Using Seamless BFD with Segment Routing

The Segment Routing TE feature provides information support for Seamless Bidirectional Forwarding Detection (S-BFD).

Restrictions For Using Seamless BFD with Segment Routing

Restrictions for Seamless-Birdirectional Forwarding (S-BFD)

- Seamless-Birdirectional Forwarding (S-BFD) supporting IPv4 only for segment routing traffic engineering (SR-TE). IPv6 is not supported.
- Single hop S-BFD session is only supported.
- RSVP-TE does not support S-BFD.

Information About Seamless BFD with Segment Routing

Bidirectional Forwarding Detection and Seamless-Bidirectional Forwarding Detection (S-BFD)

Bidirectional Forwarding Detection (BFD) is a detection protocol designed to provide fast forwarding path failure detection times for all media types, encapsulations, topologies, and routing protocols.

BFD provides a consistent failure detection method for network administrators, in addition to fast forwarding path failure detection. Because the network administrator can use BFD to detect forwarding path failures at a uniform rate, rather than the variable rates for different routing protocol hello mechanisms, network profiling and planning will be easier, and reconvergence time will be consistent and predictable.

Seamless Bidirectional Forwarding Detection (S-BFD), is a simplified mechanism for using BFD with a large proportion of negotiation aspects eliminated, thus providing benefits such as quick provisioning, as well as improved control and flexibility for network nodes initiating path monitoring.

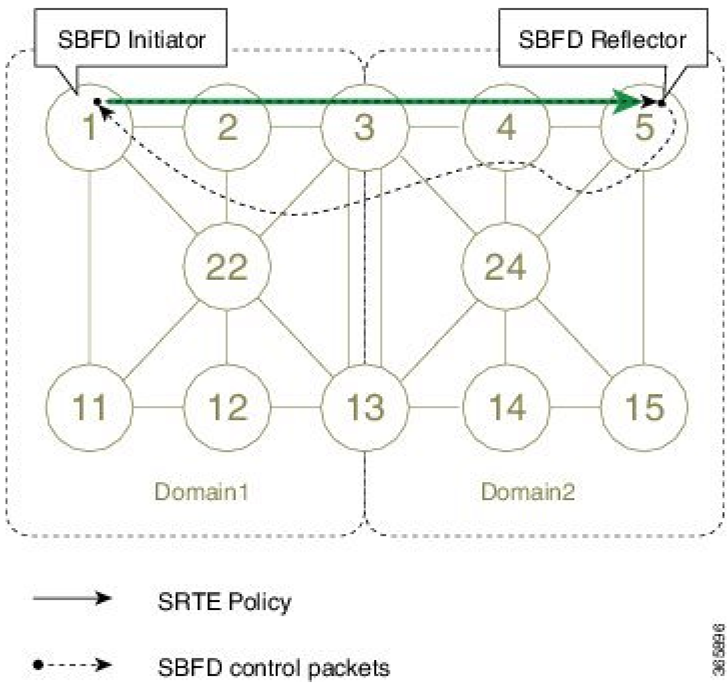
If SBFD session fails, S-BFD brings down the SR-TE session. S-BFD also provides faster session bring up due to less control packets exchange. S-BFD is associated with SR-TE to bring a session up quickly. The BFD state is only maintained at head end thereby reducing overhead.

S-BFD implements support for RFC 7880, RFC 7881 on segment routing.

Initiators and Reflectors

SBFD runs in an asymmetric behavior, using initiators and reflectors. The following figure illustrates the roles of an SBFD initiator and reflector.

Figure 1: SBFD Initiator and Reflector



The initiator is an SBFD session on a network node that performs a continuity test to a remote entity by sending SBFD packets. The initiator injects the SBFD packets into the segment-routing traffic-engineering (SRTE) policy. The initiator triggers the SBFD session and maintains the BFD state and client context.

The reflector is an SBFD session on a network node that listens for incoming SBFD control packets to local entities and generates response SBFD control packets. The reflector is stateless and only reflects the SBFD packets back to the initiator.

A node can be both an initiator and a reflector, thereby allowing you to configure different SBFD sessions.

S-BFD can be enabled and supported for SR-TE IPv4, but IPv6 is not supported. For SR-TE, S-BFD control packets are label switched in forward and reverse direction. For S-BFD, the tail end is the reflector node. Other nodes cannot be a reflector. When using S-BFD with SR-TE, if the forward and return directions are label switched paths, S-BFD need not be configured on the reflector node.

How to Configure Seamless BFD with Segment Routing

Configuring Seamless-Bidirectional Forwarding Detection (S-BFD) for Segment Routing

S-BFD must be enabled on both initiator and reflector nodes.

> **Note** When using S-BFD with SR-TE, if the forward and return directions are label switched paths, S-BFD need not be configured on the reflector node.

Enabling Seamless Bidirectional Forwarding Detection (S-BFD) on the Reflector Node

Perform this task to configure S-BFD on the reflector node.

```
sbfd local-discriminator 55.55.55.55
```

Enabling Seamless Bidirectional Forwarding Detection (S-BFD) on the Initiator Node

Perform this task to configure S-BFD on the initiator node.

```
bfd-template single-hop ABC
 interval min-tx 300 min-rx 300 multiplier 10
```

Enabling Segment Routing Traffic Engineering Tunnel with Seamless-Bidirectional Forwarding (S-BFD)

```
interface Tunnel56
 ip unnumbered Loopback11
 tunnel mode mpls traffic-eng
 tunnel destination 55.55.55.55 */IP address of Reflector node/*
 tunnel mpls traffic-eng path-option 1 dynamic segment-routing
 tunnel mpls traffic-eng bfd sbfd ABC
!
end
```

Verifying S-BFD Configuration

SUMMARY STEPS

1. **show mpls traffic-engineering tunnel** *tunnel-name*
2. **show bfd neighbors**

DETAILED STEPS

Step 1 **show mpls traffic-engineering tunnel** *tunnel-name*

Verifies the SR TE state and the S-BFD session state.

Example:

```
Router# sh mpls traffic-eng tunnel tunnel 56

    Name: R1_t56                              (Tunnel56) Destination: 55.55.55.55
      Status:
        Admin: up         Oper: up     Path: valid       Signalling: connected
        path option 1, (SEGMENT-ROUTING) type dynamic (Basis for Setup, path weight 12)

      Config Parameters:
        Bandwidth: 0        kbps (Global)  Priority: 7  7   Affinity: 0x0/0xFFFF
        Metric Type: TE (default)
        Path Selection:
         Protection: any (default)
        Path-selection Tiebreaker:
          Global: not set   Tunnel Specific: not set   Effective: min-fill (default)
        Hop Limit: disabled
        Cost Limit: disabled
        Path-invalidation timeout: 10000 msec (default), Action: Tear
        AutoRoute: disabled LockDown: disabled Loadshare: 0 [0] bw-based
        auto-bw: disabled
        Fault-OAM: disabled, Wrap-Protection: disabled, Wrap-Capable: No

      SBFD configured with template: ABC
        Session type: CURRENT        State: UP       SBFD handle: 0x3
        LSP ID: 1
        Last uptime duration: 3 minutes, 35 seconds
        Last downtime duration: --
          Active Path Option Parameters:
        State: dynamic path option 1 is active
        BandwidthOverride: disabled  LockDown: disabled  Verbatim: disabled
      Node Hop Count: 2
          History:
        Tunnel:
          Time since created: 4 minutes, 3 seconds
          Number of LSP IDs (Tun_Instances) used: 1
        Current LSP: [ID: 1]
          Uptime: 3 minutes, 36 seconds
      Tun_Instance: 1
      Segment-Routing Path Info (isis  level-2)
        Segment0[Link]: 12.12.12.1 - 12.12.12.2, Label: 48
        Segment1[Link]: 25.25.25.2 - 25.25.25.5, Label: 35 !
```

Step 2 **show bfd neighbors**

Verifies that BFD neighbors are established properly.

Example:

```
Router# show bfd neighbors

    MPLS-TE SR Sessions
    Interface      LSP ID(Type)                      LD/RD         RH/RS     State
    Tunnel56          1 (SR)                   4097/926365495  Up        Up
```

Additional References for Seamless BFD with Segment Routing

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
Segment Routing Traffic Engineering configuration	*Segment Routing -Traffic Engineering*

Table 1: Standards and RFC

Standard/RFC	Title
draft-akiya-bfd-seamless-base-03	Seamless Bidirectional Forwarding Detection (S-BFD)
draft-ietf-isis-segment-routing-extensions-07	IS-IS Extensions for Segment Routing
draft-ietf-spring-segment-routing-09	Segment Routing Architecture
RFC 7880	Seamless Bidirectional Forwarding Detection (S-BFD)
RFC 7881	Seamless Bidirectional Forwarding Detection (S-BFD) for IPv4, IPv6, and MPLS

Feature Information for Seamless BFD with Segment Routing

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 2: Feature Information for Segment Routing TE Feature

Feature Name	Releases	Feature Information
Segment Routing TE Feature	Cisco IOS XE Denali 16.4.1	Seamless Bidirectional Forwarding Detection (S-BFD), is a simplified mechanism for using BFD with a large proportion of negotiation aspects eliminated, thus providing benefits such as quick provisioning, as well as improved control and flexibility for network nodes initiating path monitoring. The following commands were introduced or modified: **address-family ipv4 strict-spf**, **bfd-template single-hop**, **index range**, **sbfd local-discriminator**, **show bfd neighbor**, **show isis segment-routing**, **show mpls forwarding-table**, **show mpls traffic tunnel**, **show mpls traffic-engineering**.