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In-situ OAM IPv6 Options
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Abstract

In-situ Operations, Administration, and Maintenance (IOAM) records operational and telemetry information in the packet while the packet traverses a path between two points in the network. This document outlines how IOAM data fields are encapsulated in IPv6.

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1. Introduction

In-situ Operations, Administration, and Maintenance (IOAM) records operational and telemetry information in the packet while the packet traverses a path between two points in the network. This document outlines how IOAM data fields are encapsulated in the IPv6 [RFC8200].

2. Conventions

2.1. 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.

2.2. Abbreviations

Abbreviations used in this document:

E2E: Edge-to-Edge

IOAM: In-situ Operations, Administration, and Maintenance

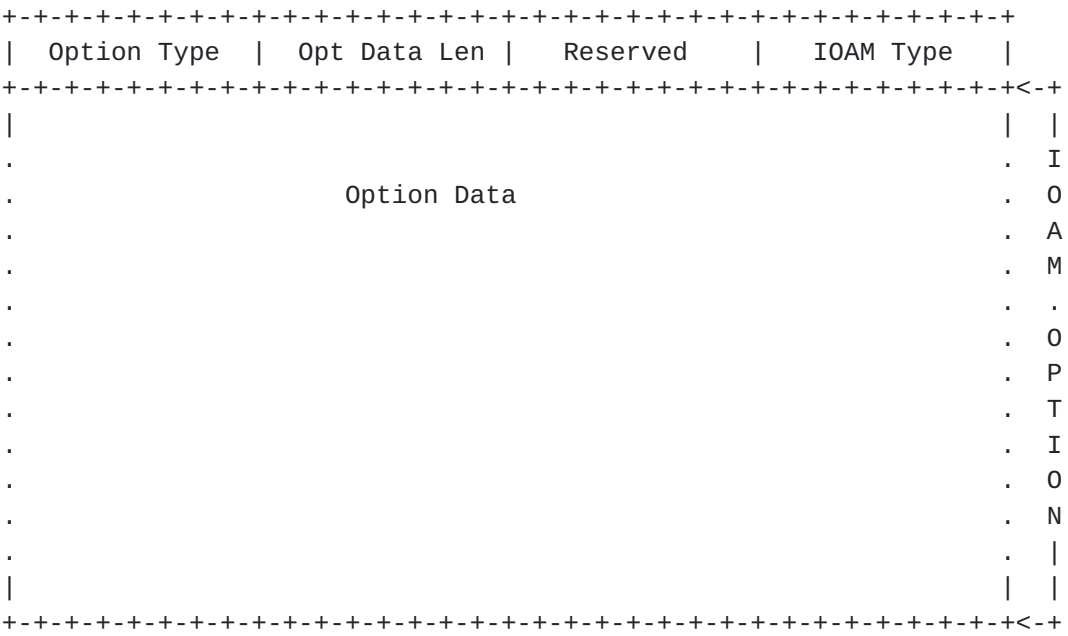
OAM: Operations, Administration, and Maintenance

POT: Proof of Transit

3. In-situ OAM Metadata Transport in IPv6

IOAM data is carried in IPv6 packets as Hop-by-Hop or Destination options. One IPv6 Destination Options and Hop-by-Hop Options Type codepoint is assigned for IOAM. Multiple options with the same Option Type MAY appear in the same Hop-by-Hop Options or Destination Options header, with varying content. This mechanism of in-situ OAM in IPv6 is used to enhance diagnostics of IPv6 networks. It complements other mechanisms proposed to enhance diagnostics of IPv6 networks, such as the IPv6 Performance and Diagnostic Metrics Destination Option described in [RFC8250].

IPv6 Hop-by-Hop and Destination Option format for carrying in-situ OAM data fields:



Option Type: 8-bit identifier of the type of option.

Opt Data Len: 8-bit unsigned integer. Length of the Reserved and Option Data field of this option, in octets.

Reserved: 8-bit field MUST be set to zero upon transmission and ignored upon reception.

IOAM Type: 8-bit field as defined in section 7.2 in [I-D.ietf-ippm-ioam-data].

Option Data: Variable-length field. Option-Type-specific data.

In-situ OAM Options are inserted as Option data as follows:

1. Pre-allocated Tracing Option: The in-situ OAM Preallocated Tracing option defined in [I-D.ietf-ippm-ioam-data] is represented as a IPv6 option in hop by hop extension header:

   Option Type: 001xxxxx 8-bit identifier of the IOAM type of option. xxxxx=TBD.

   IOAM Type: IOAM Pre-allocated Trace Option Type.

2. Incremental Tracing Option: The in-situ OAM Incremental Tracing option defined in [I-D.ietf-ippm-ioam-data] is represented as a IPv6 option in hop by hop extension header:

   Option Type: 001xxxxx 8-bit identifier of the IOAM type of option. xxxxx=TBD.

   IOAM Type: IOAM Incremental Trace Option Type.

3. Proof of Transit Option: The in-situ OAM POT option defined in [I-D.ietf-ippm-ioam-data] is represented as a IPv6 option in hop by hop extension header:

   Option Type: 001xxxxx 8-bit identifier of the IOAM type of option. xxxxx=TBD.

   IOAM Type: IOAM POT Option Type.

4. Edge to Edge Option: The in-situ OAM E2E option defined in [I-D.ietf-ippm-ioam-data] is represented as a IPv6 option in IPv6 option in destination options extension header:

   Option Type: 000xxxxx 8-bit identifier of the IOAM type of option. xxxxx=TBD.

IOAM Type: IOAM E2E Option Type.

All the in-situ OAM IPv6 options defined here have alignment requirements. Specifically, they all require 4n alignment. This ensures that 4 octet fields specified in [I-D.ietf-ippm-ioam-data] such as transit delay are aligned at a multiple-of-4 offset from the start of the Hop-by-Hop Options header. In addition, to maintain IPv6 extension header 8-octet alignment and avoid the need to add or remove padding at every hop, the Trace-Type for Incremental Tracing Option in IPv6 MUST be selected such that the IOAM node data length is a multiple of 8-octets.

4. Security Considerations

This document describes the encapsulation of IOAM data fields in IPv6. Security considerations of the specific IOAM data fields for each case (i.e., Trace, Proof of Transit, and E2E) are described in defined in [I-D.ietf-ippm-ioam-data].

As this document describes new options for IPv6 , these are similar to the security considerations of [RFC8200] and the new weakness documented in [RFC8250].

5. IANA Considerations

This draft requests the following IPv6 Option Type assignments from the Destination Options and Hop-by-Hop Options sub-registry of Internet Protocol Version 6 (IPv6) Parameters.

http://www.iana.org/assignments/ipv6-parameters/ipv6-parameters.xhtml#ipv6-parameters-2

Hex Value	Binary Value act chg rest		Description	Reference
TBD_1_0	00	0 TBD_1	IOAM	[This draft]
TBD_1_1	00	1 TBD_1	IOAM	[This draft]

6. Acknowledgements

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7. References

7.1. Normative References

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[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/info/rfc8174>.

7.2. Informative References

[I-D.kitamura-ipv6-record-route]
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