

# Encapsulation of Simple Two-Way Active Measurement Protocol (STAMP) for Pseudowires in MPLS Networks

*draft-gandhi-mpls-stamp-pw-04*

*Rakesh Gandhi - Cisco Systems ([rgandhi@cisco.com](mailto:rgandhi@cisco.com)) - Presenter*

*Patrice Brissette - Cisco Systems ([pbrisset@cisco.com](mailto:pbrisset@cisco.com))*

*Edward Leyton - Verizon Wireless ([edward.leyton@verizonwireless.com](mailto:edward.leyton@verizonwireless.com))*

# Agenda

- Requirements and Scope
- Summary of Procedure
- Review Comments
- Next Steps

# Requirements and Scope

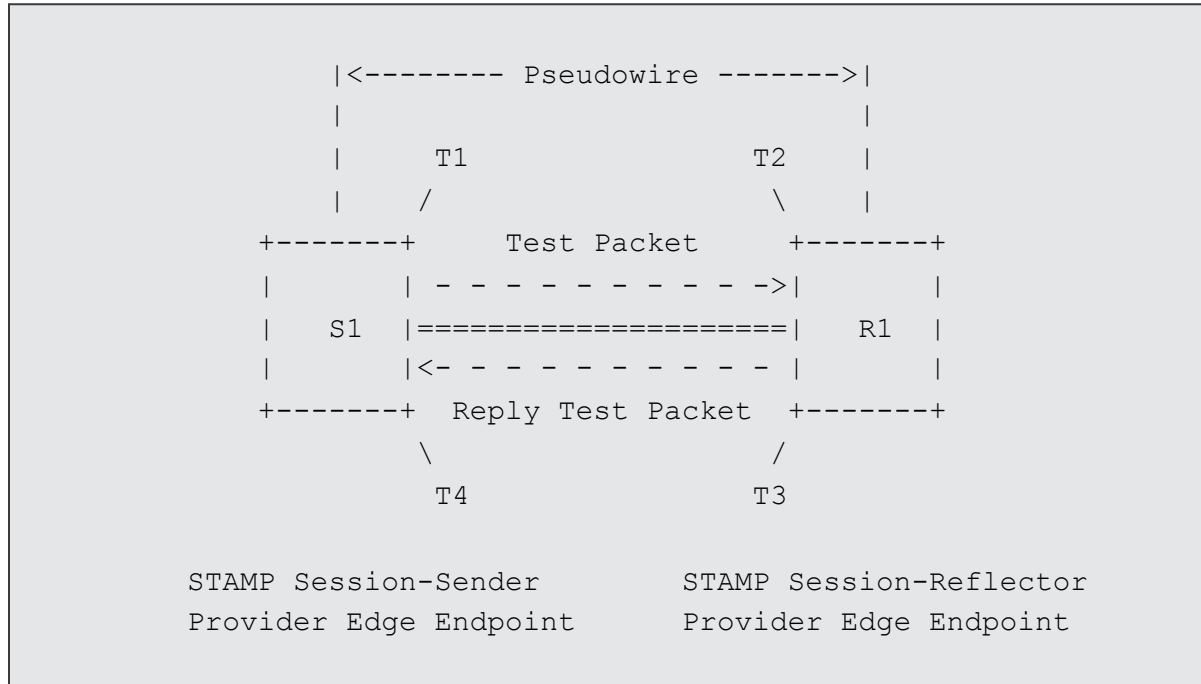
## Requirements:

1. Encapsulation of STAMP test packets for MPLS and MPLS-TP PWs
2. STAMP test packets to follow the same (ECMP) path (with fate sharing) as data traffic
  - Same MPLS encapsulation as data traffic with or without IP header
3. STAMP test packets demultiplexed over control channel (VCCV/OAM)

## Scope:

1. STAMP [RFC8762]
2. STAMP Extensions [RFC8972]
3. P2P MPLS/MPLS-TP PWs
4. P2P MPLS/MPLS-TP LSPs (to be added)
5. Out of Scope: VCCV Capability Signaling

# STAMP Reference Topology



# Example Use Cases of MPLS/MPLS-TP PW, MPLS/MPLS-TP LSP Data Traffic

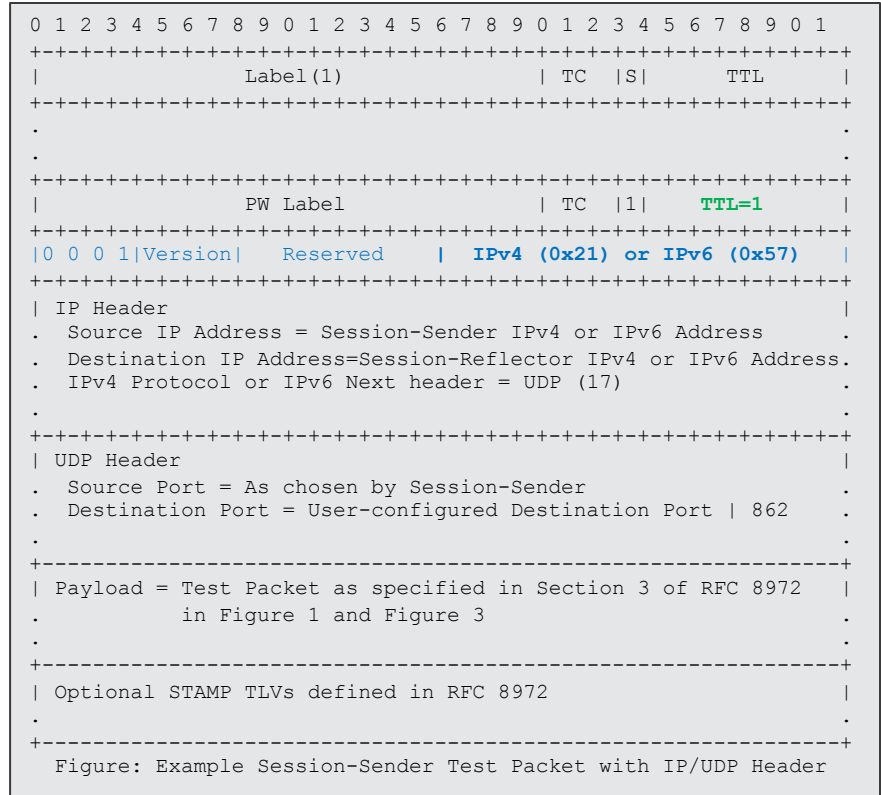
	Example Use Cases	STAMP Test Packet Formats
1	MPLS PW Data Traffic ( <u>Using CW</u> and IP Header)	IP/UDP Headers (Format 1)
2	MPLS-TP PW Data Traffic ( <u>Using CW</u> and IP Header)	
3	MPLS LSP Data Traffic (Using IP Header)	
4	MPLS Ethernet PW Data Traffic [RFC4448]	No IP/UDP Headers (Format 2)
5	L2-Specific Sublayer (L2SS) used in L2TPv3 PW Data Traffic [RFC3931]	
6	Private Line Emulation [draft-ietf-pals-ple] PW Data Traffic	
7	TDM over IP [RFC5087] PW Data Traffic (no IP Header case)	
8	MPLS-TP LSP Data Traffic	

# Applicability of RFC 5085 to STAMP Test Packets

Control Channel Types [RFC5085]	Name	STAMP Test Packet Formats	G-ACH Types for STAMP
CC Type 1	In-Band: Control Word with 0001b as first nibble	No IP/UDP Headers (Format 2)	STAMP G-ACH (TBD1/TBD2)
CC Type 2	Out-Of-Band: MPLS Router Alert Label	Not supported	Not supported
CC Type 3	TTL Expiry: MPLS PW Label with TTL == 1	IP/UDP Headers (Format 1)	IPv4 G-ACH (0x21) IPv6 G-ACH (0x57)
		No IP/UDP Headers (Format 2)	STAMP G-ACH (TBD1/TBD2)

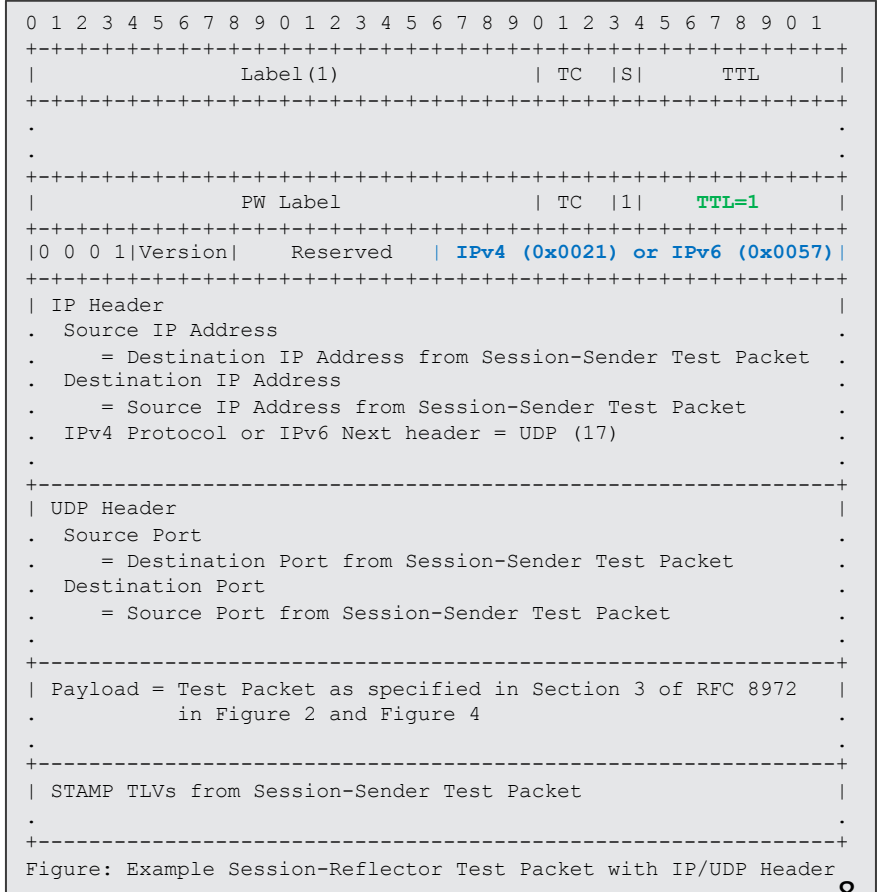
# Format 1: STAMP Session-Sender Test Packet with IP/UDP Headers

1. Session-Sender test packets are encapsulated with MPLS header using the same label stack as the PW data traffic
2. PW Label added with **TTL=1** to punt packet on Session-Reflector
  - "TTL Expiry VCCV (Type 3)" defined in Section 5.1.3 of [RFC5085] to terminate the OAM messages on the remote PE endpoint nodes
3. PW Generic Associated Channel (G-ACh) Type for IPv4 or IPv6 to encapsulate the Session-Sender test packets with IP/UDP headers



# Format 1: STAMP Session-Reflector Test Packet with IP/UDP Headers

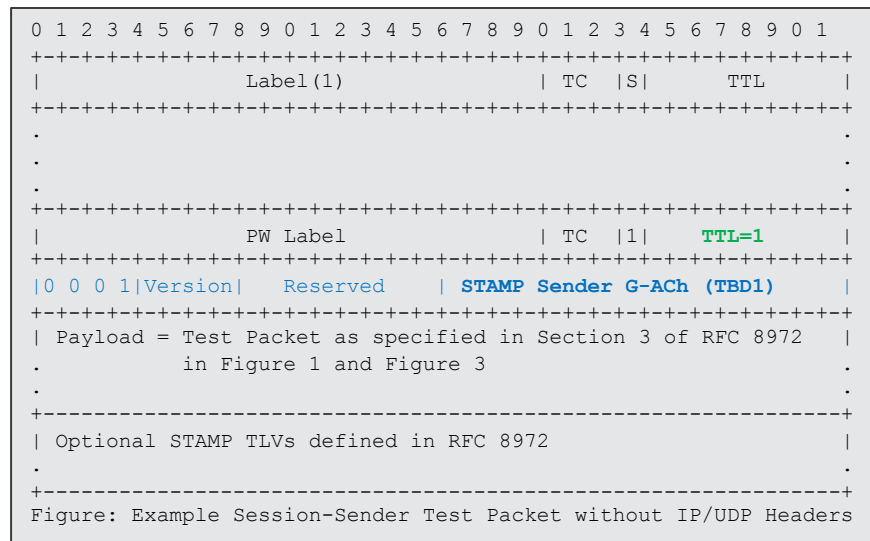
1. Session-Reflector test packet is transmitted with IP/UDP headers using the information from the IP/UDP headers in the received Session-Sender test packet
2. Session-Reflector test packets are encapsulated with MPLS header using the same label stack as the data traffic in the reverse direction of the bidirectional PW
3. PW Label added with **TTL=1** to punt packet on Session-Sender
  - "TTL Expiry VCCV (Type 3)" defined in Section 5.1.3 of [RFC5085] to terminate the OAM messages on the remote PE endpoint nodes
4. PW Generic Associated Channel (G-ACh) Type for IPv4 or IPv6 to encapsulate the Session-Reflector test packets with IP/UDP headers





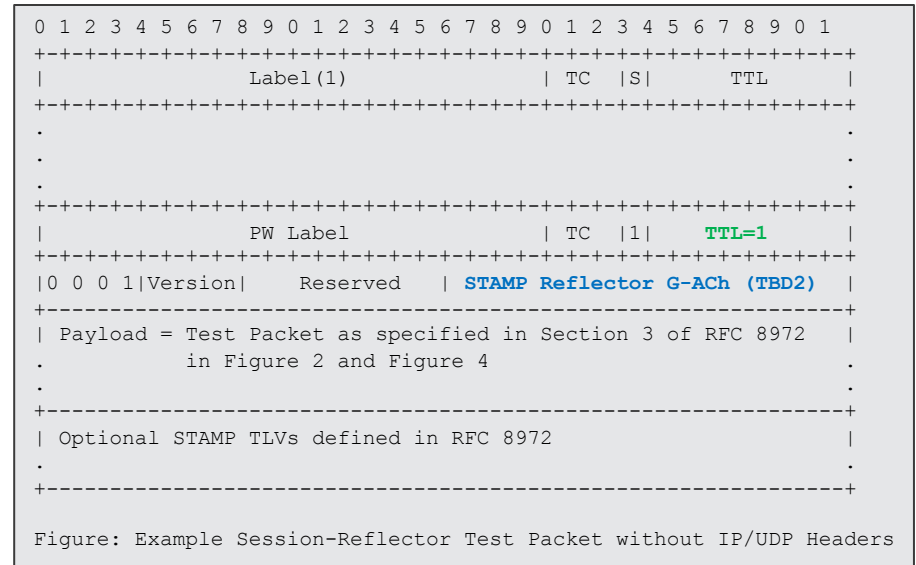
# Format 2: STAMP Session-Sender Test Packet without IP/UDP Headers

1. Session-Sender test packets are encapsulated with MPLS header using the same label stack as the PW data traffic
2. PW Label added with **TTL=1** to punt packet on Session-Reflector
  - "TTL Expiry VCCV (Type 3)" defined in Section 5.1.3 of [RFC5085] to terminate the OAM messages on the remote PE endpoint nodes
3. Define new PW Generic Associated Channel (G-ACh) Type for STAMP Sender (value TBD1) to encapsulate the Session-Sender test packets without IP/UDP headers
  - Applicable to "In-Band VCCV (Type 1)" defined in Section 5.1.1 of [RFC5085]



# Format 2: STAMP Session-Reflector Test Packet without IP/UDP Headers

1. Session-Reflector test packets are encapsulated with MPLS header using the same label stack as the traffic in the reverse direction of the bidirectional PW
2. PW Label added with **TTL=1** to punt packet on Session-Sender
  - "TTL Expiry VCCV (Type 3)" defined in Section 5.1.3 of [RFC5085] to terminate the OAM messages on the remote PE endpoint nodes
3. Define new PW Generic Associated Channel (G-ACh) Type for STAMP Reflector (value TBD2) to encapsulate the Session-Reflector test packets without IP/UDP headers
  - Applicable to "In-Band VCCV (Type 1)" defined in Section 5.1.1 of [RFC5085]



# STAMP Test Packet Discriminators

- Session-Sender and Session-Reflector test packet formats do not have a way to discriminate them

Format 1: With IP/UDP Headers:

- Different destination UDP port numbers in the Session-Sender and Session-Reflector test packets to discriminate them

Format 2: Without IP/UDP Headers:

- Different G-ACh types in the Session-Sender and Session-Reflector test packets to discriminate them

Value	Description	Reference
TBD1	STAMP Session-Sender G-ACh Type	This document
TBD2	STAMP Session-Reflector G-ACh Type	This document

# Comment 1: Using New STAMP G-ACh Types without IP/UDP Headers

## Use Case 1:

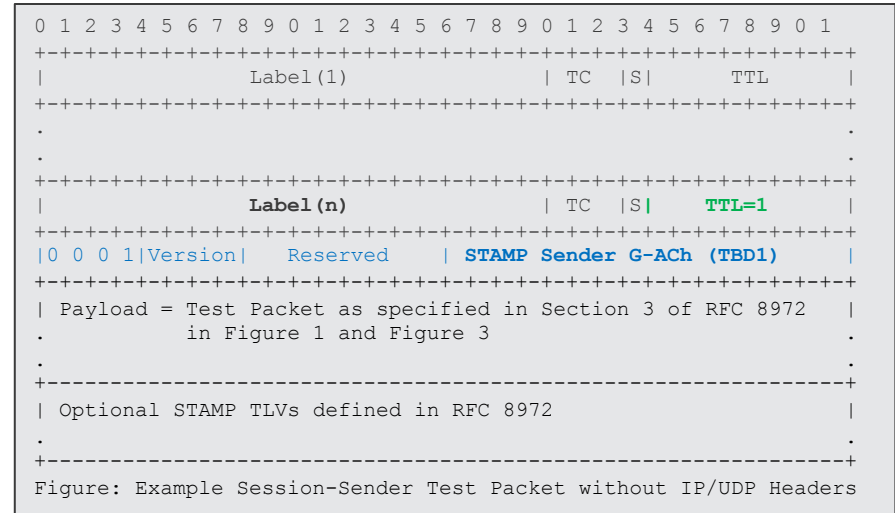
- Same MPLS Encapsulation as Data Traffic carrying Control-Word (CW) for monitoring ECMP and fate sharing
  1. MPLS Ethernet PW [RFC4448]
  2. L2-Specific Sublayer (L2SS) used in L2TPv3 PW carry CW (no IP header) [RFC3931]
  3. PLE [draft-ietf-pals-ple] traffic over PSN (as VPWS) carry CW (no IP header)
  4. TDM over IP [RFC5087] payload (structure-aware/structure-agnostic) carry CW with or without IP header
  5. MPLS-TP LSP carry CW

## Use Case 2:

- Demultiplex Control Channel (VCCV/OAM)
  1. G-ACh types allow to demultiplex VCCV Control Channel for PWs [RFC7708] and MPLS-TP PWs [RFC7189]
    - For example, G-ACh types for BFD packets with or without IP/UDP headers allow to demultiplex VCCV Control Channel [RFC5885]
  2. G-ACh types allow to demultiplex OAM Control Channel for MPLS-TP PWs [RFC5960]

## Comment 2: STAMP for MPLS LSPs and MPLS-TP LSPs (Not in draft)

1. Data traffic over MPLS LSPs (no CW)
  - Data traffic with IP header
2. Data traffic over MPLS-TP LSPs (with CW)
  - Data traffic without IP header
3. STAMP test packets are encapsulated with MPLS header using the same label stack as the LSP data traffic
4. MPLS LSP without G-ACh
  - IP + UDP + STAMP Payload
5. MPLS-TP LSP with G-ACh
  - Use GAL or TTL==1 (if ultimate label)
  - STAMP Payload



## Comment 3: Out-of-Band VCCV (Type 2) - Not Supported (Not in draft)

Out-of-Band VCCV Type 2 is not supported for STAMP.

Text from [RFC5085]

- CC Type 2 is also referred to as "MPLS Router Alert Label"
- This approach could result in a **different Equal Cost Multi-Path (ECMP) hashing** behavior than pseudowire PDUs, and thus result in the VCCV control channel traffic taking a path which differs from that of the actual data traffic under test

## Next Steps

- Thank you, Greg, Stewart, Xiao Min for your comments and suggestions
- Welcome Xiao Min as co-author
- Welcome further comments and suggestions
- Include MPLS/MPLS-TP LSPs in the draft
- Request WG adoption

Thank you