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T. Ao
ZTE Corporation
G. Mirsky
ZTE Corp.
Z. Chen
China Telecom
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Controlled Return Path for Service Function Chain (SFC) OAM
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Abstract

This document defines extensions to the Service Function Chain (SFC) Operation, Administration and Maintenance (OAM) that enable control of the Echo Reply return path by specifying it as Reverse Service Function Path. Enforcing the specific return path can be used to verify bidirectional connectivity of SFC and increase robustness of SFC OAM.

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1. Introduction

While Echo Request, defined in [I-D.ooamdt-rtgwg-demand-cc-cv], always traverses the Service Function Chain (SFC) it directed to, the corresponding Echo Reply is sent over IP network [I-D.wang-sfc-multi-layer-oam]. There are scenarios when it is beneficial to direct the responder to use path other than the IP network. This document defines extensions to the Service Function Chain (SFC) Operation, Administration and Maintenance (OAM) that enable control of the Echo Reply return path by specifying it as Reply Service Function Path. This document defines a new Type-Length-Value (TLV), Reply Service Function Path TLV, for Reply via Specified Path mode of Overlay Echo Reply (Section 4).

The Reply Service Function Path TLV provides efficient mechanism to test bidirectional and hybrid SFCs, as these were defined in Section 2.2 [RFC7665], that allows an operator to test both directions of the bidirectional or hybrid SFP with a single Overlay Echo Request/Echo Reply operation.

2. Conventions used in this document

2.1. Terminology

SF - Service Function

SFF - Service Function Forwarder

SFC - Service Function Chain, an ordered set of some abstract SFs.

SFP - Service Function Path

SPI - Service Path Index

OAM - Operation, Administration, and Maintenance

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. Extension

Following reply modes had been defined in [I-D.ooamdt-rtgwg-demand-cc-cv]:

- o Do Not Reply
- o Reply via an IPv4/IPv6 UDP Packet
- o Reply via Application Level Control Channel
- o Reply via Specified Path

The Reply via Specified Path mode is intended to enforce use of the particular return path specified in the included TLV. This mode may help to verify bidirectional continuity or increase robustness of the monitoring of the SFC by selecting more stable path. In case of SFC, the sender of Echo Request instructs the egress SFF to send Echo Reply message along the SFP specified in the SFC Reply Path TLV Section 4.

4. SFC Reply Path TLV

The SFC Reply Path TLV carries the information that sufficiently identifies the return SFP that the Overlay Echo Reply message is expected to follow. The format of SFC Reply Path TLV is display in Figure 1.

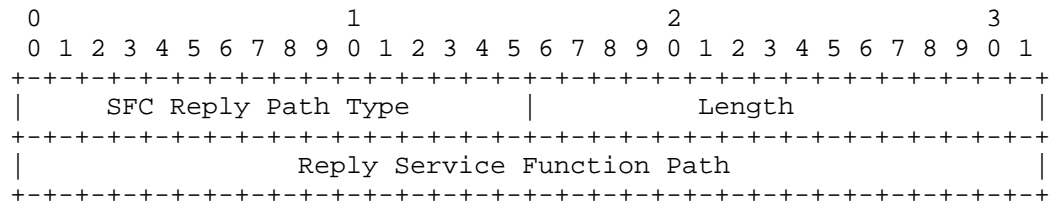


Figure 1: SFC Reply TLV Format

where:

- o Reply Path TLV Type: is 2 octets long, indicates the TLV that contains a information about the SFC Reply path.
- o Length: is 2 octets long, MUST be equal to 4
- o Reply Service Function Path is used to describe the return path that an Overlay Echo Reply is requested to follow.

The format of the Reply Service Function Path field displayed in Figure 2

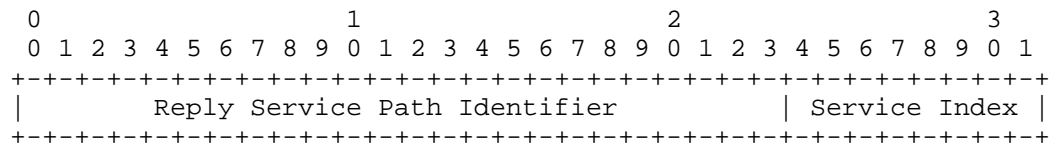


Figure 2: Reply Service Function Path Field Format

where:

- o Reply Service Path Identifier: is SFP identifier for the path that the Overlay Echo Reply message is requested to be sent over.
- o Service Index: used for forwarding in the reply SFP.

5. Theory of Operation

[RFC7110] defined mechanism to control return path for MPLS LSP Echo Reply. In case of SFC, the return path is a SFP along which Overlay Echo Reply message MUST be transmitted. Hence, the SFC Reply Path TLV included in the Overlay Echo Request message MUST sufficiently identify the SFP that the sender of the Echo Request message expects the receiver to use for the corresponding Overlay Echo Reply.

When sending an Echo Request the sender MUST set the value of Reply Mode field to "Reply via Specified Path", defined in [I-D.ooamdt-rtgwg-demand-cc-cv], and MUST include SFC Reply Path TLV. The SFC Reply Path TLV includes identifier of the reverse SFP and an appropriate Service Index.

Echo Reply is expected to be sent by the egress SFF of the SFP being tested or by the SFF at which SFC TTL expires as defined [I-D.ietf-sfc-nsh]. Processing described below equally applies in both cases and referred as responding SFF.

If the Echo Request message with SFC Reply Path TLV, received by the responding SFF, has Reply Mode value of "Reply via Specified Path" but no SFC Reply Path TLV is present, then the responding SFF MUST send Echo Reply with Return Code set to "Reply Path TLV is missing" value (TBA2). If the responding SFF cannot find requested SFP it MUST send Echo Reply with Return Code set to "Reply SFP was not found" and include the SFC Reply Path TLV from the Echo Request message.

5.1. Case of Bi-directional SFC

Ability to specify the return path to be used for Echo Reply is very useful in bi-directional SFC. For bi-directional SFC, since the last SFF of the forward SFP may not co-locate with classifier of the reverse SFP, it is assumed that last SFF doesn't know the reply path of a SFC. So even for bi-directional SFC, a reverse SFP also need to be indicated in reply path TLV in echo request message.

6. Security Considerations

Will be added in the future updates.

7. IANA Considerations

7.1. SFC Return Path Type

IANA is requested to assign from its Overlay Echo Request/Echo Reply TLV registry new type as following:

Value	Description	Reference
TBA1	SFC Reply Path Type	This document

Table 1: SFC Return Path Type

7.2. New Return Codes

IANA is requested to assign new return codes from the Overlay Echo Request/Echo Reply Return Codes registry as following:

Value	Description	Reference
TBA2	Reply Path TLV is missing	This document
TBA3	Reply SFP was not found	This document

Table 2: SFC Overlay Echo Reply Return Codes

8. References

8.1. Normative References

[I-D.ietf-sfc-nsh]

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Authors' Addresses

Ting Ao
ZTE Corporation
No.889, BiBo Road
Shanghai 201203
China

Phone: +86 21 68897642
Email: ao.ting@zte.com.cn

Greg Mirsky
ZTE Corp.
1900 McCarthy Blvd. #205
Milpitas, CA 95035
USA

Email: gregimirsky@gmail.com

Zhonghua Chen
China Telecom
No.1835, South PuDong Road
Shanghai 201203
China

Phone: +86 18918588897
Email: 18918588897@189.cn