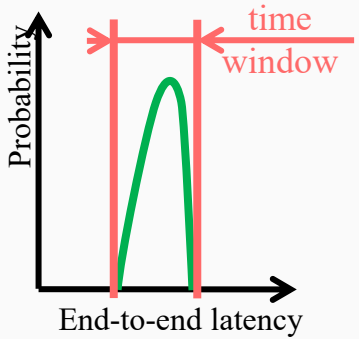
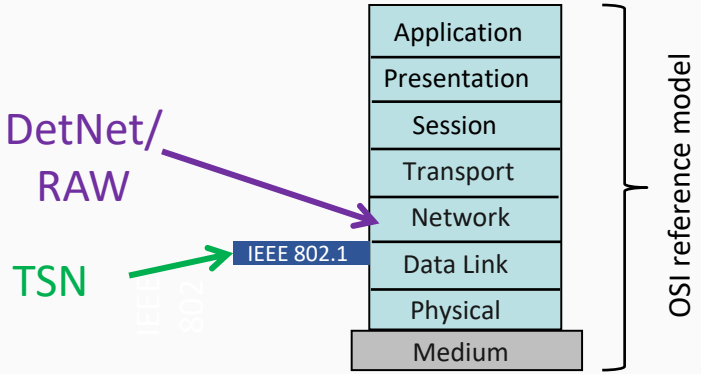
DETERMINISTIC COMMUNICATIONS

- The Right Packet at The Right Time
  - Deterministic data packet delivery
  - Packet delivery within a time window without loss or delay due to congestion or errors



- IEEE 802.1 Time-Sensitive Networking (TSN) at Layer 2 (bridging)
- IETF Deterministic Networking (DetNet) at Layer 3 (IP/MPLS routing)



IETF DetNet WG

- The Deterministic Networking (DetNet) Working Group focuses on deterministic data paths that operate over Layer 2 bridged and Layer 3 routed segments, where such paths can **provide bounds on latency, loss, and packet delay variation (jitter), and high reliability**. The Working Group addresses **Layer 3 aspects in support of applications requiring deterministic networking**. The Working Group collaborates with IEEE802.1 Time-Sensitive Networking (TSN), which is responsible for Layer 2 operations, to define a **common architecture for both Layer 2 and Layer 3**. Example applications for deterministic networks include professional and home audio/video, multimedia in transportation, engine control systems, and other general industrial and vehicular applications being considered by the IEEE 802.1 TSN Task Group.

  ….
- https://datatracker.ietf.org/wg/detnet/about

IETF Reliable and Available Wireless (RAW) WG

- Dedicated WG established to **extend the DetNet concepts to provide high reliability and availability for an IP network utilizing scheduled wireless segments and other wireless media**. … https://datatracker.ietf.org/wg/raw/about
- RAW WG has achieved key milestones
- RAW WG is being folded to DetNet WG for wider community work

- RFC 9372 L-Band Digital Aeronautical Communications System (LDACS)
- RAW Use Cases – with RFC Editor
- RAW Technologies – wrapping up
- OAM Features for RAW – to be finalized in DetNet WG
- RAW Architecture – joint review by RAW and DetNet WGs
- RAW Framework – to be done after the architecture

RAW use cases

- Different use cases considered in draft-ietf-raw-use-cases:
  - Aeronautical Communications
  - Amusement Parks
  - Wireless for Industrial Applications
  - Pro Audio and Video
  - Wireless gaming
  - Unmanned Aerial Vehicles and Vehicle-to-Vehicle platooning and control
  - Edge Robotics control
  - Instrumented emergency medical vehicles

Wireless for Industrial Applications

Ethernet backbone

IEEE 802.15.4

IEEE 802.11

3GPP 5G

Wireless for Industrial Applications: Specifics

- Heterogeneous technologies
- Multiple simultaneous links
- Variable link conditions (even with low mobility)
- Different needs/traffic types, e.g.:
  - Control loops: reliability is key
  - Monitoring and diagnostics: should not be mixed with previous

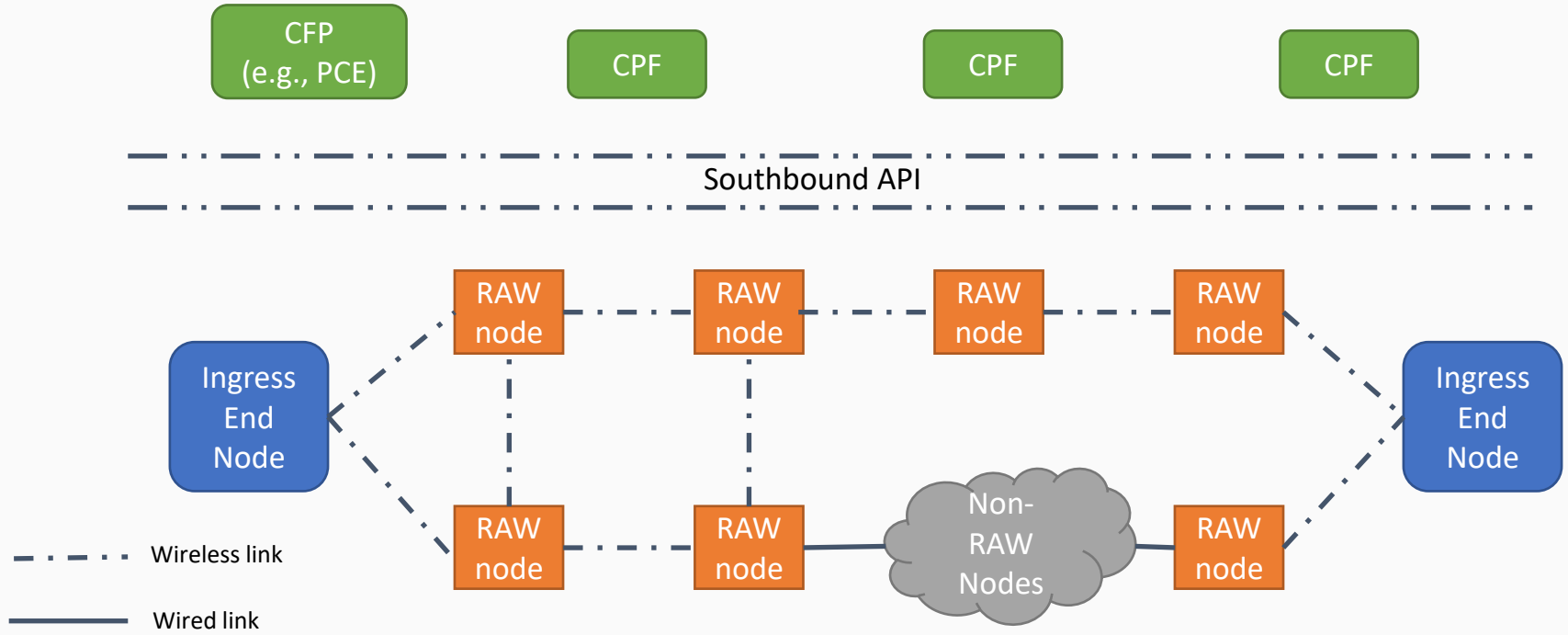
Wireless for Industrial Applications: Requirements for RAW

- Solutions should support heterogeneous traffic
  - Capable of transporting both regular (multiplexed) flows and flows requiring predictable behavior

- Solutions should be able to work over multiple wireless access technologies
  - E.g., segment such as Time Slotted Channel Hopping (TSCH) [IEEE 802.15.4] and a backbone segment such as Ethernet

RAW architecture: conceptual model

CFP: Control Plane Function
PCE: Path Computation Element



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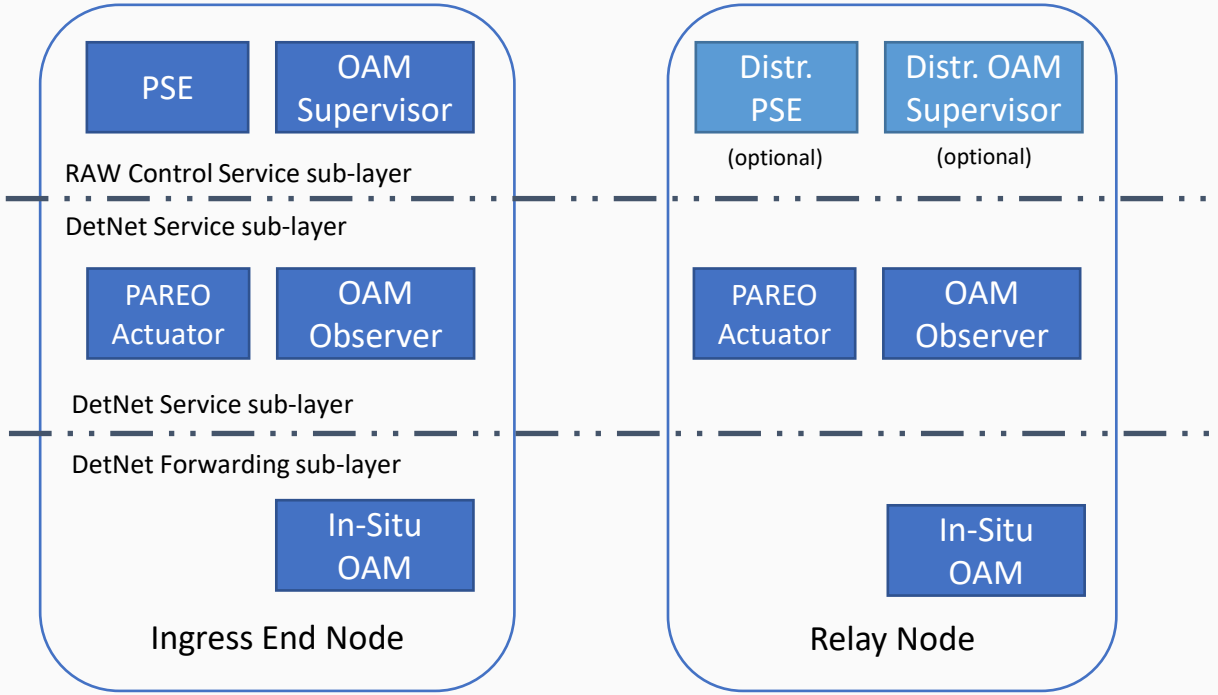
RAW architecture: RAW and DetNet



PSE: Path Selection Engine
OAM: Operations, Administration and Maintenance
PAREO: Packet (hybrid) ARQ, Replication, Elimination and Ordering

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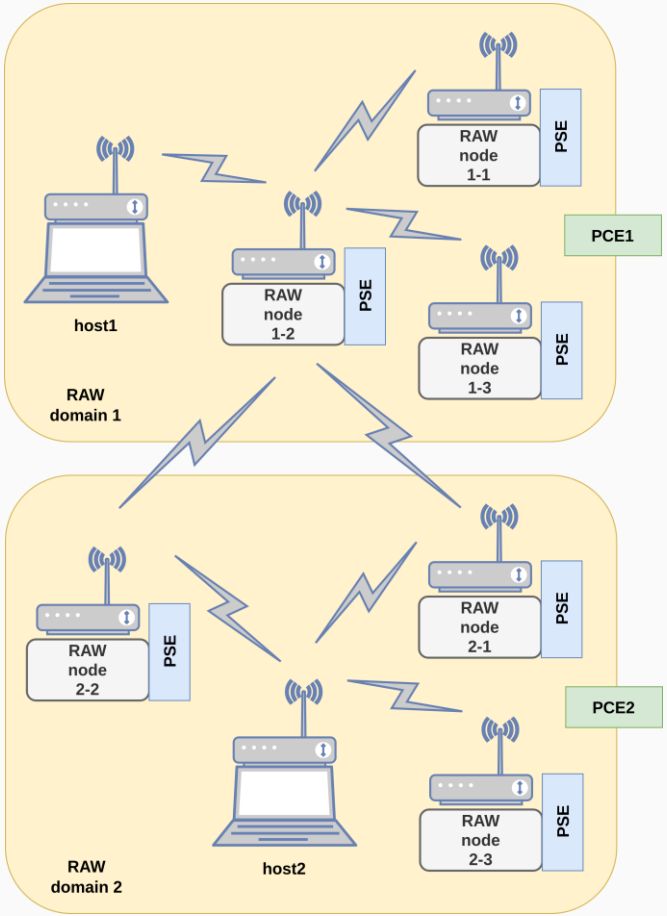
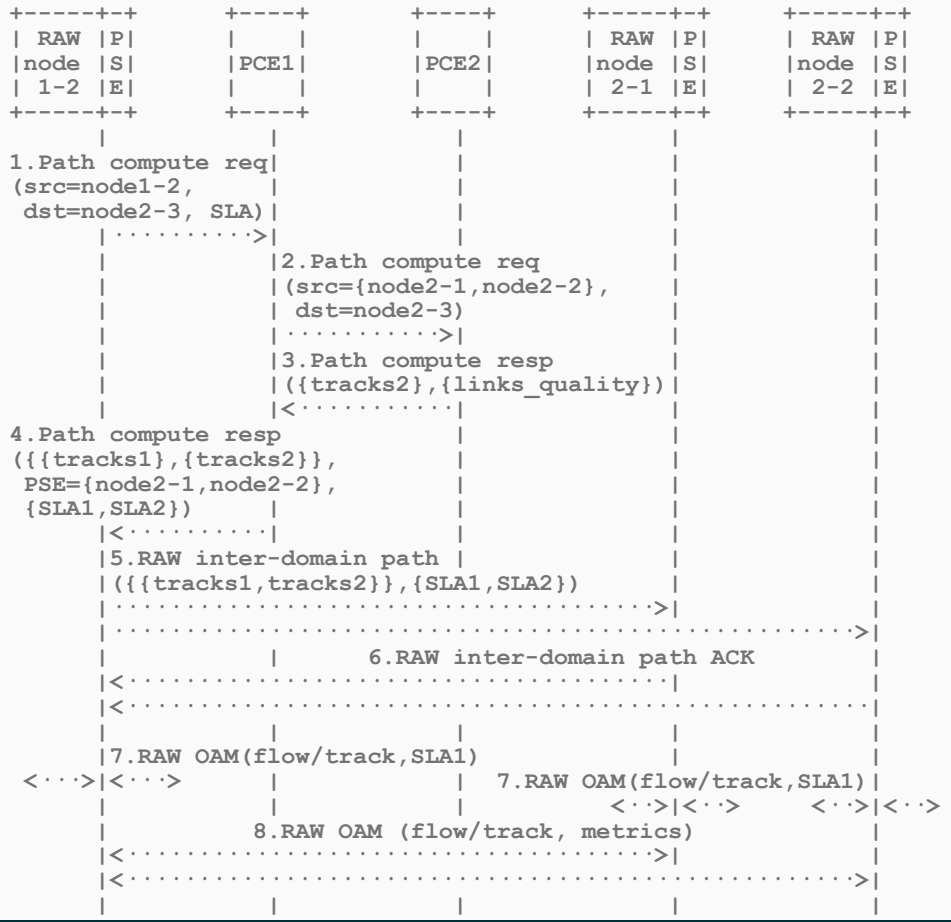
Exemplary scenario and gaps



- Two domains, each one with its own PCE
- Domains might be interconnected via multiple paths
- Multiple gaps:
  - PSE of one domain can not act on the other domains (e.g., no multi-domain OAM solutions yet)
  - Running uncoordinatedly RAW solutions in each domain is not an effective solution
  - PSEs need to have global E2E information as well as be capable of running multi-domain OAM mechanism

Some proposed extensions (example/initial work)



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Summary and next steps

- Work presented in the DetNet
  - Previously presented in the RAW WG, with good feedback, but it was early to look on extensions

- Please share your comments on the ML!

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Acknowledgements

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