Performance Measurement for Geneve

draft-xiao-nvo3-pm-geneve-00

Abstract

This document describes the method to achieve Performance Measurement (PM) in point-to-point Generic Network Virtualization Encapsulation (Geneve) tunnels that form an overlay network.

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1. Introduction

"Generic Network Virtualization Encapsulation" (Geneve) [I-D.ietf-nvo3-geneve] provides an encapsulation scheme that allows building an overlay network by decoupling the address space of the attached virtual hosts from that of the network.

This document describes the use of Packet Loss and Delay Measurement for MPLS Networks [RFC6374], as well as Simple Two-way Active Measurement Protocol [I-D.ietf-ippm-stamp], to enable measuring the performance of the path between two Geneve tunnel endpoints.

In this document, NVE (Network Virtualization Edge) represents a Geneve tunnel endpoint, TS (Tenant System) represents a physical or virtual device attached to a Geneve tunnel endpoint, and VAP (Virtual Access Point) represents the NVE side of the interface between the NVE and the TS.

2. Conventions Used in This Document

2.1. Terminology

GAL: Generic Associated Channel Label

G-ACh: Generic Associated Channel

Geneve: Generic Network Virtualization Encapsulation

MPLS: Multiprotocol Label Switching
STAMP: Simple Two-way Active Measurement Protocol

TS: Tenant System

VAP: Virtual Access Point

VNI: Virtual Network Identifier

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. PM Packet Transmission over Geneve Tunnel

Analogous to what’s specified in Section 3 of [I-D.xiao-nvo3-bfd-geneve], this document considers three options of PM packet encapsulation in Geneve:

- with Ethernet and IP/UDP encapsulation;
- with IP/UDP encapsulation;
- with MPLS encapsulation.

3.1. PM Encapsulation With Inner Ethernet/IP/UDP Headers

If the Protocol Type field (as defined in Section 3.4 of [I-D.ietf-nvo3-geneve]) of data packets indicates that an inner Ethernet header immediately follows the Geneve header, i.e., the Protocol Type equals to 0x6558 (Ethernet frame), then PM packets are encapsulated in Geneve as described below.
The STAMP test packet MUST be carried inside the inner Ethernet frame of the Geneve packet, immediately after the inner IP/UDP headers. The inner Ethernet frame carrying the STAMP Test Packet has the following format:

![Geneve Encapsulation Diagram]

**Figure 1: Geneve Encapsulation of PM Message With the Inner Ethernet/IP/UDP Header**
The Ethernet header and IP header are encoded as specified in Section 4 of [I-D.ietf-bfd-vxlan].

The destination UDP port MUST be set the well-known port 862 as defined in [I-D.ietf-ippm-stamp].

The STAMP Test Packet SHOULD be unauthenticated STAMP Session-Sender test packet or unauthenticated STAMP Session-Reflector test packet. The STAMP Test Packet is encoded as specified in [I-D.ietf-ippm-stamp] and [I-D.ietf-ippm-stamp-option-tlv].

If the PM packets are encapsulated in Geneve as described above, the values in the Geneve header are set as follows:

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<table>
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<tr>
<th>Ver</th>
<th>Opt Len</th>
<th>O</th>
<th>C</th>
<th>Rsvd.</th>
<th>Protocol Type</th>
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</tbody>
</table>
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
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Figure 2: Geneve Header

Opt Len field MUST be set to 0 to indicate that the header does not include any variable-length options.

O bit MUST be set to 1, which indicates this packet contains a control message.

C bit MUST be set to 0.

Protocol Type field MUST be set to 0x6558 (Ethernet frame).

3.2. PM Encapsulation With Inner IP/UDP Headers

If the Protocol Type field (as defined in Section 3.4 of [I-D.ietf-nvo3-geneve]) of data packets indicates that an inner IP header immediately follows the Geneve header, i.e., the Protocol Type equals to 0x0800 (IPv4) or 0x86DD (IPv6), then PM packets are encapsulated in Geneve as described below.
A STAMP test packet MUST be carried inside the inner IP/UDP packet that immediately follows the Geneve header. The values in the inner IP packet carrying the STAMP Test Packet are as follows:

The IP header is encoded as specified in Section 3.2 of [I-D.xiao-nvo3-bfd-geneve].

The destination UDP port MUST be set the well-known port 862 as defined in [I-D.ietf-ippm-stamp].
The STAMP Test Packet SHOULD be unauthenticated STAMP Session-Sender test packet or unauthenticated STAMP Session-Reflector test packet. The STAMP Test Packet is encoded as specified in [I-D.ietf-ippm-stamp] and [I-D.ietf-ippm-stamp-option-tlv].

When the PM packets are encapsulated in Geneve in this way, the Geneve header follows the value set below.

- Opt Len field MUST be set to 0 to indicate there isn’t any variable-length option.
- O bit MUST be set to 1, which indicates this packet contains a control message.
- C bit MUST be set to 0.
- Protocol Type field MUST be set to 0x0800 (IPv4) or 0x86DD (IPv6), depending on the address family of the inner IP packet.

3.3. PM Encapsulation With Inner MPLS Header

If the Protocol Type field (as defined in Section 3.4 of [I-D.ietf-nvo3-geneve]) of data packets indicates that an MPLS label stack immediately follows the Geneve header, i.e., the Protocol Type equals to 0x8847 (MPLS) or 0x8848 (MPLS with the upstream-assigned label), then PM packets are encapsulated in Geneve, as described below.
Figure 4: Geneve Encapsulation of PM Message With the Inner MPLS GAL/G-ACh

The Loss Measurement Message, Delay Measurement Message, or Combined Loss/Delay Measurement Message MUST be carried inside the inner MPLS packet that immediately follows the Geneve header. The values in the inner MPLS packet carrying the Loss Measurement Message, Delay Measurement Message, or Combined Loss/Delay Measurement Message are as follows:

The MPLS Interface Context Label and the MPLS GAL (Generic Associated Channel Label) are encoded as specified in Section 3.3 of [I-D.xiao-nvo3-bfd-geneve].
The MPLS G-ACh (Generic Associated Channel) is encoded as specified in [RFC5586], and the "Channel Type" field of MPLS G-ACh MUST be set to 0x000A, 0x000C or 0x000D requested by [RFC6374], respectively indicating "MPLS Direct Loss Measurement", "MPLS Delay Measurement" or "MPLS Direct Loss and Delay Measurement".

The Loss Measurement Message, Delay Measurement Message, and Combined Loss/Delay Measurement Message are encoded as specified in Sections 3.1 through 3.3 of [RFC6374].

When the PM packets are encapsulated in Geneve in this way, the Geneve header follows the value set below.

- Opt Len field MUST be set to 0 to indicate there isn’t any variable-length option.
- 0 bit MUST be set to 1, which indicates this packet contains a control message.
- C bit MUST be set to 0.
- Protocol Type field MUST be set to 0x8847 (MPLS).

4. Reception of PM packet from Geneve Tunnel

Once a packet is received, NVE MUST validate the packet as described in [I-D.ietf-nvo3-geneve] and Section 4 of [I-D.xiao-nvo3-bfd-geneve].

4.1. Demultiplexing of the PM packet

Similar to BFD over Geneve, multiple PM sessions may be running between two NVEs, so there needs to be a mechanism for demultiplexing received PM packets to the proper session.

If the PM packet is received with Session Identifier value equals to 0, for different PM encapsulation, the procedure for demultiplexing the received PM packets is different, which would follow the procedure for a BFD packet with Your Discriminator equals to 0, as specified in Section 4.1 of [I-D.xiao-nvo3-bfd-geneve].

If the PM packet is received with a non-zero Session Identifier, then PM session MUST be demultiplexed only with Session Identifier as the key.

With respect to PM for Geneve, the use of the specific VNI would follow the principle as specified in Section 4.1 of [I-D.xiao-nvo3-bfd-geneve].
5. Security Considerations

This document does not raise any additional security issues beyond those of the specifications referred to in the list of normative references.

6. IANA Considerations

This document has no IANA action requested.

7. Acknowledgements

TBA.

8. Normative References

[I-D.ietf-bfd-vxlan]

[I-D.ietf-ippm-stamp]

[I-D.ietf-ippm-stamp-option-tlv]

[I-D.ietf-nvo3-geneve]

[I-D.xiao-nvo3-bfd-geneve]


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