DetNet/TSN Flow/QoS mapping between DetNet and TSN

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Mapping between DetNet and TSN

Several areas subject to mapping

- Terminology
- Data plane: QoS execution
- Data plane: Tunneling
- Data plane: Interworking
- Data plane: Aggregation
- Control plane: Resource reservation

Terminology

The mappings are trivial:

- DetNet **flow** vs. TSN **stream**
- DetNet **node** vs. TSN **system**
- DetNet **Packet Replication**, **Packet Elimination** vs. TSN **Frame Replication and Elimination**
- DetNet **source, destination** vs. TSN **talker, listener**

Data plane: QoS execution

- This was mostly covered earlier, “TSN Flow Definition and Identification, QoS Service definition and parameters.”
- As is well-known in the industry, bridges can make use of IETF-defined QoS specifications for routers, and routers can make use of IEEE 802- specifications for bridges. (And, this is being made easier.)
- For the purposes of QoS (not for forwarding!), anything in the packet can be used as input to flow recognition.
  - That was not an uncontroversial statement! This presenter much prefers explicitly exporting upper-layer flow identification to lower layers’ fields.

Data plane: Tunneling

- **TSN/DetNet is a QoS technology, not a connectivity technology**. TSN/DetNet connections do not have to be separate connectivity entities, e.g. special logical ports on the talker/listener.
- A routed (or label switched) network can perform a useful service by tunneling an L2 TSN conversation from one L2 domain to another.
  - L2 TSN operates in its sphere, L3 DetNet in it sphere, with minimum interaction (but see aggregation" and "resource reservation" below).
- Sometimes, tunneling is exactly what's needed.
- Sometimes, it is inadequate – one reason for using routers is that the two L2 domains are too large to interconnect in this fashion.

Data plane: Interworking

- The sender and receiver can be connected by any combination of routers, bridges, firewalls, label switches, etc., in any order.
- A TSN flow identified by a MAC address can happen to carry IP packets. The stream can be mapped, by a DetNet edge node, into a DetNet encapsulation. Whenever transmitted in an L2 domain, the packet must use a special VLAN/destination MAC address, as defined by TSN. This translation is an *interworking function*.
  - Connectivity is unchanged from the non-TSN/DetNet case.
  - The DetNet/TSN QoS is maintained hop-by-hop through bridges and routers.

Data plane: Aggregation

- Some TSN/DetNet queuing mechanisms require per-flow data plane resources in every hop. This can limit the number of flows.
- Both TSN and DetNet can do QoS-only aggregation by assigning some number of flows to the same set of resources, but the number of flows to be recognized is still large.
- DetNet, especially the MPLS data plane encapsulation, offers proven method for aggregating flows. This saves both QoS and flow recognition resources.
- There are issues to work out:
  - Normal MPLS aggregates/splits for different reasons and at different places.
  - Extra buffering is required at entrances to / exits from aggregations.

Control plane: Resource reservation

- It would be lovely to let IEEE define L2 resource reservation and IETF define L3 resource reservation, and let them coexist. But:
  - **Connectivity** is tied inextricably with the **logical** topology of the network.
  - Latency and buffer **QoS** calculations are tied inextricably with the **physical** topology of the network.
  - **The logical and physical topology of the network are very different in a great many networks of interest to DetNet + TSN**.
- This will not be a trivial issue to solve, but there are good ideas out there.