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ISIS-TE Extensions for Enhanced DetNet

Abstract

This document defines extensions to ISIS to distribute the enhanced DetNet information at node and/or link granularity.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](https://datatracker.ietf.org/rfc/rfc2119/) [RFC2119].

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Table of Contents

- [1. Introduction](#)
- [2. Terminology](#)
- [3. DetNet Extensions to ISIS TE](#)
 - [3.1. DetNet Node Attributes Advertisement](#)
 - [3.1.1. DetNet Processing Delay Sub-TLV](#)
 - [3.2. DetNet Link Attributes Advertisement](#)
 - [3.2.1. Max DetNet Reservable Bandwidth Sub-TLV](#)
 - [3.2.2. DetNet Available Bandwidth Sub-TLV](#)
 - [3.2.3. DetNet Time Resource Sub-TLV](#)
- [4. IANA Considerations](#)
 - [4.1. Sub-TLVs for ISIS Router Capability TLV](#)
 - [4.2. Sub-TLVs for IS-IS TLVs 22, 23, 141, 222, and 223](#)
- [5. Security Considerations](#)
- [6. Acknowledgements](#)
- [7. References](#)
 - [7.1. Normative References](#)
 - [7.2. Informative References](#)
- [Authors' Addresses](#)

1. Introduction

DetNet([\[RFC8655\]](#)) provides the capability to carry specified unicast or multicast data flows with extremely low data loss rates and bounded end-to-end latency within a network domain. Three primary goals of DetNet QoS are defined in section 3.1 of [\[RFC8655\]](#):

- *Minimum and maximum end-to-end latency from source to destination, timely delivery, and bounded jitter (packet delay variation) derived from these constraints.
- *Packet loss ratio under various assumptions as to the operational states of the nodes and links.
- *An upper bound on out-of-order packet delivery. It is worth noting that some DetNet applications are unable to tolerate any out-of-order delivery.

This document defines extensions to ISIS to distribute the information for bounded latency(enhanced DetNet) at node and/or link granularity.

Some of information (e.g., Link delay/loss) can be distributed and collected through [Traffic Engineering \(TE\) metric extensions](#)

[[RFC7471](#)] and [[RFC7810](#)], which will not be redefined by this document.

2. Terminology

All the DetNet related terminologies used in this document conform to the [DetNet architecture](#) [I-D.ietf-detnet-architecture].

3. DetNet Extensions to ISIS TE

This document defines an extension to IS-IS used to advertise DetNet information.

3.1. DetNet Node Attributes Advertisement

3.1.1. DetNet Processing Delay Sub-TLV

The DetNet Processing Delay Sub-TLV is defined within the body of the IS-IS Router Capability TLV [RFC7981] to carry Enhanced DetNet information.

In the scope of DetNet, packet processing delay, which begins after the packet goes into the input port and ends before the packet arrives the output buffer, can be expected in a known range, and the value of the delay bound is specified in this sub-TLV, including:

*Maximum DetNet packet processing delay

*Minimum DetNet packet processing delay

*Maximum DetNet packet processing delay variation

The format of this sub-TLV is shown in the following diagram:

[illegible]

The Type field is 1 octets in length, and the value is TBD1.

The Length field is 1 octets in length and its value is 8.

The RESERVED field is reserved for future use. It MUST be set to 0 when sent and MUST be ignored when received.

The Minimum DetNet Processing Delay is 3 octets in length and presents the minimum delay for a DetNet flow in the device, excluding the queuing delay in output port. The units are microsecond.

The Maximum DetNet Processing Delay is 3 octets in length and presents the maximum delay for a DetNet flow in the device, excluding the queuing delay in output port. The units are microsecond.

The Maximum DetNet Processing Delay Variation is 3 octets in length and presents the maximum delay variation for a DetNet flow in the device, excluding the queuing delay in output port. The units are microsecond.

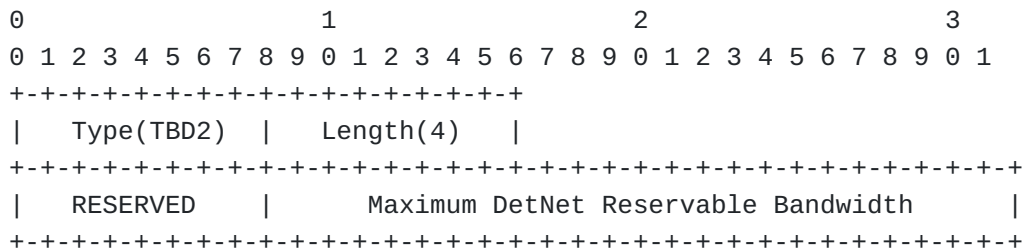
3.2. DetNet Link Attributes Advertisement

This document defines new IS-IS TE sub-TLVs that can be announced in the TLVs 22, 23, 141, 222, and 223 in order to distribute DetNet information.

3.2.1. Max DetNet Reservable Bandwidth Sub-TLV

This sub-TLV specifies the maximum amount of bandwidth that is reserved for DetNet on this link. Note that this value SHOULD be smaller than the value of [Maximum Reservable Link Bandwidth \[RFC5305\]](#).

The format of this sub-TLV is shown in the following diagram:



The Type field is 1 octets in length, and the value is TBD2.

The Length field is 1 octets in length and its value is 4.

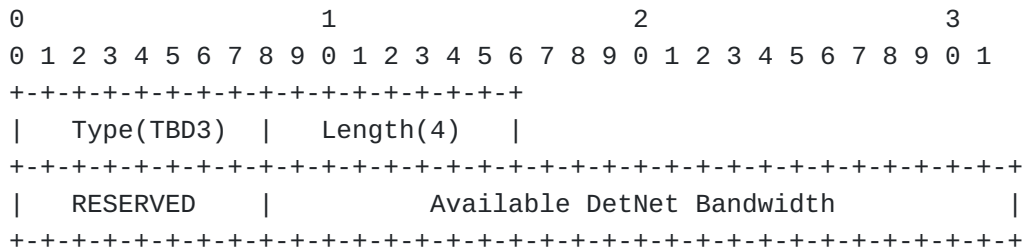
The RESERVED field is reserved for future use. It MUST be set to 0 when sent and MUST be ignored when received.

This Maximum DetNet Reservable Bandwidth field is 3 octets in length and presents the maximum bandwidth that may be reserved for DetNet. The units are bytes per second.

3.2.2. DetNet Available Bandwidth Sub-TLV

This sub-TLV specifies the available bandwidth that can be reserved for DetNet flow on this link for now. It is different from the Unreserved Bandwidth sub-TLV defined [in \[RFC5305\]](#) referring to section 3.3.

The format of this sub-TLV is shown in the following diagram:



The Type field is 1 octets in length, and the value is TBD3.

The Length field is 1 octets in length and its value is 4.

The RESERVED field is reserved for future use. It MUST be set to 0 when sent and MUST be ignored when received.

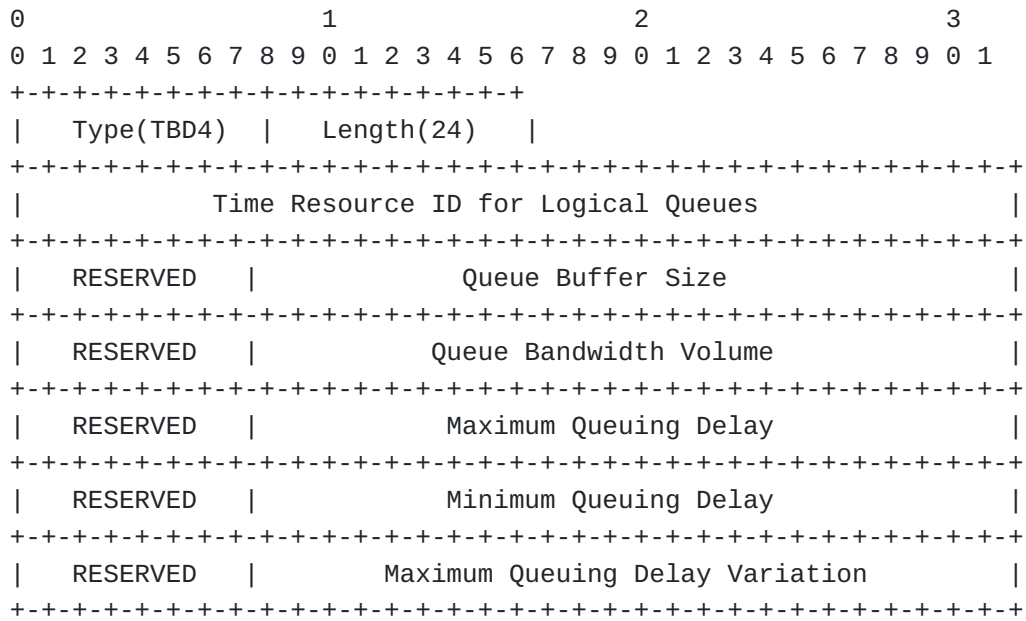
This Available DetNet Bandwidth field is 3 octets in length and presents the available bandwidth for DetNet in this link. The units are bytes per second.

3.2.3. DetNet Time Resource Sub-TLV

Time resource ID represent different types of identifiers used to indicate the capability of underlying bounded latency mechanisms. When the underlying technique is a logical queue based scheduling mechanisms, it represents a queue ID (There may different technologies for implementing logical queues, for example QoS, Flex-E, etc.). When the underlying technique is a time scheduling based mechanisms, it represents a time slot ID.(Cyclic queuing mechanisms could be considered as a special form of time scheduling, whose time slot is with equal length)

There are 2 types of Time Resource Sub-TLV: Time Resource for Logical queues sub-TLV and Time Resource for Time Scheduling sub-TLV:

The format of Time Resource for Logical queues sub-TLV is shown in the following diagram:



The Type field is 1 octets in length, and the value is TBD4.

The Length field is 1 octets in length and its value is 24.

Time resource ID for Logical Queues is 3 octets in length, and specifies the identifier of a logical queue.

The queue The Queue Buffer Size field is 3 octets in length, and specifies the size of a queue with unit of bytes.

Queue Bandwidth Volume: is 3 octets in length, and carries maximum bandwidth could be put into the queue to provide the latency boundary. It is encoded in G bps encoded as an integer value.

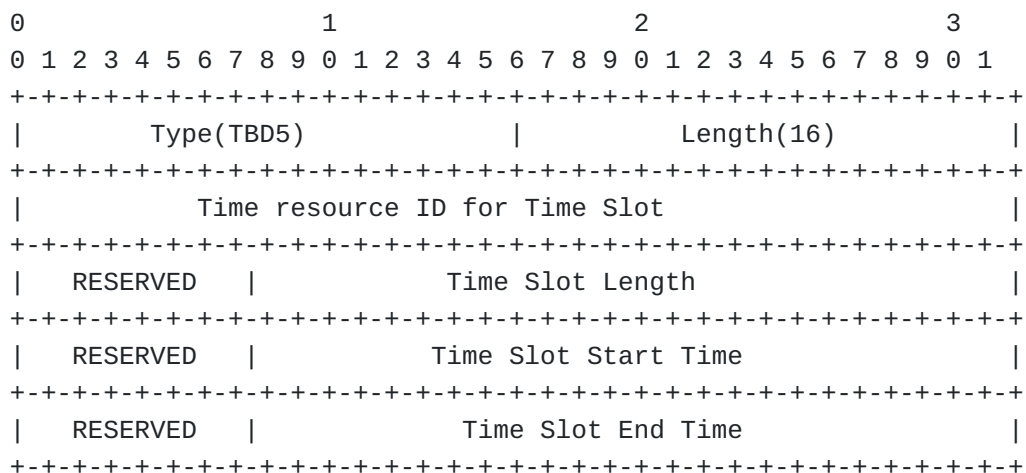
Minimum Queuing Delay is 3 octets in length, and carries minimum queuing delay value (in microseconds) encoded as an integer value.

Maximum Queuing Delay is 3 octets in length, and carries the maximum queuing delay value (in microseconds) encoded as an integer value.

Maximum Queuing Delay variation is 3 octets in length, and carries the maximum queuing delay variation value (in microseconds) encoded as an integer value.

The RESERVED field is reserved for future use. It MUST be set to 0 when sent and MUST be ignored when received.

The format of Time Resource for Time Scheduling sub-TLV is shown in the following diagram:



The Type field is 2 octets in length, and the value is TBD5.

The Length field is 2 octets in length and its value is 16.

Time Resource ID for Time Slot is 4 octets in length, and specifies the identifier of a time slot.

The Time Slot Length field is 3 octets in length, and specifies the length of time slot value (in microseconds) encoded as an integer value. When it is based on IEEE 802.1 Qch, time slot granularity presents cycle length.

The Time Slot Start Time field is 3 octets in length, and specifies the start time of the time slot in the time scheduling (in microseconds) encoded as an integer value.

The Time Slot End Time field is 3 octets in length, and specifies the end time of the time slot in the time scheduling (in microseconds) encoded as an integer value.

The RESERVED field is reserved for future use. It MUST be set to 0 when sent and MUST be ignored when received.

4. IANA Considerations

4.1. Sub-TLVs for ISIS Router Capability TLV

IANA is requested to register the ISIS sub-TLVs defined in this document in the sub-TLVs for Router Capability TLV registry.

Type	Description
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TBD1	Packet Processing Delay

4.2. Sub-TLVs for IS-IS TLVs 22, 23, 141, 222, and 223

IANA is requested to register the ISIS sub-TLVs defined in this document in the Sub-TLVs for TLVs 22, 23, 141, 222, and 223 registry.

Type	Description
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TBD2	Maximum DetNet Reservable Bandwidth
TBD3	DetNet Available Bandwidth
TBD4	Time Resource for Logical Queues
TBD5	Time Resource for Time Slot

5. Security Considerations

This document does not introduce security issues beyond those discussed [in \[RFC7471\]](#) and [\[RFC7810\]](#).

6. Acknowledgements

7. References

7.1. Normative References

[I-D.finn-detnet-bounded-latency]

Finn, N., Le Boudec, J., Mohammadpour, E., Zhang, J., Varga, B., and J. Farkas, "DetNet Bounded Latency", Work in Progress, Internet-Draft, draft-finn-detnet-bounded-latency-04, 25 June 2019, <<https://datatracker.ietf.org/doc/html/draft-finn-detnet-bounded-latency-04>>.

[I-D.ietf-detnet-architecture] Finn, N., Thubert, P., Varga, B., and J. Farkas, "Deterministic Networking Architecture", Work in Progress, Internet-Draft, draft-ietf-detnet-architecture-13, 6 May 2019, <<https://datatracker.ietf.org/doc/html/draft-ietf-detnet-architecture-13>>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.

[RFC5786] Aggarwal, R. and K. Kompella, "Advertising a Router's Local Addresses in OSPF Traffic Engineering (TE) Extensions", RFC 5786, DOI 10.17487/RFC5786, March 2010, <<https://www.rfc-editor.org/info/rfc5786>>.

[RFC7471] Giacalone, S., Ward, D., Drake, J., Atlas, A., and S. Previdi, "OSPF Traffic Engineering (TE) Metric

Extensions", RFC 7471, DOI 10.17487/RFC7471, March 2015, <<https://www.rfc-editor.org/info/rfc7471>>.

[RFC7810] Previdi, S., Ed., Giacalone, S., Ward, D., Drake, J., and Q. Wu, "IS-IS Traffic Engineering (TE) Metric Extensions", RFC 7810, DOI 10.17487/RFC7810, May 2016, <<https://www.rfc-editor.org/info/rfc7810>>.

[RFC7981] Ginsberg, L., Previdi, S., and M. Chen, "IS-IS Extensions for Advertising Router Information", RFC 7981, DOI 10.17487/RFC7981, October 2016, <<https://www.rfc-editor.org/info/rfc7981>>.

[RFC8655] Finn, N., Thubert, P., Varga, B., and J. Farkas, "Deterministic Networking Architecture", RFC 8655, DOI 10.17487/RFC8655, October 2019, <<https://www.rfc-editor.org/info/rfc8655>>.

7.2. Informative References

[IEEE802.1Q-2014] "MAC Bridges and VLANs (IEEE 802.1Q-2014)", 2014.

[IEEE802.1Qch] IEEE, "Cyclic Queuing and Forwarding", 2016.

[IEEE802.1Qcr] IEEE, "Asynchronous Traffic Shaping", 2016.

[IEEE802.1Qbv] IEEE, "Enhancements for Scheduled Traffic", 2016.

[RFC3630] Katz, D., Kompella, K., and D. Yeung, "Traffic Engineering (TE) Extensions to OSPF Version 2", RFC 3630, DOI 10.17487/RFC3630, September 2003, <<https://www.rfc-editor.org/info/rfc3630>>.

[RFC5305] Li, T. and H. Smit, "IS-IS Extensions for Traffic Engineering", RFC 5305, DOI 10.17487/RFC5305, October 2008, <<https://www.rfc-editor.org/info/rfc5305>>.

[RFC5316] Chen, M., Zhang, R., and X. Duan, "ISIS Extensions in Support of Inter-Autonomous System (AS) MPLS and GMPLS Traffic Engineering", RFC 5316, DOI 10.17487/RFC5316, December 2008, <<https://www.rfc-editor.org/info/rfc5316>>.

[RFC7310] Lindsay, J. and H. Foerster, "RTP Payload Format for Standard apt-X and Enhanced apt-X Codecs", RFC 7310, DOI 10.17487/RFC7310, July 2014, <<https://www.rfc-editor.org/info/rfc7310>>.

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