DetNet Enhancements for Large-Scale Deterministic Networks

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Quan Xiong(ZTE)
Zongpeng Du(China Mobile)

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Background

- The latest WG Charter was updated at 06th July 2022. Packet treatment related methods should be supported in data plane.

- The Milestones show the document plan of DetNet WG in the future 2 years. Enhanced DetNet is the next focal topic.

Data plane: This work will document how to use IP and/or MPLS, and related OAM, to support a data plane method of flow identification and packet treatment over Layer 3. Other IETF defined data plane technologies may also be used.

Milestones

Date	Milestone	Associated documents
Jun 2023	Submit first Enhanced DetNet Data Plane solution document for publication	
Feb 2023	Submit Enhanced DetNet Data Plane Requirements document for publication	
Dec 2022	Submit controller plane framework	
Oct 2022	Submit OAM Solution Document(s)	
Aug 2022	Adopt first Enhanced DetNet Data Plane solution document	
Jul 2022	Submit first OAM document for publication	
May 2022	Adopt Enhanced DetNet Data Plane Requirements document	

Problem Statements

- What is Enhanced DetNet?

    - From charter and milestones, the Enhanced DetNet is required to provide the enhancemant of flow identification and packet treatment and support the enhanced functions/mechanisms for DetNet data plane to achieve the DetNet QoS.

- What is the enhancemant of packet treatment?

    - As per [RFC8938], DetNet-related data plane functions must be decomposed into two sub-layers: a service sub-layer and a forwarding sub-layer. DetNet-Specific Metadata and DetNet IP/MPLS Data Plane has been described.

    - For enhancement for packet treatment, treatment functions for DetNet Data Plane should be described and treatment-specific metadata and encapsulation should be defined for the DetNet flow.

Requirements

- [I-D.liu-detnet-large-scale-requirements] described the enhancement requirements for the large-scale deterministic network, including the technical requirements and data plane enhancement requirements.

    - The Overall Characteristics of Large-Scale Deterministic Networks (Different levels of application demands)

    - Technical Requirements in Large-Scale Deterministic Networks

    - Data Plane Enhancement Requirements

- [I-D.xiong-detnet-large-scale-enhancements] also described the requirements from the perspective of service sub-layer and forwarding sub-layer including routes and resources. Some of the queuing related and data plane requirements has been merged into [I-D.liu-detnet-large-scale-requirements].

    - Deterministic service may demand different deterministic QoS requirements according to various application scenarios.

    - Deterministic routes should be established and the distributed routes and inter-domain routes should be taken into consideration.

    - Deterministic resources should be managed to provide bounded latency guarantees for the deterministic forwarding.

Data Plane Consideration

- As per [I-D.xiong-detnet-large-scale-enhancements], the enhancements for DetNet data plane has been proposed to support the flow identification and packet treatment to achieve the DetNet QoS. The enhancemnt for the DetNet data plane is shown as follows.

	RFC8938	**Enhanced DetNet Data Plane**
Functions	Service Sub-layer: • Packet sequencing • Flow replication/elimination • Packet encoding/decoding • Flow merging Forwarding Sub-layer: • Resource allocation • Explicit routes	Service Sub-layer: • Flow Aggregation • Flow Redundancy • Service-level Aggregation Forwarding Sub-layer: • Multiple queuing mechanisms • Deterministic Path • Deterministic Resource Scheduling • Distributed Routes • ...
Metadata	1. Flow-ID 2. Sequence number	1.Service Level information 2.Aggregated flow information 3.Redundancy information 4.path information 5.Queuing information ...
Encapsulation	IP/MPLS	IPv6/MPLS/SR-MPLS/SRv6

Controller Plane Consideration

- Particular considerations and requirements for the Controller Plane should be taken into consideration according to the enhancement of DetNet Data Plane.

    - Management and Scheduling of Deterministic Resources

    - Distributed Deterministic Path Establishment

    - Inter-domain Deterministic Path Establishment

    - Deterministic Path Calculation based on the deterministic metrics

    - Configuration of Flow Mapping

    - and so on...

Next Steps

- The solutions of enhanced treatment functions and metedata are open to WG.

    - Call for co-authors to provide a more feasible and achievable way to progress this work.

- Comments and Questions are appreciated and welcome to join us.