IP Performance Measurement
Internet-Draft
Intended status: Standards Track
Expires: 22 June 2026

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19 December 2025

IPv6 Options for Congestion Measurement
draft-shi-ippm-congestion-measurement-ipv6-options-04

Abstract

The Congestion Measurement enables precise congestion control, assists in effective load balancing, and simplifies network debugging by accurately reflecting the degree of congestion across network paths. This document defines how Congestion Measurement Data Fields are encapsulated in IPv6.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

[I-D.shi-ippm-congestion-measurement-data] introduces data fields of Congestion Measurement which enables sender to obtain the degree of congestion across the path. This document defines the IPv6 encapsulation of the Congestion Measurement Data Fields.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. Congestion Measurement Option

The Congestion Measurement IPv6 Option is defined to carry the Congestion Measurement Data-Fields.

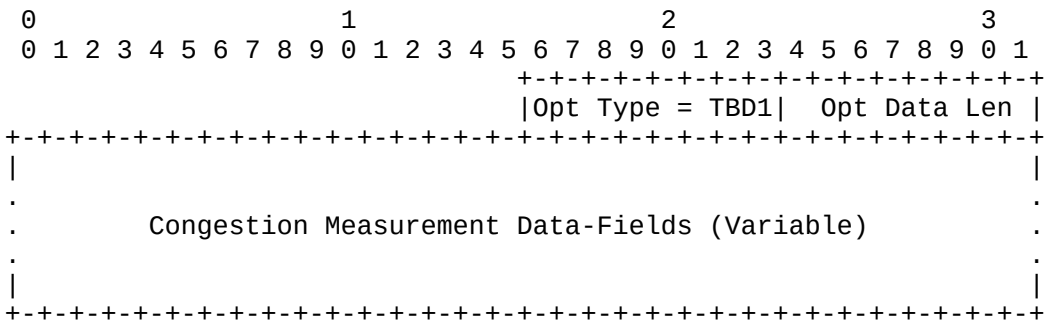

Figure 1: Congestion Measurement IPv6 Option

where:

* Opt Type: Type value is TBD1, an 8-bit unsigned integer. Identifier of the type of this Congestion Measurement Option.

* Opt Data Len: An 8-bit unsigned integer. The length of the Option Data field of this option, that is, the length of the Congestion Measurement Data-Fields.

* Congestion Measurement Data-Fields: Option-Type-specific data. It carries the data fields for Congestion Measurement as specified in [I-D.shi-ippm-congestion-measurement-data].

2.1. Congestion Measurement Hop-by-hop Options Header (HBH)

The Congestion Measurement option can be carried in the IPv6 Hop-by-Hop Options Header. In this case, each node along the path can inspect the Congestion Info Data field if they are configured to support this option. If the U bit of Congestion Measurement Data-Fields is set, intermediate nodes will modify the Congestion Info Data field accordingly. In theory, the presence of the Hop-by-Hop Option should not affect the traffic throughput both on nodes that do not recognize this Option and on the nodes that support it. However, in a real implementation, a packet with a Hop-by-hop Option may be skipped or processed in the slow path. Proposals to mitigate the problem are out of the scope for this document.

2.2. Congestion Measurement Destination Options Header (DOH)

The Congestion Measurement option can be carried in the IPv6 Destination Options Header. In this case, it is usually processed by the destination node. Note that, if there is also a Routing Header (RH), any visited destination in the route list can process it. If the U bit of Congestion Measurement Data-Fields is set, intermediate nodes that are in the route list will modify the Congestion Info Data field accordingly.

3. Security Considerations

The security considerations of the Congestion Measurement are discussed in [I-D.shi-ippm-congestion-measurement-data].

4. IANA Considerations

IANA is requested to assign an IPv6 Option from the "Destination Options and Hop-by-Hop Options" subregistry of "Internet Protocol Version 6 (IPv6) Parameters (https://www.iana.org/assignments/ipv6-parameters/)" as follows:

Value	Description	Reference
TBD1	Congestion Measurement Option	Section 2

Table 1

5. References

5.1. Normative References

[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/rfc/rfc2119>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/rfc/rfc8174>.

5.2. Informative References

[I-D.shi-ippm-congestion-measurement-data] Fioccola, G., Zhou, T., Zhao, G., and Z. Li, "Data Fields for Congestion Measurement", Work in Progress, Internet-

Draft, draft-shi-ippm-congestion-measurement-data-05, 19 December 2025, <https://datatracker.ietf.org/doc/html/draft-shi-ippm-congestion-measurement-data-05>.

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