Simple Two-Way Active Measurement Protocol (STAMP) Extensions for Multi-path

draft-zhang-ippm-stamp-mp-02

(was draft-zhang-ippm-ioam-mp-00)

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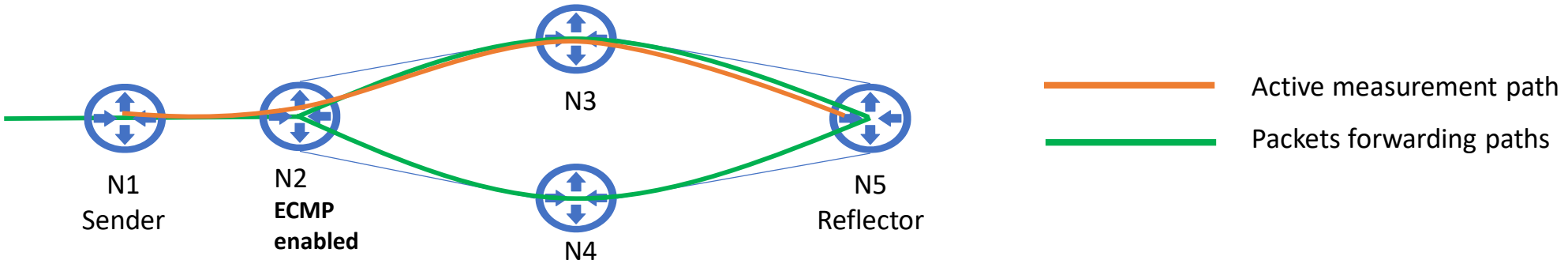
Updates

- Extend STAM instead of IOAM to avoid intrusion problem.
- Provide more detail descriptions on the procedures of Session Sender, Session Reflector, and Transit Nodes.
- Split a new I-D to address the round-trip co-path measurement-> draft-zhang-ippm-stamp-co-routed-path.

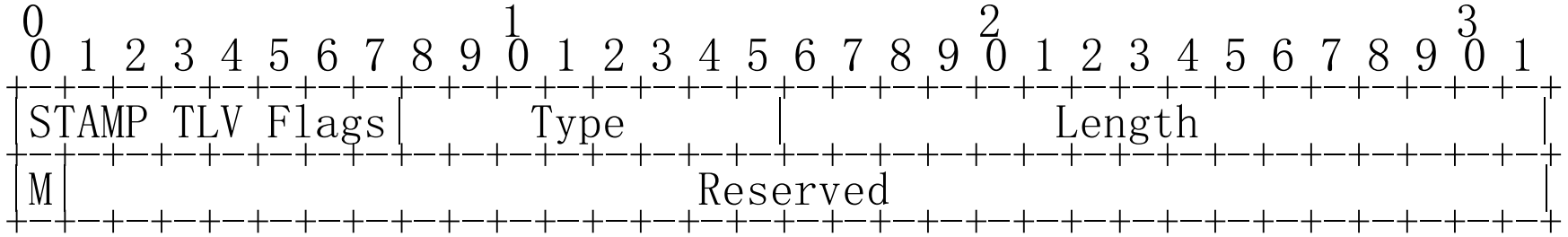
Motivation

- STAMP[RFC8762] is an active performance measurement test protocol, which enables measurement of both one-way and round-trip performance metrics.
- However, STAMP are typically for a specific path, **it can't collect all the path's information on the same time when there are multiple paths**(such as ECMP, UCMP).
- Although the multipath measurement could be **achieved by constructing different IPv6 flow labels or MPLS entropy labels**, but it has the following shortcomings:
  - It is hard to know **whether all the available paths has been measured;**
  - It can only realize **the one-way performance measurement;**



STAMP Packet Format Extensions

- A Multi-path TLV for STAMP test packets:



Type: TBA

Length: 4;

M: Indicate Multi-path measurement. When a transit node receives a STAMP packet with this flag Set, it should duplicate this packet to all the interfaces which can reach the destination.

STAMP Procedure Extensions

- **Session Sender Procedures**:

  Session Sender need to generate test packets with the following fields:

  - **Multi-path TLV**, to indicate multi-path measurement. Defined in this draft.
  - **Set Co-routed Bidirectional Path flag of Return Path Control Code Sub-TLV**, to indicate the reflected packet should be forwarded on the same path as test packet. Defined in draft-zhang-ippm-stamp-co-routed-path.
  - **IOAM HBH Option**, to distinguish different path by collection the HBH node and interface information.
  - **Reflected IPv6 Extension Header Data TLV**, to indicate the session-reflector to reflect the IOAM fields. Defined in draft-ietf-ippm-stamp-ext-hdr.

STAMP Procedure Extensions

Transit Node Procedures

- **Packet modification**, add its node ID, ingress interface ID, and egress interface ID to the IOAM trace option of the test packet;
- **Packet Forwarding**, duplicate the packet to each egress interface that can reach the destination node.

Session Reflector Procedures

- **Copy IPv6 Options**, copy the entire IPv6 option including the header into the STAMP "Reflected IPv6 Extension Header Data" TLV in Session-Reflector payload;
- **Reset M-bit** of the reflect packet, to prevent the replication in the backward path.
- **Encapsulate SID list** to the reflected test packet according to the IOAM Trace Option.
- **Main a Counter for Each Path**, only required for stateful mode

STAMP Procedure Extensions

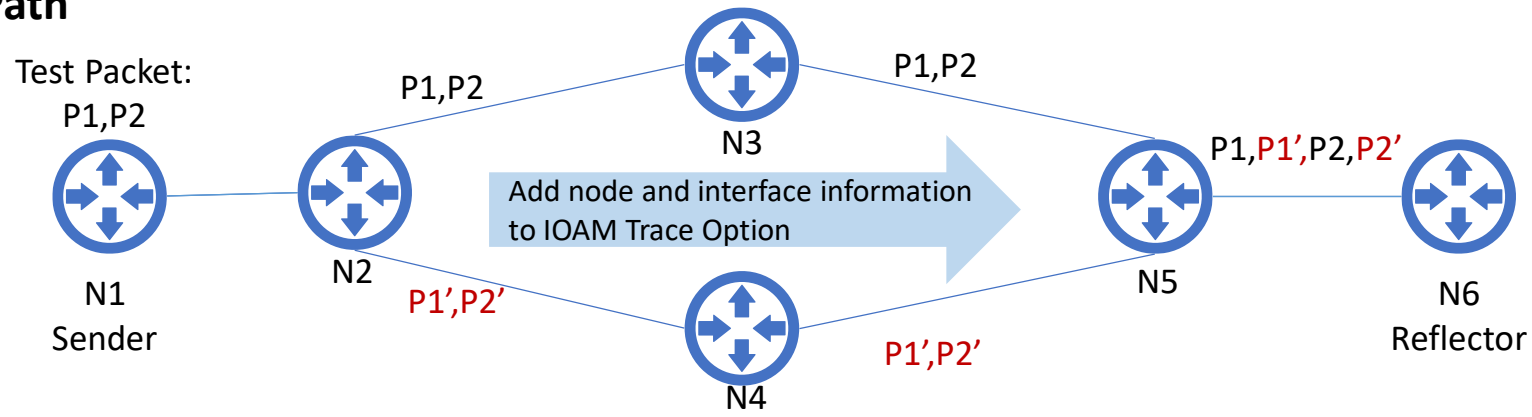
- **Reflected Packet Analysis Procedures**:

  - **Determines** which test packet the reflected packet corresponding to base on the Session-Sender sequence number;
  - **Distinguishes different paths** based on the Reflected IPv6 Extension Header Data" TLV ;
  - **Generates a table** for all the paths and record the sequence number for each path;
  - **Gets** round-trip **packet loss** for each path(stateless mode), or gets forward and backward packet loss for each path (stateful mode).
  - **Gets the forward and backward transit delay** of each path by comparing the Timestamps of the reflected packet.

Examples

An STAMP Multi-path measurement example in stateful mode:

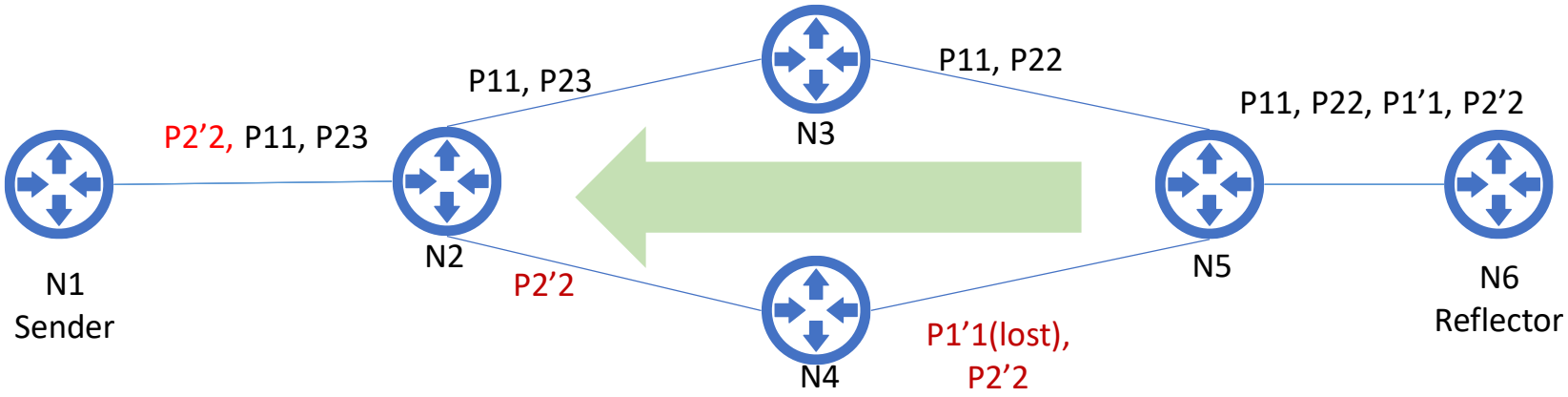
Forward Path



1. Copy IPv6 Options
2. Reset M-bit of the reflect packet
3. Encapsulate SID list to SRH

Backward Path

Paths go through	Send packets number	Reflect packets number
Paht1	2	2
Path2	2	1



Path1 Packet Loss Rate: 0%

Path2 Packet Loss Rate: 50%(packet is lost in the backward path)

Questions:

This draft is similar with draft-ietf-ippm-asymmetrical-pkts, whether that extension could be generalized to fit in this use case?

Ans:
Draft-ietf-ippm-asymmetrical-pkts propose a method to do active measurement in multicast network. It is achieved by extending a Reflected Test Packet Control TLV to indicate the Address Group of destination nodes.

There are two different points between these two use cases:

1. **The reflect behavior is different.** The use case proposed in multi-pah draft is more complex, because it need to keep the forward path and backward path are same, this is not required in multicast network.
2. **The analysis behavior is different.** Although in both use cases, a sender may expect multiple responses to a single packet. But in multicast use case, the sender can distinguish which node the reflected packet is from by the source IP, However in multi-path case, it need to distinguish different path by the IOAM Trace Option. Therefore, it need to be combined with IOAM extension header.

Next Steps

Add MPLS data plane solutions

Continue to improve quality

Any comments and opinions ?

Thank You