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Seamless Bidirectional Forwarding Detection (S-BFD) for Segment Routing
draft-akiya-bfd-seamless-sr-03

Abstract

This document defines procedures to use Seamless Bidirectional Forwarding Detection (S-BFD) for the Segment Routing environment.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

Seamless Bidirectional Forwarding Detection (S-BFD), [I-D.ietf-bfd-seamless-base], defines a generalized mechanism to allow network nodes to seamlessly perform continuity checks to remote entities. This document defines necessary procedures to use S-BFD on the Segment Routing environment described by [I-D.filsfils-spring-segment-routing].

The reader is expected to be familiar with the IP, MPLS, Segment Routing [I-D.filsfils-spring-segment-routing], BFD [RFC5880] and S-BFD [I-D.ietf-bfd-seamless-base] terminologies and protocol constructs.

2. Inheritance of Code Points and Procedures

S-BFD on the Segment Routing MUST use the code points and procedures defined in [I-D.akiya-bfd-seamless-ip] regarding following aspects:

- S-BFD UDP Port
- S-BFD Echo UDP Port
- S-BFD Control Packet Demultiplexing
- Initiator Procedures

o Responder Procedures

The Segment Routing on the MPLS data plane is to use MPLS based procedures, and the Segment Routing on the IPv6 data plane is to use IP based procedures.

3. SBFDInitiator Models

The S-BFD technology defines an SBFDReflector and how SBFDInitiators speak to SBFDReflectors. Outside of these definitions, implementations are free to be flexible in terms of how SBFDInitiators behave. The packet steering capability of the Segment Routing allows for, at very high level, two distinct SBFDInitiator models. This section describes the two SBFDInitiator models as an implementation reference.

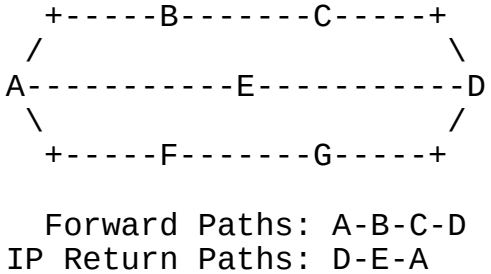
3.1. Uncontrolled Return Path

A network node sending S-BFD control packets to a remote target with particular segment stack will allow the network node to determine whether or not such packets reach the intended remote target. The network node can conclude the reachability when valid response S-BFD control packets are received back. In opposite, the network node can conclude the lack of reachability when valid response S-BFD control packet are not received back. Because S-BFD control packets back from the responder to the initiator will be IP routed, how S-BFD control packets traverse the network back to the initiator is uncontrolled. If the network employs good set of local protection mechanisms, this may not be concerning and the model of only sending S-BFD control packets may be sufficient.

In this model, SBFDInitiator is to send only S-BFD control packets.

3.2. Controlled Return Path

In addition to SBFDInitiator sending S-BFD control packets, described in Section 3.1, S-BFD echo packets can also be sent.



Forward Paths: A-B-C-D
IP Return Paths: D-E-A

Figure 1: S-BFD Echo Example

Node A sending S-BFD control packets with segment stack {B, C, D} will cause S-BFD control packets to traverse the paths A-B-C-D in the forward direction. The response S-BFD control packets from node D back to node A will be IP routed and will traverse the paths D-E-A. The SBFDInitiator sending such packets can also send S-BFD echo packets with segment stack {B, C, D, C, A}. S-BFD echo packets will u-turn on node D and traverse the paths D-C-B-A. If required, the SBFDInitiator can possess multiple types of S-BFD echo packets, with each having varying return paths. In this particular example, the SBFDInitiator can be sending two types of S-BFD echo packets in addition to S-BFD control packets.

- S-BFD control packets
  - Segment stack: {B, C, D}
  - Return path: D-E-A
- S-BFD echo packets #1
  - Segment stack: {B, C, D, C, A}
  - Return path: D-C-B-A
- S-BFD echo packets #2
  - Segment stack: {B, C, D, G, A}
  - Return path: D-G-F-A

The SBFDInitiator can correlate the result of each packet type to determine the nature of the failure. One such example of failure correlation is described in the figure below.

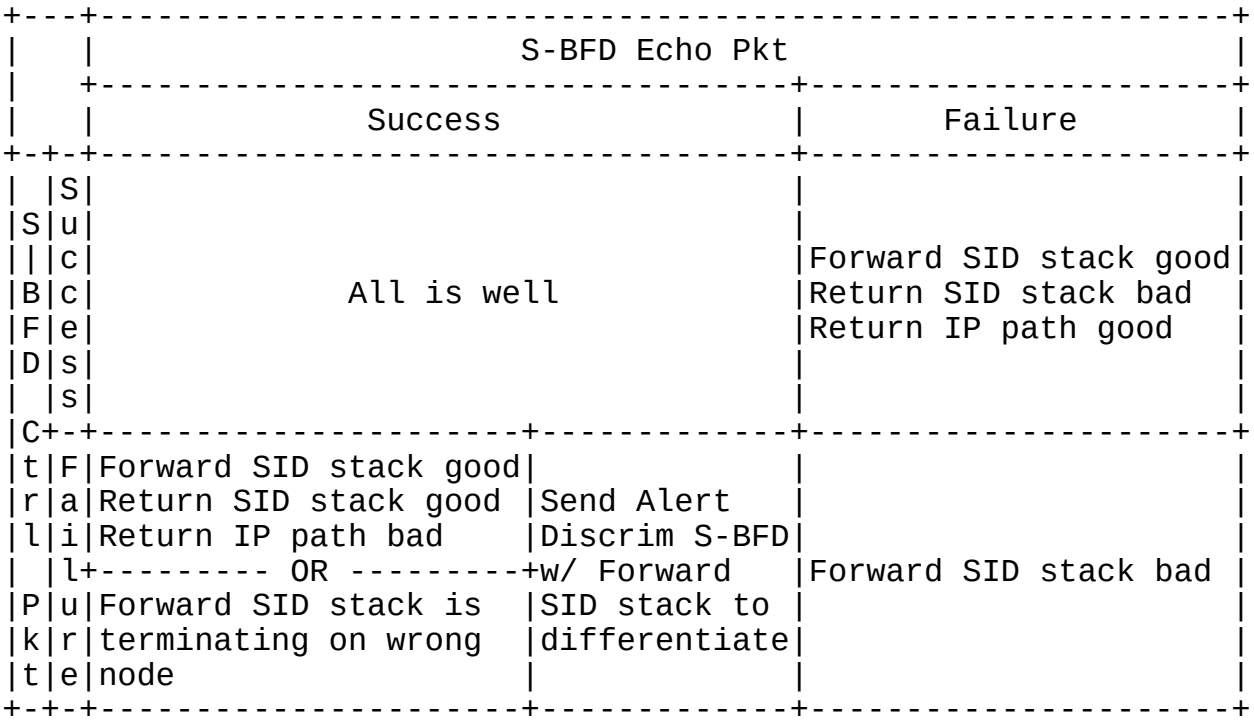


Figure 2: SBFDInitiator Failure Correlation Example

4. S-BFD Echo Recommendations

- It is RECOMMENDED to compute and use smallest number of segment stack to describe the return path of S-BFD echo packets to prevent the segment stack being too large. How SBFDInitiator determines when to use S-BFD echo packets and how to identify corresponding segment stack for the return paths are outside the scope of this document.

- It is RECOMMENDED that SBFDInitiator does not send only S-BFD echo packets. S-BFD echo packets are crafted to traverse the network and to come back to self, thus there is no guarantee that S-BFD echo are u-turning on the intended remote target. On the other hand, S-BFD control packets can verify that segment stack of the forward direction reaches the intended remote target. Therefore, an SBFDInitiator SHOULD send S-BFD control packets when sending S-BFD echo packets.

- It is RECOMMENDED that, for Segment Routing on the MPLS data plane, destination IP address of S-BFD echo packets is chosen from the 127/8 range for IPv4 and from the 0:0:0:0:0:FFFF:7F00/104 range for IPv6.

5. Security Considerations

Security considerations for S-BFD are discussed in [I-D.ietf-bfd-seamless-base] and [I-D.akiya-bfd-seamless-ip].

6. IANA Considerations

This document does not request any new code points from IANA.

7. Acknowledgements

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9.1. Normative References

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