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## **Timestamp extension for In Situ Operations, Administration, and Maintenance (IOAM) Direct Export**

### **Abstract**

This document extends the In Situ Operations, Administration, and Maintenance (IOAM) Direct Export option type to support timestamping by adding and defining two optional timestamp fields and corresponding flags.

### **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.

### **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

Network operators wish to measure the On-Path delay across their networks to understand which part of the network causes how much delay and impact which applications. Network nodes can leverage IOAM [RFC9197] to add timestamps into the packet and export the raw data with [I-D.spiegel-ippm-ioam-rawexport] or the calculated On-Path delay with [I-D.ietf-opsawg-ipfix-on-path-telemetry] to the IPFIX [RFC7011] collector.

In order to support Postcard-Based On-Path delay measurement, IOAM Direct Export Option-type (DEX) [RFC9326] needs to be extended with timestamps to accommodate delay monitoring.

This document defines two new Extension fields for IOAM DEX Option-type [RFC9326] to support an optional timestamp in the header.

### 2. Solution overview

The IOAM DEX Option-type format is defined in [Section 3.2 \[RFC9326\]](#). To be able to measure the delay between the IOAM encapsulation node and the current IOAM node, the timestamp is added to the IOAM DEX option-type as illustrated in [Figure 1](#).

This document proposes two optional fields to be included in the IOAM DEX option type format so that they can be enabled using IOAM DEX Extension-Flags. New Extension-Flags are allocated by IANA, as defined in [Section 7](#). This document proposes using the bit 2 for the Timestamp Seconds and the bit 3 for the Timestamp Fraction.

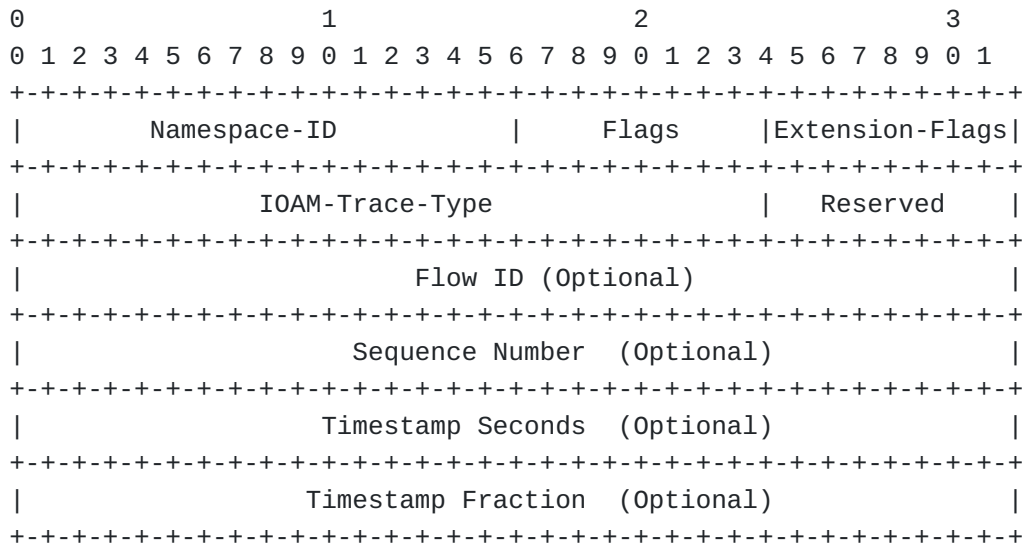


Figure 1: IOAM DEX Option-Type Format including the timestamps

While the Timestamp Seconds field can be used standalone, the Timestamp Fraction MUST be used in combination with the Timestamp Seconds field.

### 3. Timestamp Formats

The Timestamp Seconds and Timestamp Fraction field encoding format definitions are described in Section 5 of [\[RFC9197\]](#).

### 4. Export Method

While the Timestamp Seconds and Timestamp Fraction can be exported via IOAM raw export using [\[I-D.spiegel-ippm-ioam-rawexport\]](#) and the calculated On-Path delay can be exported using IPFIX with [\[I-D.ietf-opsawg-ipfix-on-path-telemetry\]](#), the mechanism and associated formats for exporting the delay metrics are outside the scope of this document.

### 5. Use Cases

Possible interesting On-Path delay measurement use cases in combination with other key metrics is described in Section 5 of [\[I-D.ietf-opsawg-ipfix-on-path-telemetry\]](#).

## 6. Security Considerations

The security considerations for the IOAM DEX Option-type are described in [RFC9326]. This document adds no additional security considerations.

## 7. IANA Considerations

This document requests IANA to create the following two bits in the "IOAM DEX Extension-Flags" registry.

Bit: 2

Description: Timestamp Seconds

Reference: this document

Bit: 3

Description: Timestamp Fraction

Reference: this document

## 8. Acknowledgements

The authors would like to thank xxx for their review and valuable comments.

## 9. References

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[RFC9197] Brockners, F., Ed., Bhandari, S., Ed., and T. Mizrahi, Ed., "Data Fields for In Situ Operations, Administration, and Maintenance (IOAM)", RFC 9197, DOI 10.17487/RFC9197, May 2022, <<https://www.rfc-editor.org/rfc/rfc9197>>.

[RFC9326] Song, H., Gafni, B., Brockners, F., Bhandari, S., and T. Mizrahi, "In Situ Operations, Administration, and Maintenance (IOAM) Direct Exporting", RFC 9326, DOI 10.17487/RFC9326, November 2022, <<https://www.rfc-editor.org/rfc/rfc9326>>.

### 9.2. Informative References

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**[I-D.spiegel-ippm-ioam-rawexport]** Spiegel, M., Brockners, F., Bhandari, S., and R. Sivakolundu, "In-situ OAM raw data export with IPFIX", Work in Progress, Internet-Draft, draft-spiegel-ippm-ioam-rawexport-06, 21 February 2022, <<https://www.ietf.org/archive/id/draft-spiegel-ippm-ioam-rawexport-06.txt>>.

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