Enhanced DetNet Data Plane Requirement

Xuesong Geng, Huawei
Motivation

- As suggested by WG in IETF 114/115, the document of draft-yzz-detnet-enhanced-data-plane is supposed to be split into 2 documents for two separate topics:
  - Enhanced DetNet Data Plane Requirement
  - Enhanced DetNet Data Plane Solution
Enhanced DetNet Data Plane Scope

Provide a rough understanding of Enhanced DetNet...

DetNet:
- Reuse the exiting IETF and IEEE mechanism
- RFC 9320 (Deterministic Networking (DetNet) Bounded Latency) gives a timing model to compute end-to-end latency and backlog bounds for various queuing mechanisms
- The queuing mechanism includes: Frame Preemption, Time-Aware Shaper, Credit-Based Shaper, Cyclic Queuing and Forwarding, etc.

Enhanced DetNet:
- Define new Layer 3 mechanism for resource allocation for bounded latency and zero congestion loss to satisfy new requirements, for example large scale deterministic networking as discussed in draft-liu-detnet-large-scale-requirements
Enhanced DetNet Data Plane Requirement

As defined in RFC 9320, Enhanced DetNet services of bounded latency and zero congestion loss depends upon the following 3 parts of mechanism:

- **Resource Allocation**
  - Configuring and allocating network resources for the exclusive use of DetNet flows;

- **Encapsulation**
  - Identifying, in the data plane, the resources to be utilized by any given packet;

- **Queuing/Shaping/Scheduling Mechanism**
  - The detailed behavior of allocation resources, which determines transmission queue selection,

No new meta data is requested:
- Flow ID
- Reuse existing encapsulation field, like DSCP;

Explore meta data for Enhanced DetNet that could be used for different queuing mechanism;

Define different meta data queuing mechanism uses different encapsulation.
Enhanced DetNet Data Plane Design

• As explained in RFC8655, DetNet flows are notably characterized by:
  - A maximum bandwidth, guaranteed either by the transmitter or by strict input metering.
  - A requirement for a guaranteed worst-case end-to-end latency.

• In order to provide identification that could be used for different queuing mechanisms, DetNet data plane could be enhanced by carrying a new defined metadata information in DetNet service packets: **Bounded Latency Information (BLI)**

- Resource ID: cycle ID, queue ID, and time slot ID etc.
- Requirement: end-to-end delay budget, local delay budget, local deadline, delay variation budget, local delay variation budget etc.

Resource ID → cycle ID, queue ID, and time slot ID etc

Requirement → end-to-end delay budget, local delay budget, local deadline, delay variation budget, local delay variation budget etc

Various mechanisms defined in existing documents and future mechanisms:

- draft-eckert-detnet-tcqf-00
- draft-joung-detnet-asynch-detnet-framework
- draft-eckert-detnet-mpls-tc-tcqf
- draft-dang-queuing-with-multiple-cyclic-buffers
- draft-peng-detnet-deadline-based-forwarding

...
Next Step Proposal

• Split the document

• Invite authors of other document to review the document and give comments

• Suggest to have a DT to design the data plane encapsulation
Thanks