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Simple Two-way Active Measurement Protocol Optional Extensions
draft-mirsky-ippm-stamp-option-tlv-02

Abstract

This document describes optional extensions to Simple Two-way Active Measurement Protocol (STAMP) which enable measurement performance metrics in addition to ones enabled by the STAMP base specification.

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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This Internet-Draft will expire on April 13, 2019.

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1. Introduction

Simple Two-way Active Measurement Protocol (STAMP) [I-D.ietf-ippm-stamp] supports the use of optional extensions that use Type-Length-Value (TLV) encoding. Such extensions are to enhance the STAMP base functions, such as measurement of one-way and round-trip delay, latency, packet loss, as well as ability to detect packet duplication and out-of-order delivery of the test packets. This specification provides definitions of optional STAMP extensions, their formats, and theory of operation.

2. Conventions used in this document

2.1. Terminology

STAMP - Simple Two-way Active Measurement Protocol

DSCP - Differentiated Services Code Point

ECN - Explicit Congestion Notification

NTP - Network Time Protocol

PTP - Precision Time Protocol

HMAC Hashed Message Authentication Code

TLV Type-Length-Value

2.2. 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.

3. Theory of Operation

STAMP Session-Sender transmits test packets to STAMP Session-Reflector. STAMP Session-Reflector receives Session-Sender's packet and acts according to the configuration and optional control information communicated in the Session-Sender's test packet. STAMP defines two different test packet formats, one for packets transmitted by the STAMP-Session-Sender and one for packets transmitted by the STAMP-Session-Reflector. STAMP supports three modes: unauthenticated, authenticated, and encrypted. Unauthenticated STAMP test packets are compatible on the wire with unauthenticated TWAMP-Test [RFC5357] packet formats.

By default, STAMP uses symmetrical packets, i.e., the size of the packet transmitted by Session-Reflector equals the size of the packet received by the Session-Reflector.

4. TLV Extensions to STAMP

TBA

4.1. Extra Padding TLV

TBA

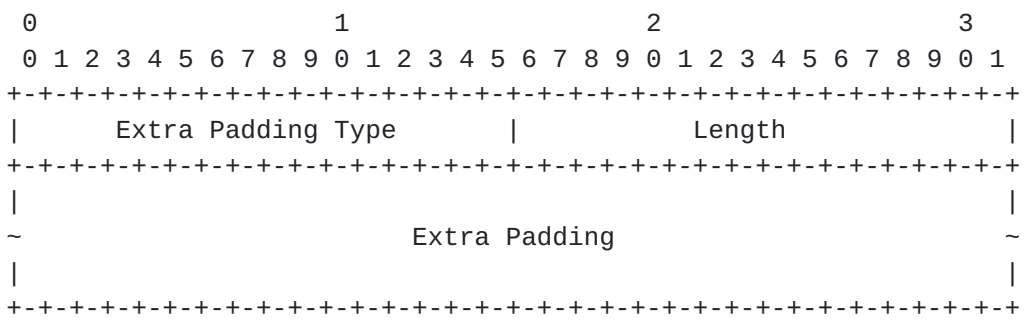

Figure 1: Extra Padding TLV

where fields are defined as the following:

- Extra Padding Type - TBA1 allocated by IANA Section 5.1

- Length - 2 octets long field equals length on the Extra Padding field in octets.

- Extra Padding - a pseudo-random sequence of numbers. The field MAY be filled with all zeroes.

4.2. Location TLV

STAMP session-sender MAY include the Location TLV to request information from the session-reflector. The session-sender SHOULD NOT fill any information fields except for Type and Length. The session-reflector MUST validate the Length value against address family of the transport encapsulating the STAMP test packet. If the value of the Length field is invalid, the session-reflector MUST zero all fields and MUST NOT return any information to the session-sender. The session-reflector MUST ignore all other fields of the received Location TLV.

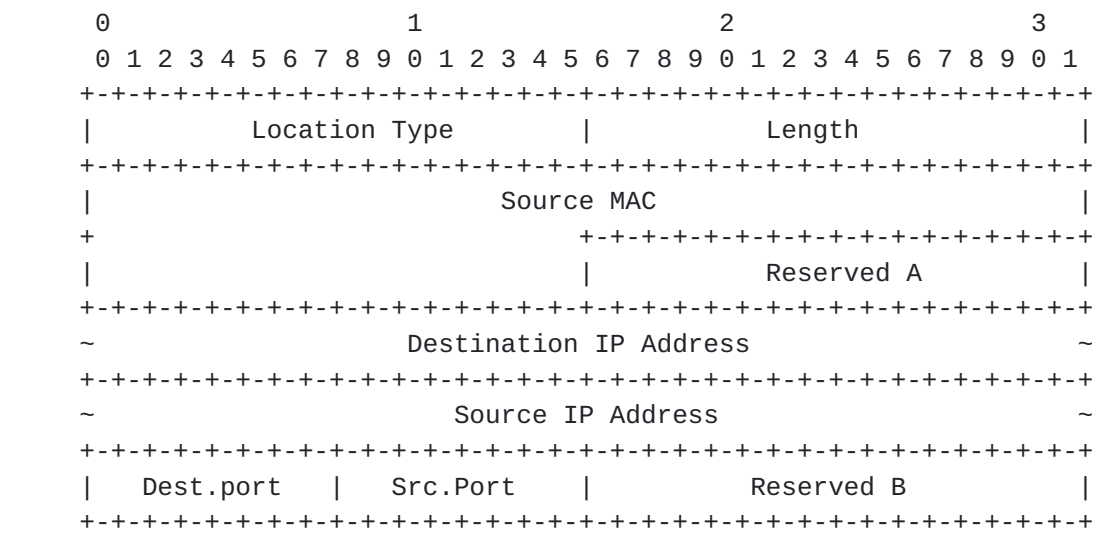

Figure 2: Session-Reflector Location TLV

where fields are defined as the following:

- Location Type - TBA2 allocated by IANA Section 5.1

- Length - 2 octets long field equals length on the Value field in octets. Length field value MUST be 20 octets for the IPv4 address family. For the IPv6 address family value of the Length field MUST be 44 octets. All other values are invalid.

- Source MAC - 6 octets 48 bits long field. The session-reflector MUST copy Source MAC of received STAMP packet into this field.

- Reserved A - two octets long field. MUST be zeroed on transmission and ignored on reception.

- Destination IP Address - IPv4 or IPv6 destination address of the received by the session-reflector STAMP packet.

- Source IP Address - IPv4 or IPv6 source address of the received by the session-reflector STAMP packet.

- Dest.port - one octet long UDP destination port number of the received STAMP packet.

- Src.port - one octet long UDP source port number of the received STAMP packet.

- Reserved B - two octets long field. MUST be zeroed on transmission and ignored on reception.

4.3. Timestamp Information TLV

STAMP session-sender MAY include the Timestamp Information TLV to request information from the session-reflector. The session-sender SHOULD NOT fill any information fields except for Type and Length. The session-reflector MUST validate the Length value of the STAMP test packet. If the value of the Length field is invalid, the session-reflector MUST zero all fields and MUST NOT return any information to the session-sender.

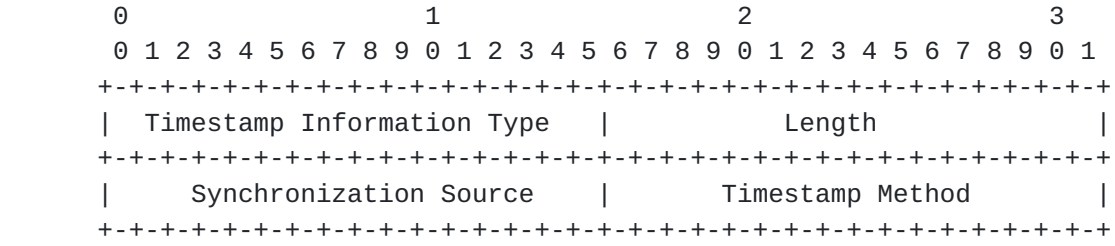

Figure 3: Timestamp Information TLV

where fields are defined as the following:

- Timestamp Information Type - TBA3 allocated by IANA Section 5.1
- Length - 2 octets long field, equals four octets.
- Synchronization Source - two octets long field that characterizes the source of clock synchronization at the session-reflector. The value is one of Section 5.2.
- Timestamp Method - two octets long field that characterizes the timestamping method at the session-reflector. The value is one of Section 5.3. [Ed.note: Should it be split for ingress and egress?]

4.4. Class of Service TLV

The STAMP session-sender MAY include Class of Service TLV in the STAMP test packet. If the Class of Service TLV is present in the STAMP test packet and the value of the Op field equals Report (TBA5) value Section 5.4, then the STAMP session-reflector MUST copy Differentiated Services Code Point (DSCP) and Explicit Congestion Notification (ECN) values from the received STAMP test packet into DSCP and ECN fields of the Class of Service TLV of the reflected STAMP test packet. If the value of the Op field equals Set and Report (TBA6) Section 5.4, then the STAMP session-reflector MUST use DSCP value from the Class of Service TLV in the received STAMP test packet as DSCP value of STAMP reflected test packet and MUST copy

DSCP and ECN values of the received STAMP test packet into DSCP and ECN fields of Class of Service TLV in the STAMP reflected a packet.

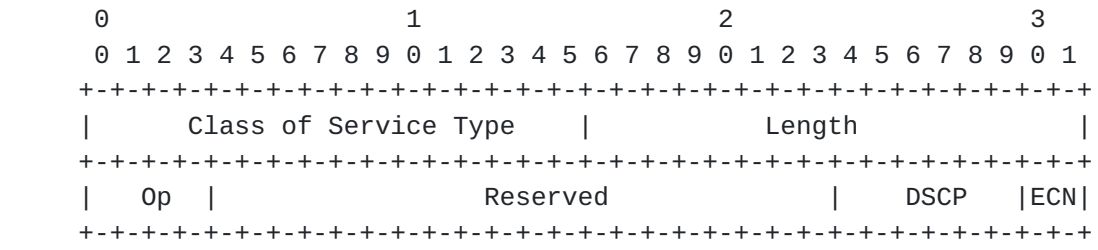

Figure 4: Class of Service TLV

where fields are defined as the following:

- Class of Service Type - TBA4 allocated by IANA Section 5.1
- Length - 2 octets long field, equals four octets.
- Op - 4 bits long field with the value set to operation code point:
  - TBA5 - Report CoS values by STAMP Session-Reflector
  - TBA6 - Set and Report CoS values to be used for reflected STAMP test packet
- Reserved - 20 bits long field, must be zeroed in transmission and ignored on receipt.
- DSCP - Differentiated Services Code Point (DSCP).
- ECN - Explicit Congestion Notification.

4.5. Direct Measurement TLV

The Direct Measurement TLV enables collection of "in profile" IP packets that had been transmitted and received by the Session-Sender and Session-Reflector respectfully. The definition of "in-profile packet" is outside the scope of this document.

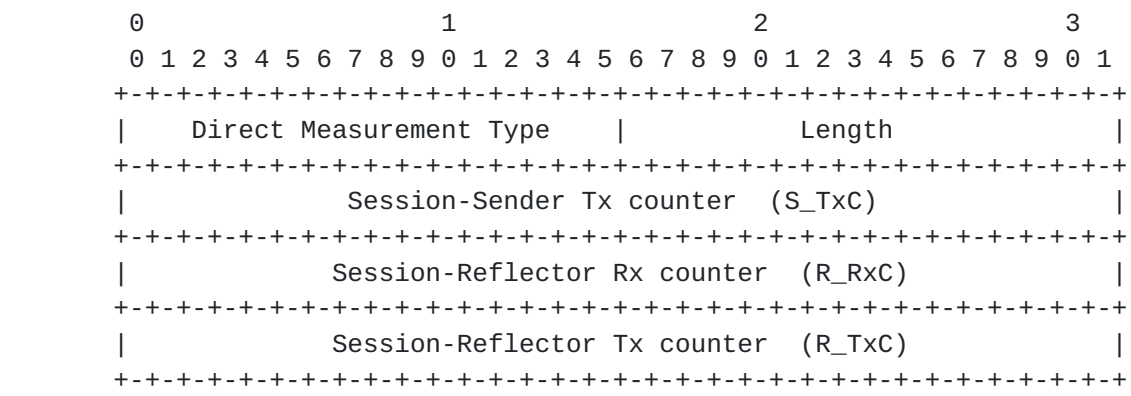

Figure 5: Direct Measurement TLV

where fields are defined as the following:

- Direct Measurement Type - TBA5 allocated by IANA Section 5.1
- Length - 2 octets long field equals length on the Value field in octets. Length field value MUST be 12 octets.
- Session-Sender Tx counter (S_TxC) is four octets long field.
- Session-Reflector Rx counter (R_RxC) is four octets long field. MUST be zeroed by the Session-Sender and filled by the Session-Reflector.
- Session-Reflector Tx counter (R_TxC) is four octets long field. MUST be zeroed by the Session-Sender and filled by the Session-Reflector.

5. IANA Considerations

5.1. STAMP TLV Registry

IANA is requested to create STAMP TLV Type registry. All code points in the range 1 through 32759 in this registry shall be allocated according to the "IETF Review" procedure as specified in [RFC8126]. Code points in the range 32760 through 65279 in this registry shall be allocated according to the "First Come First Served" procedure as specified in [RFC8126]. Remaining code points are allocated according to Table 1:

Value	Description	Reference
0	Reserved	This document
1- 32759	Unassigned	IETF Review
32760 - 65279	Unassigned	First Come First Served
65280 - 65519	Experimental	This document
65520 - 65534	Private Use	This document
65535	Reserved	This document

Table 1: STAMP TLV Type Registry

This document defines the following new values in STAMP TLV Type registry:

Value	Description	Reference
TBA1	Extra Padding	This document
TBA2	Location	This document
TBA3	Timestamp Information	This document
TBA4	Class of Service	This document
TBA5	Direct Measurement	This document

Table 2: STAMP Types

5.2. Synchronization Source Sub-registry

TBD

5.3. Timestamp Method Sub-registry

TBD

5.4. CoS Operation Sub-registry

TBD

6. Security Considerations

Use of HMAC in authenticated and encrypted modes may be used to simultaneously verify both the data integrity and the authentication of the STAMP test packets.

7. Acknowledgments

TBD

8. Normative References

[I-D.ietf-ippm-stamp]
Mirsky, G., Jun, G., Nydell, H., and R. Foote, "Simple Two-way Active Measurement Protocol", draft-ietf-ippm-stamp-02 (work in progress), September 2018.

[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>.

[RFC5357] Hedayat, K., Krzanowski, R., Morton, A., Yum, K., and J. Babiarz, "A Two-Way Active Measurement Protocol (TWAMP)", RFC 5357, DOI 10.17487/RFC5357, October 2008, <https://www.rfc-editor.org/info/rfc5357>.

[RFC8126] Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 8126, DOI 10.17487/RFC8126, June 2017, <https://www.rfc-editor.org/info/rfc8126>.

[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>.

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