DetNet Requirements on Data Plane and Control Plane

draft-zha-detnet-requirments-00

Yiyong Zha, Liang Geng
Agenda

- DetNet Architecture
- Data Plane Design Requirements
- Control Plane Design Requirements
- DetNet Modeling
- Synchronization and OAM
DetNet Architecture

- **Service Layer** - Deploy DetNet service
  - Service model

- **Control Plane** – manage DetNet network
  - Controller or protocols
  - Interfaces

- **Data Plane** – manage devices
  - Multi-vendor NEs
  - Queuing, shaping, scheduling

- **DetNet Architecture**
Agenda

- DetNet Architecture
- Data Plane Design Requirements
- Control Plane Design Requirements
- DetNet Modeling
- Synchronization and OAM
Use MPLS to Support DetNet

- **MPLS**
  - Existing Layer-2.5 technique to support any network protocol

- **DetNet over MPLS**
  - Setup Label Switched Path (LSP) for DetNet flow with label definition and QoS mapping.
  - Latency-aware LSP installment and removing
  - Supporting Layer-2 techniques such as pseudowire

  **Latency-aware MPLS?**

![Diagram]

- MPLS Label
- DetNet Label
Flow Identification

- How to differentiate DetNet from BE flow
  - Tuple matching approach (VLAN, MAC, Src) is not applicable
  - Do proxy or transformation
  - Unique flow ID in the network

- How to differentiate multiple delay requirements
  - QoS mapping mechanisms
  - Service model with delay information
Deterministic Forwarding

- TSN is good candidate
  - Frame preemption (IEEE 802.1Qbu)
  - Time aware shaping (IEEE 802.1Qbv)

- Standard queuing, shaping, transmission selection mechanisms
  - Also related to the southbound interface and configuration model
Agenda

- DetNet Architecture
- Data Plane Design Requirements
- Control Plane Design Requirements
- DetNet Modeling
- Synchronization and OAM
Centralized or Distributed Control

- **Centralized**
  - Good for Deterministic service provisioning, OAM
  - Existing SDN controller
  - Lack of agility

- **Distributed**
  - Peer-to-peer protocols to manage multiple devices
  - Autonomic negotiation between NEs
Southbound/Northbound Interface

- **Northbound**
  - Service level delay requirement
  - Flow and service description, service model

- **Southbound**
  - Resource inventory, Topology. (Bandwidth e.g.)
  - The data plane information of NEs. (queuing, e.g.)

---

**APP**

Controller

NBI: communications between Apps and controller

SBI: communications between controller and NEs
Peer-to-Peer Reservation Protocol

- Peer-to-Peer Reservation Protocol
  - Good for sensor network, IOT, lightweight comm.
  - “Tell and go”: One way reservation, maybe?
  - Easy to be utilized via MPLS
  - RSVP-TE is not feasible

- Depending on the how to describe DetNet flow
  - Flow modeling, (time aware, application aware)
Agenda

- DetNet Architecture
- Data Plane Design Requirements
- Control Plane Design Requirements
- DetNet Modeling
- Synchronization and OAM
Modeling of DetNet

Information Model
- UML

Data Model
- YANG
- XML/Schema

Independent of vendor, language, protocol

Derivation/mapping

Independent of vendor, dependent on language, protocol,

Augment, extension

Dependent on vendor, language, protocol
Service / Configuration Model

- Service model to deploy service
  - L3VPN
  - DetNet service?

- Configuration model to config device
  - Config queuing
  - Config shaping
  - ….

- Flow model
  - Dependent on config model
  - Related to service model
Agenda

- DetNet Architecture
- Data Plane Design Requirements
- Control Plane Design Requirements
- DetNet Modeling
- Synchronization and OAM
Time Synchronization & OAM

- Time synchronization
  - Time aware shaper is good for LAN and Ethernet
  - Time sync is necessary for multi-hop networking
  - Absolute end-to-end delay bound requires time sync

- OAM
  - Latency measuring
  - Congestion control
  - Device failure
Questions?