

ATSSS PMF Protocol

Adi Masputra
Krisztian Kiss
Apple Inc.
26 September 2019

Background

Background

- **Motivations**

- Leverage existing IETF specified protocols, implementations and deployments

- **IP and Ethernet**

- Simple, lightweight protocol that works on both

- **Security mechanisms**

- At the minimum, integrity protection

- **Performance Measurements**

- Round-Trip Time

- **Extensible**

- Can be easily extended to support future requirements

STAMP

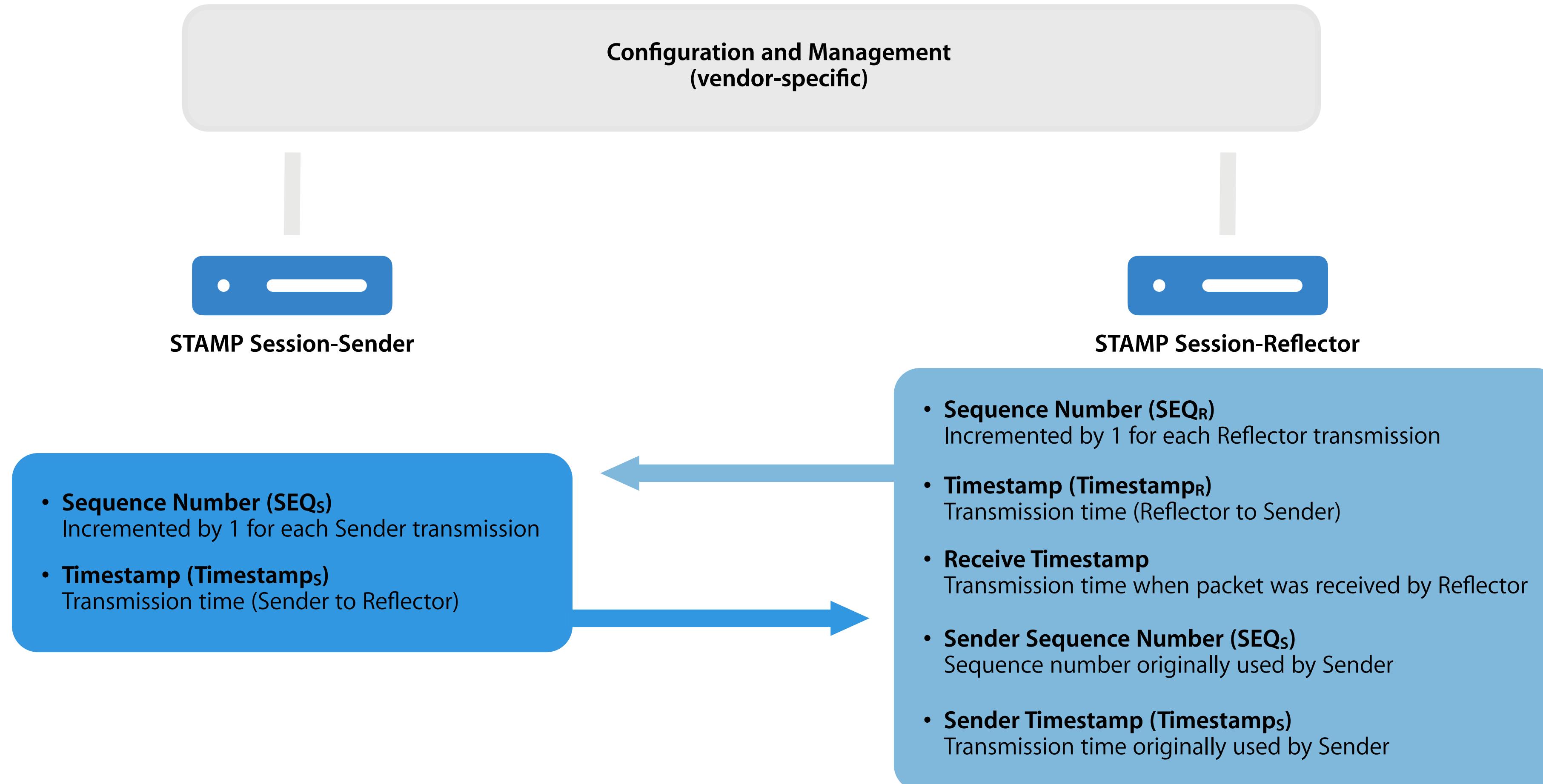
STAMP

Overview

- **Simple Two-way Active Measurement Protocol (STAMP)**
 - [draft-ietf-ippm-stamp-08](#)
IETF [ippm](#) Working Group, Standards Track, Submitted to IESG, Based on TWAMP [RFC 5357](#)
- **UDP/IP based**
 - Payload flexible and is agnostic to outer protocol encapsulation
- **Integrity Protection (authenticated mode)**
- **Performance Measurement Metrics**
 - Round-Trip Time, Receiver Delay, Packet Loss, Packet Reordering, Packet Duplication
- **Extensible via Type-Length-Value (TLV) in Payload**
 - [draft-ietf-ippm-stamp-option-tlv-01](#)

STAMP

Theory of Operations



STAMP

Two-Way Active Measurements

Derive measurements from reflected packets sent by Session-Reflector:

- Round-Trip Time

- Current Time - Timestamps

- Receiver Processing Delay

- Timestamp_R - Receive Timestamp

- Packet Loss

- Expected SEQ_S not reflected after some time

- Packet Reordering

- SEQ_S less than expected Sender Sequence Number

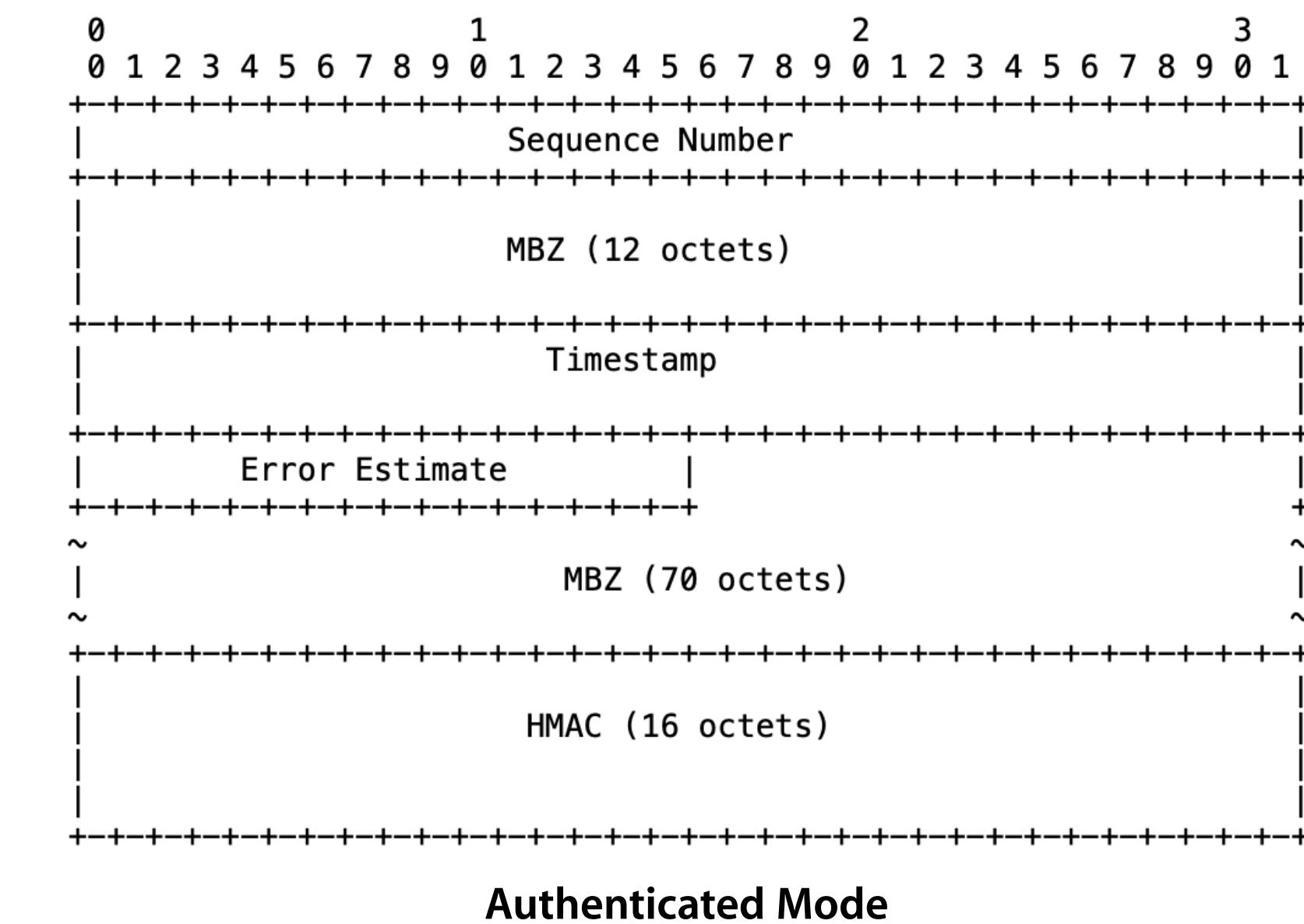
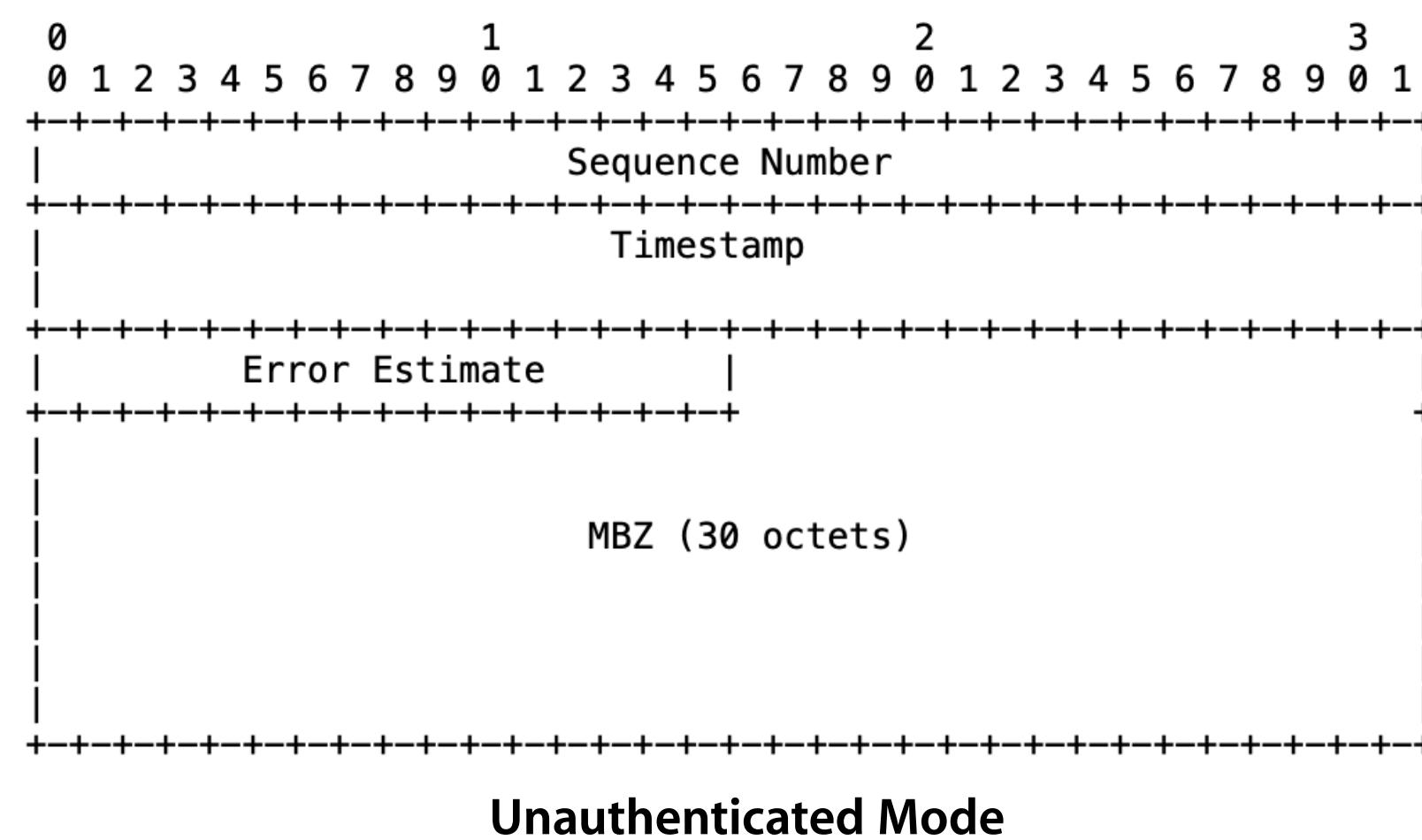
- Packet Duplication

- Reflected packet has identical contents as previous one

- **Sequence Number (SEQ_R)**
Incremented by 1 for each Reflector transmission
- **Timestamp (Timestamp_R)**
Transmission time (Reflector to Sender)
- **Receive Timestamp**
Transmission time when packet was received by Reflector
- **Sender Sequence Number (SEQ_S)**
Sequence number originally used by Sender
- **Sender Timestamp (Timestamps)**
Transmission time originally used by Sender

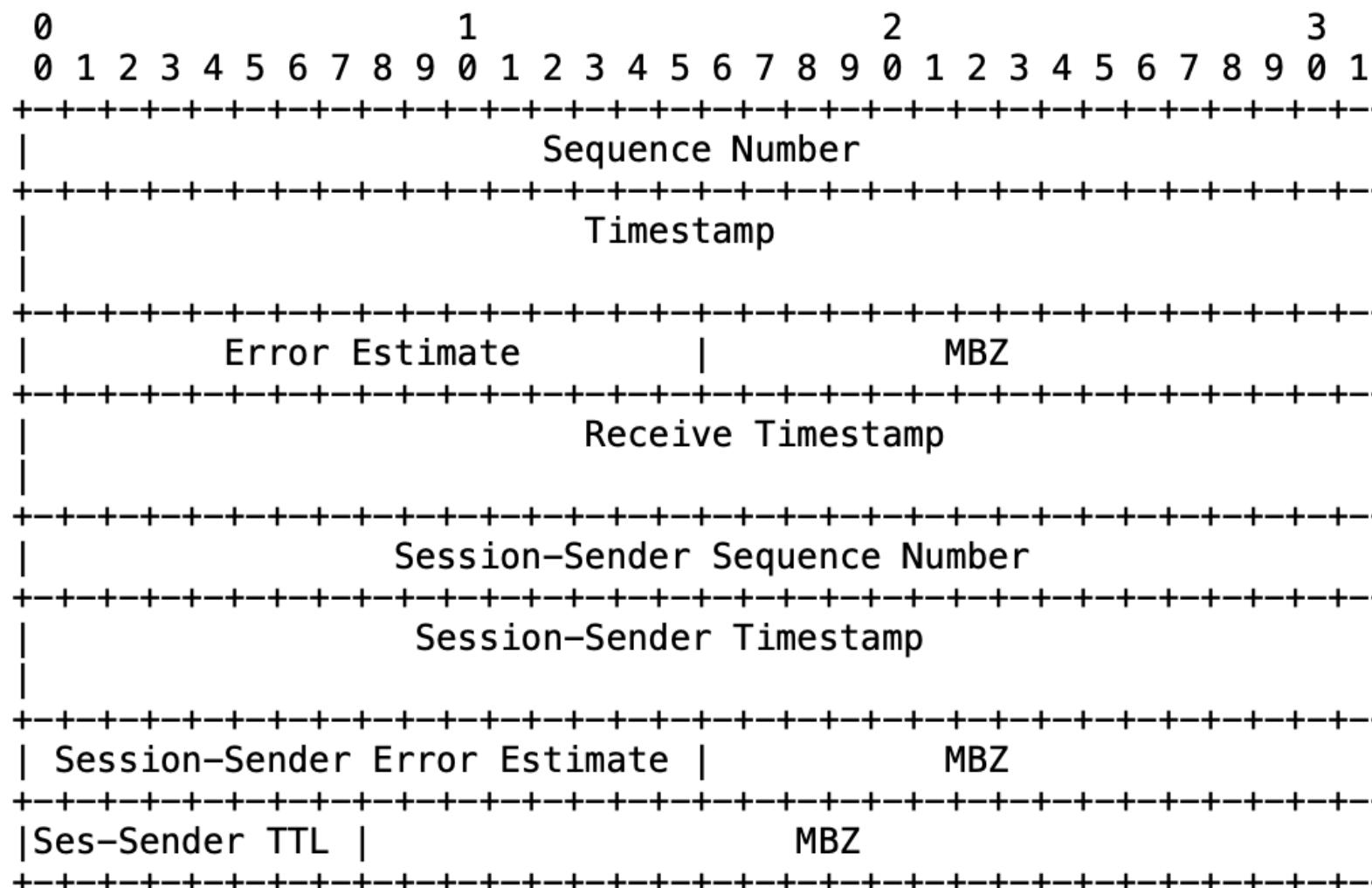
STAMP

Session-Sender Test Packet Format

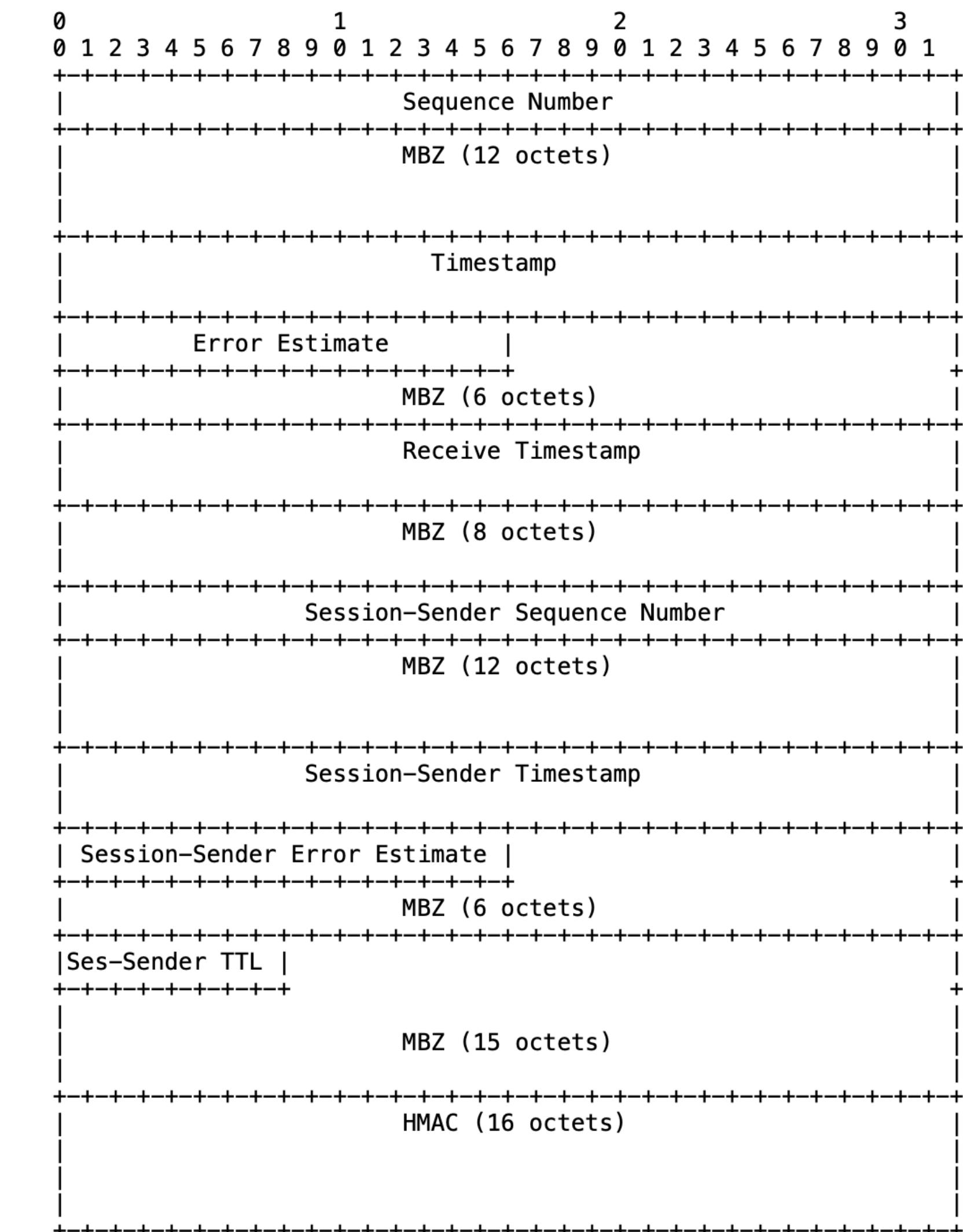


STAMP

Session-Reflector Test Packet Format



Unauthenticated Mode



Authenticated Mode

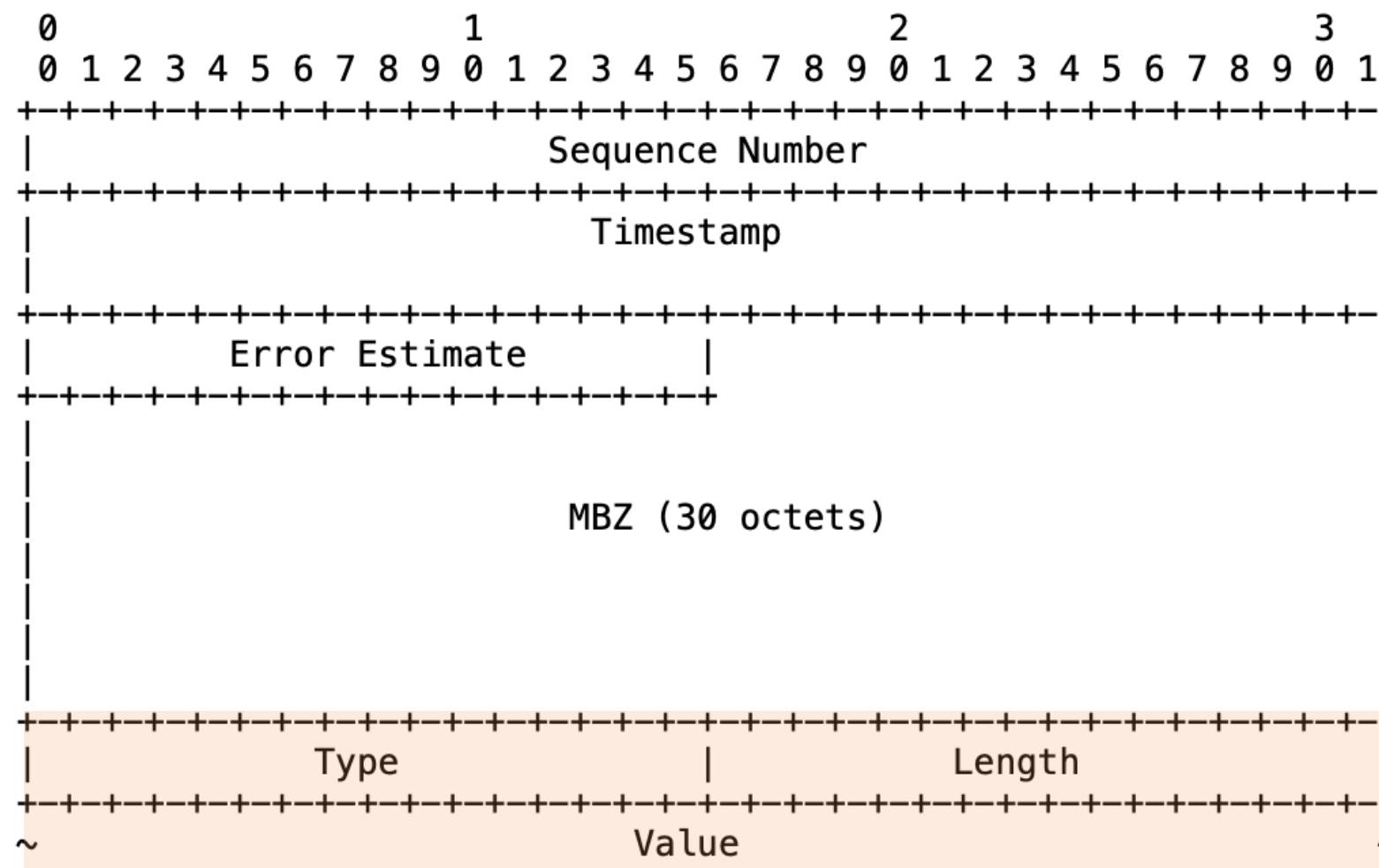
STAMP

TLV Extensions

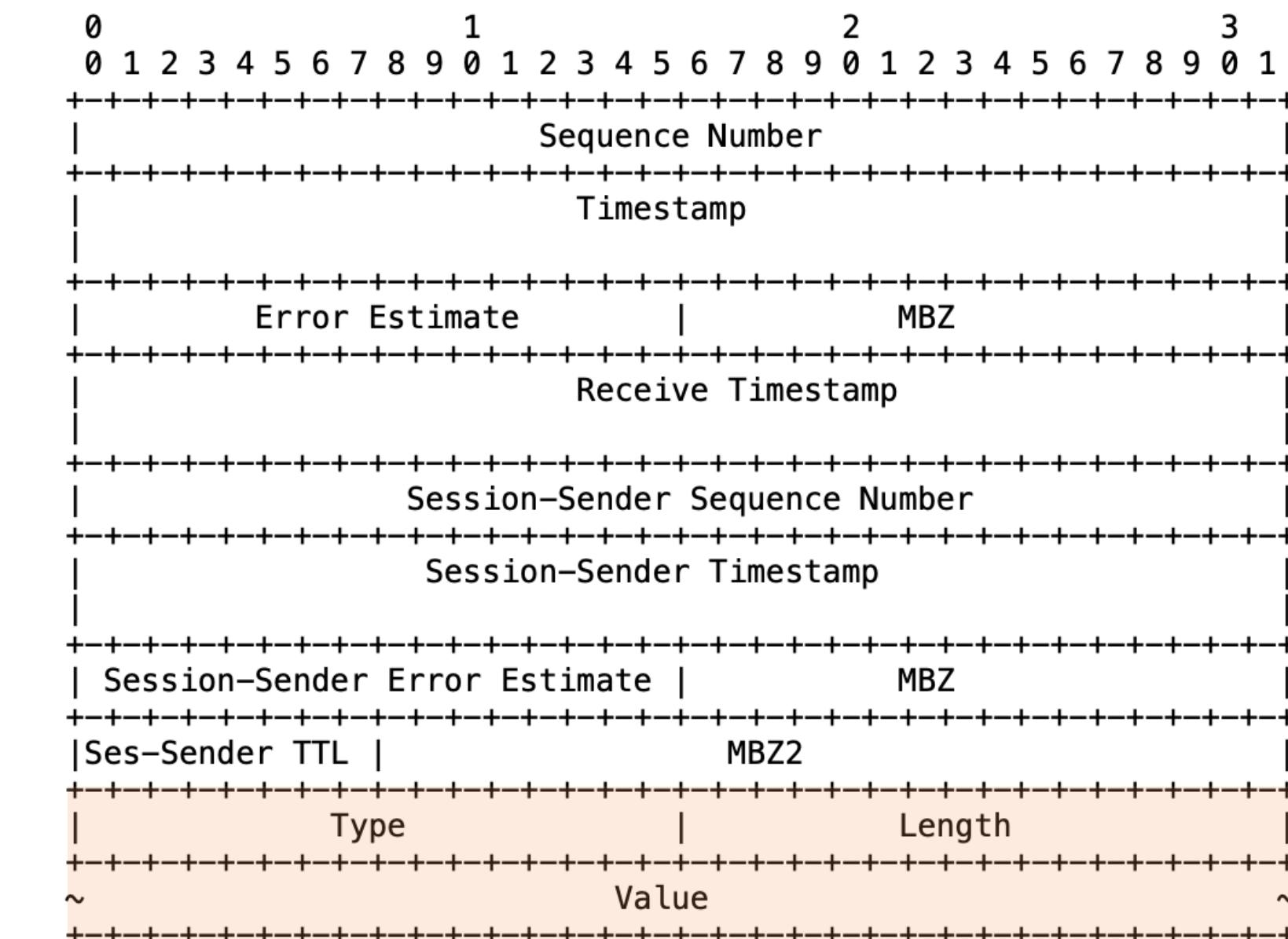
- **Basic STAMP has all-zeroes "payload"**
 - MBZ (Must be Zeroed) used for padding purposes
 - Padding can be used to ensure symmetric packet size on both directions
- **TLV Extensions defines "payload" and is "future-proof", e.g:**
 - Extra Padding TLV
 - Location TLV
 - Timestamp Information TLV
 - Class of Service TLV
 - Direct Measurement TLV
 - Access Report TLV

STAMP

TLV Extensions Packet Format



Session-Sender Packet Format
with TLV



Session-Reflector Packet Format
with TLV

PMF Protocol

PMF Protocol

Overview

- **UE-initiated Measurements**

- UE as STAMP Session-Sender, UPF as STAMP Session-Reflector
- UE sends STAMP Test Packet, reflected by UPF, measure RTT

- **Network-initiated Measurements**

- UPF as STAMP Session-Sender, UE as STAMP Session-Reflector
- UPF sends STAMP Test Packet, reflected by UE, measure RTTs

- **Access Reporting**

- UE sends STAMP Test Packet with Access Reporting TLV
- UPF reflects STAMP Test Packet with Access Reporting TLV, serves as acknowledgement

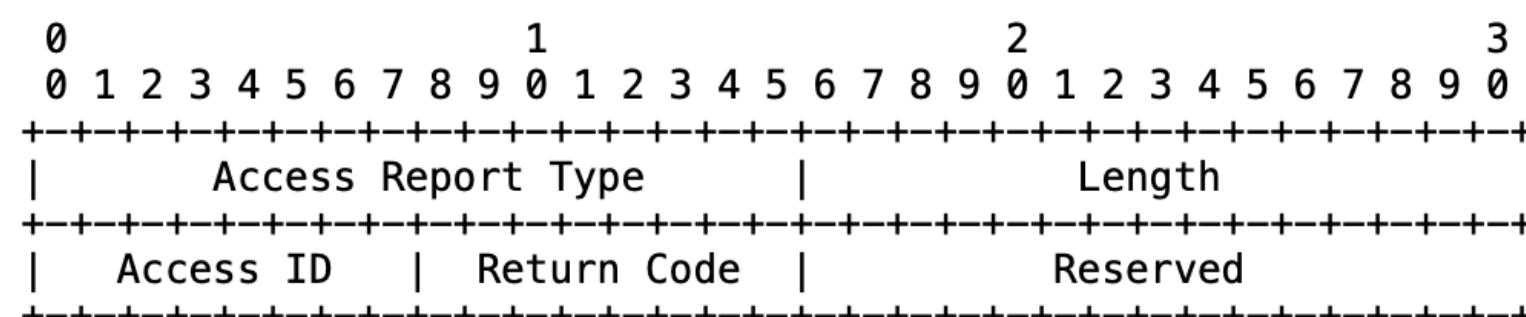
PMF Protocol

STAMP

- **PMF-Echo Request**
 - STAMP Session-Sender sending Test Packet
- **PMF-Echo Response**
 - STAMP Session-Reflector reflecting Test Packet
- **PMF-Access Report**
 - STAMP Session-Sender sending Test Packet with Access Report TLV
- **PMF-Access Report Acknowledgement**
 - STAMP Session-Reflector reflecting Test Packet with Access Report TLV

PMF Protocol

Access Report TLV Packet Format ([draft-ietf-ippm-stamp-option-tlv-01](#))



Access Report TLV Packet Format

Value	Description	Reference
1	3GPP	This document
2	Non-3GPP	This document

Access IDs

Value	Description	Reference
1	Network available	This document
2	Network unavailable	This document

Return Codes

PMF Protocol

STAMP over Ethernet

- **STAMP "payload" is IP/UDP agnostic**
 - Only needs "length" field from the encapsulating protocol/frame
- **3GPP to define Ethernet framing and Ethertype**
 - Framing needs to indicate frame length
 - 3GPP may define a "3GPP Ethertype" with feature-specific sub-type
- **STAMP implementations can easily be adapted to accommodate Ethernet**