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MPLS Encapsulation for SFC NSH
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Abstract

This document describes how to use a Service Function Forwarder (SFF) Label (similar to a pseudowire label or VPN label) to indicate the presence of a Service Function Chaining (SFC) Network Service Header (NSH) between an MPLS label stack and the packet payload. This allows SFC packets using the NSH to be forwarded between SFFs over an MPLS network, and the selection between multiple SFFs in the destination node.

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1. Introduction

As discussed in [RFC8300], a number of encapsulations for the Service Function Chaining (SFC) Network Service Header (NSH) already exist, such as in Ethernet, GRE [RFC2784], and VXLAN-GPE [I-D.ietf-nvo3-vxlan-gpe]. This document describes an MPLS encapsulation for the NSH, and also describes how to use an Service Function Forwarder (SFF) [RFC7665] Label to indicate the presence of the NSH header in the MPLS packet payload. This allows SFC packets using the NSH to be forwarded between SFFs over an MPLS network, and the selection between multiple SFFs in the destination node.

SFF Labels are similar to other labels at the bottom of an MPLS label stack that denote the contents of the MPLS payload being other than globally routed IP, such as a layer 2 pseudowire, an IP packet that is routed in a VPN context with a private address, or an Ethernet virtual private wire service.

This informational document follows well-established MPLS procedures and does not require any actions by IANA or any new protocol elements.

2. MPLS Encapsulation

The encapsulation is simply a standard MPLS label stack [RFC3032] with the SFF Label at the bottom of the stack, followed by a NSH as defined by [RFC8300] and the NSH payload.

As discussed by [RFC4928] and [RFC7325], there are Equal Cost Multipath (ECMP) considerations for payloads carried by MPLS. Many

existing routers use deep packet inspection to examine the payload of an MPLS packet, and if the first nibble of the payload is equal to 0x4 or 0x6, these routers assume that the payload is IPv4 or IPv6 respectively, and perform ECMP load balancing on the MPLS packets.

For SFC, this is undesirable for several reasons. First of all, NSH is not IPv4 and IPv6, and the presumed contents of the TCP/IP five-tuple used for load balancing would be incorrect. Also, as discussed in [RFC8300], ECMP in general is undesirable for SFC and should be avoided. For this reason, the NSH Base Header was carefully constructed so that the NSH could not look like IPv4 or IPv6 based on its first nibble. See Section 2.2 of [RFC8300] for further details.

3. SFF Label

Much like a pseudowire label, an SFF Label is allocated by the downstream receiver of the NSH header from its per-platform label space.

If a receiving node supports more than one SFF (i.e, more than one SFC forwarding instance), then the SFF Label can be used select the proper SFF, by having the receiving advertise more than one SFF Label to its upstream sending nodes as appropriate.

The method used by the downstream receiving node to advertise SFF Labels to the upstream sending node is currently out of scope of this document. That said, a number of methods are possible, such as via a protocol exchange, or via a centralized controller that manages both the sender and the receiver via NETCONF/YANG, BGP, PCEP, etc. These are meant as possible examples and not to constrain the future definition of such advertisement methods.

4. IANA Considerations

This document does not request any actions from IANA.

Editorial note to RFC Editor: This section may be removed at your discretion.

5. Security considerations

This document describes a method for transporting SFC packets using the NSH over MPLS. It follows well-established MPLS procedures and does not define any new protocol elements or allocate any new code points. It is operationally equivalent to other existing NSH encapsulations as defined in [RFC8300]. As such, it should have no effect on SFC security as already discussed in Section 8 of [RFC8300].

6. Acknowledgements

Thanks to Jim Guichard for his review and comments.

7. References

7.1. Normative References

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7.2. Informative References

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