Proposed text for P802.1DF, TSN Profile for Service Provider Networks, clause 9, Interface with DetNet.

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9. Interface with DetNet

9.1 Introduction

The Deterministic Networking Working Group (DetNet, https://datatracker.ietf.org/wg/detnet/documents/) of the Internet Engineering Task Force (IETF) has worked closely with the IEEE 802.1 Time-Sensitive Networking Task Group, by means of common participation by individuals, to generate documents that provide very similar services, for IETF routers and label switches, that TSN provides for bridged LANs. Participants have endeavored to make the TSN and DetNet documents consistent and compatible. To date, DetNet has published a number of RFCs. The one most relevant to the present IEEE standard include:

a) RFC 8557, Deterministic Networking Problem Statement;
b) RFC 8578, Deterministic Networking Use Cases;
c) RFC 8655, Deterministic Networking Architecture;
d) RFC 8938, Deterministic Networking (DetNet) Data Plane Framework;
e) RFC 9016, Flow and Service Information Model for Deterministic Networking (DetNet);
f) RFC 8939, Deterministic Networking {DetNet) Data Plane: IP;
g) RFC xx04, (draft-ietf-detnet-ip-over-mpls) DetNet Data Plane: IP over MPLS;
h) RFC xx05, (draft-ietf-detnet-ip-over-tsn) DetNet Data Plane: IP over IEEE 802.1 Time Sensitive Networking (TSN);
i) RFC 8964, Deterministic Networking {DetNet) Data Plane: MPLS;
j) RFC xx07, (draft-ietf-detnet-mpls-over-tsn) DetNet Data Plane: MPLS over IEEE 802.1 Time Sensitive Networking (TSN);
k) RFC xx08, (draft-ietf-detnet-mpls-over-udp-ip) DetNet Data Plane: MPLS over UDP/IP;
l) RFC xx09, (draft-ietf-detnet-tsn-vpn-over-mpls) DetNet Data Plane: IEEE 802.1 Time Sensitive Networking over MPLS;
m) RFC xx10, (draft-ietf-detnet-yang) Deterministic Networking (DetNet) Configuration YANG Model;
n) RFC xx11, (draft-ietf-detnet-security) Deterministic Networking (DetNet) Security Considerations.

<< Editor's note: We expect the referenced IETF drafts, above, to achieve RFC status by the time the present draft standard is published. We expect only RFCs to be referenced in the published IEEE standard. >>

Section 10 of RFC 8578, use cases, gives the particular example of applying DetNet to provide network slicing capability for a 5G bearer network. (See RFC 8578 for the definitions of these terms.)

<<Editor's note: original ideas in this section is to consider how Layer 2 reservation protocol interwork with Layer 3 reservation protocols. Probably will delete if it is not clear to users >>

9.2 Data plane

If a network compliant to the present standard is intended to transport DetNet traffic, or if traffic in a compliant network is to be transported over an IP or MPLS network, then it shall conform to the relevant IETF standards, including RFC 8939, RFC xx05, RFC xx07, and/or RFC xx09.

The models for cooperation between TSN and DetNet can be classified into two categories:

a) DetNet over TSN (9.2.1); and
b) TSN over DetNet (9.2.2).

9.2.1 DetNet over TSN data plane

TSN provides a layer 2 mechanism that a DetNet node (see RFC 8655) can use to carry a DetNet flow. This may be as simple as a single IEEE 802.3 link connecting two DetNet nodes, or as complex as a VLAN Bridged Network. Two DetNet IETF RFCs define two specific cases for DetNet over TSN:

a) RFC xx05, (draft-ietf-detnet-ip-over-tsn) defines IP over TSN networks.
b) RFC xx07, (draft-ietf-detnet-mpls-over-tsn) defines MPLS over TSN networks.

The IEEE TSN specifications, including in particular the present standard and IEEE 802.1Q, specify mechanisms for IEEE 802 media that are compatible with and compliant to these RFCs,

IETF and DetNet do not specify how layer 1 and layer 2 methods are used to achieve deterministic behavior. See IEEE Std 802.1DC for a description of how a DetNet node (router or label switch) can utilize the TSN Quality of Service techniques specified in IEEE Std 802.1Q over IEEE 802 media. The present standard specifies no such supporting techniques for non-IEEE 802 media.

9.2.2 TSN over DetNet data plane

DetNet can provide a layer 2-over-higher-layers service that can be used between two TSN systems. The DetNet service substitutes for an IEEE 802 link. One specific caseis defined by DetNet:

a) RFC xx09, (draft-ietf-detnet-tsn-vpn-over-mpls) defines how a DetNet MPLS label switched path can carry TSN traffic (IEEE 802.3 format frames).

In this case, the TSN network is extended over the MPLS network by the DetNet service; the TSN systems at the ends of the service are both part of a single TSN network.

9.3 Control plane

Networks compliant to the present standard shall employ the Centralized Network Configuration component (IEEE Std 802.1Qcc) and/or the Resource Allocation Protocol (IEEE Std 802.1Qdd) for creating reservations for Streams.

<< Editor's note: At this writing, the charter of the IETF DetNet Working Group does not allow for specifying the control plane (e.g. resource reservation and fixed path establishment). Rather, it states that existing control plane protocols will be used and, where appropriate, the Working Groups controlling those protocols can make changes in order to meet DetNet's needs. As yet, there is no Working Group Draft in DetNet specifying gaps in the current protocols. >>

9.3.1 DetNet over TSN control plane

The problem to be solved when operating DetNet over TSN is to create reservations for TSN Streams at layer 2 as a consequence of creating reservations at the IP and/or MPLS layer. There are a number of ways this could be accomplished:

a) If a central server is used in the IP/MPLS network (e.g. a Path Computation Element, or PCE, RFC 4655), the PCE could interface with a TSN Centralized Network Configuration (CNC, 46.1.3.2 of IEEE Std 802.1Q), or even include its functionality.
b) If a central server is used in the IP/MPLS network (e.g. a PCE), then whether the TSN network has a uses the CNC model or not, the PCE could interface with the TSN network using MSRP (clause 35 of IEEE Std 8i02.1Q) or RAP (IEEE Std 802.1Qdd), using the DetNet node at the edge of the TSN network to transmit and receive the MSRP or RAP protocol data units.

No standards exist, at this time, specifying the details of either of these options.

9.3.2 TSN over DetNet control plane

For the TSN over DetNet case, the problem is the revers of the DetNet over TSN case: the CNC, MSRP, and/or RAP Stream reservations need to generate the necessary DetNet flow reservations.

No standards exist, at this time, specifying the details of the interactions among the TSN and DetNet control protocols.