

Linking DetNet and IEEE 802 Time-Sensitive Networking

Norman Finn, March 2017

You need both

- DetNet is not just multi-path redundancy, although we have been spending most of our time on this important aspect.
- DetNet is also about reserving resources so that we can give **bounded end-to-end latency** and **zero congestion loss** to DetNet flows.

Lessons learned from deployed TSN networks.

- Achieving 0 congestion loss and bounded latency is a **different problem** from low congestion loss and low average latency.
- The obtainable bound on end-to-end latency is critically dependent, among other things, upon the details of the queue arrangements and draining algorithm(s) used at each hop.
- The reservation algorithms used to compute the latency bounds must be aware of, and have detailed control of, that queue plan.
- The queue plan must be more precisely defined than IETF

Lessons learned from deployed TSN networks.

- Zero congestion loss and bounded latency are not trivial goals. Different queue plans make different trade-offs among:
 - Implementation complexity
 - Actual bound on latency, low or high
 - Ability to handle more or fewer individual flows
 - Computational difficulty of determining the latency bound
 - Ability to offer more or fewer different latency bounds to flows
 - Whether network topology affects per-hop contribution to latency
 - Distribution of typical latencies within the bounded maximum
 - Ratio between minimum and maximum bandwidth contract

DetNet routers and label switches must take advantage of TSN queues

- Most existing TSN bridges route as easily as they bridge, and thus, already take advantage of TSN for routed traffic.
- The problem for DetNet lies in making normative references from a DetNet RFC to the definitions of these queues.
 1. The algorithms are scattered throughout IEEE Std 802.1Q, which is an 1800-page definition of a VLAN Bridge.
 2. The definitions are tied closely to the Bridge architecture.
 3. The managed objects for controlling the queues are tied to the Bridge MIB and Bridge YANG models.

I suggest ...

- DetNet and IEEE 802.1 TSN cooperate, somehow, to generate a YANG model for queuing that applies equally well to a router, bridge, label switch, or host, and allows a network controller to support DetNet / TSN flows.
- Said YANG model can also be used to supply the knobs to be tweaked by any reservation protocols defined either by IETF or TSN.
- This will fill our immediate needs. Long term solutions will take a while to find.

Questions and comments



Thank you