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Seamless BFD for VCCV
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Abstract

This document extends the procedures and Connectivity Verification (CV) types already defined for Bidirectional Forwarding Detection (BFD) for Virtual Circuit Connectivity Verification (VCCV) to define Seamless BFD (S-BFD) for VCCV. This document updates RFC 5885, extending the CV Values and the Capability Selection.

Status of This Memo

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This Internet-Draft will expire on October 30, 2016.

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1. Background

BFD for VCCV [RFC5885] defines the CV types for BFD using VCCV, protocol operation and the required packet encapsulation formats. This document extends those procedures, CV type values to enable S-BFD [I-D.ietf-bfd-seamless-base] operation for VCCV.

The new S-BFD CV Types are Pseudowire (PW) demultiplexer-agnostic, and hence applicable for both MPLS and Layer Two Tunneling Protocol version 3 (L2TPv3) pseudowire demultiplexers. This document concerns itself with the S-BFD VCCV operation over single-segment pseudowires

(SS-PWs). The scope of this document is as follows:

This specification describes procedures only for S-BFD asynchronous mode.

S-BFD Echo mode is outside the scope of this specification.

S-BFD operation for fault detection and status signaling is outside the scope of this specification.

This document specifies the use of a single S-BFD discriminator per Pseudowire. There are cases where multiple S-BFD discriminators per PW can be useful. One such cases is using different S-BFD discriminators per Flow within a FAT PW [RFC6391]; however, the mapping between Flows and discriminators is a prerequisite. FAT PWs can be supported as described in Section 7 of [RFC6391].

1.1. 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 [RFC2119].

2. S-BFD Connectivity Verification

S-BFD protocol provides continuity check services by monitoring the S-BFD control packets sent and received over the VCCV channel of the PW. The term "Connectivity Verification" is used throughout this document to be consistent with [RFC5885].

This section defines the CV types to be used for S-BFD. It also defines the procedures for the S-BFD reflector and S-BFD Initiator operation.

Two CV Types are defined for S-BFD. Table 1 summarizes the S-BFD CV Types, grouping them by encapsulation (i.e., with versus without IP/UDP headers) for fault detection only. S-BFD for fault detection and status signaling is outside the scope of this specification.

	Fault Detection Only	Fault Detection and Status Signaling
S-BFD, IP/UDP Encapsulation (with IP/UDP Headers)	TBD1	N/A
S-BFD, PW-ACH Encapsulation when using MPLS PW or L2-Specific Sublayer (L2SS) Encapsulation when using L2TP PW (without IP/UDP Headers)	TBD2	N/A

Table 1: Bitmask Values for BFD CV Types

Two new bits are requested from IANA to indicate S-BFD operation.

2.1. Co-existence of S-BFD and BFD Capabilites

Since the CV types for S-BFD and BFD are unique, BFD and S-BFD capabilities can be advertised concurrently.

2.2. S-BFD CV Operation

2.2.1. S-BFD Initiator Operation

The S-BFD Initiator SHOULD bootstrap S-BFD sessions after it learns

the discriminator of the remote target identifier. This can be achieved, for example but not limited to, through one or more of the following methods:

1. Advertisements of S-BFD discriminators made through a PW signaling protocol, for example AVP/TLVs defined in L2TP/LDP.

2. Provisioning of S-BFD discriminators by manual configuration of the PE/LCCEs.

3. Assignment of S-BFD discriminators by a controller.

4. Probing remote S-BFD discriminators through a mechanism such as S-BFD Alert discriminators [I-D.akiya-bfd-seamless-alert-discrim]

S-BFD Initiator operation MUST be according to the specifications in Section 7.2 of [I-D.ietf-bfd-seamless-base].

2.2.2. S-BFD Reflector Operation

When a pseudowire signaling protocol such as LDP or L2TPv3 is in use, the S-BFD Reflector can advertise its target discriminators using that signaling protocol. When static PWs are in use the target discriminator of S-BFD needs to be provisioned on the S-BFD Initiator nodes.

All point to point pseudowires are bidirectional, the S-BFD Reflector therefore reflects the S-BFD packet back to the Initiator using the VCCV channel of the reverse direction of the PW on which it was received.

It is observed that the reflector has enough information to reflect the S-BFD Async packet received by it back to the S-BFD initiator using the PW context (e.g., fields of the L2TPv3 headers).

S-BFD Reflector operation for BFD protocol fields MUST be according to the specifications of [I-D.ietf-bfd-seamless-base].

2.2.2.1. Demultiplexing

Demultiplexing of S-BFD is achieved using the PW context, following the procedures in Section 7.1 of [I-D.ietf-bfd-seamless-base].

2.2.2.2. Transmission of Control Packets

The procedures of S-BFD Reflector described in [I-D.ietf-bfd-seamless-base] apply for S-BFD using VCCV.

2.2.2.3. Advertisement of Target Discriminators Using LDP

The advertisement of the target discriminator using LDP is left for further study. It should be noted that S-BFD can still be used with signaled PWs over an MPLS PSN, by provisioning of the S-BFD discriminators or by learning the S-BFD discriminators by other means.

2.2.2.4. Advertisement of Target Discriminators Using L2TP

The S-BFD Reflector MUST use the AVP [I-D.ietf-l2tpext-sbfd-discriminator] defined for advertising its target discriminators using L2TP.

2.2.2.5. Provisioning of Target Discriminators

S-BFD target discriminators MAY be provisioned when static PWs are used.

2.3. S-BFD Encapsulation

Unless specified differently below, the encapsulation of S-BFD packets is identical to the method specified in Section 3.2 [RFC5885] and in [RFC5880] for the encapsulation of BFD packets.

- IP/UDP BFD Encapsulation (BFD with IP/UDP Headers)
  - The destination UDP port for the IP encapsulated S-BFD packet MUST be 7784 [I-D.ietf-bfd-seamless-ip].

* The encapsulation of the S-BFD header fields MUST be according to Section 7.3.2 of [I-D.ietf-bfd-seamless-base].

* The Time to Live (TTL) (IPv4) or Hop Limit (IPv6) is set to 255.

o PW-ACH/ L2SS BFD Encapsulation (BFD without IP/UDP Headers)

* The encapsulation of S-BFD packets using this format MUST be according to Section 3.2 of [RFC5885] with the exception of the value for the PW-ACH/L2SS type.

* When VCCV carries PW-ACH/ L2SS-encapsulated S-BFD (i.e., "raw" S-BFD), the PW-ACH (pseudowire CW's) or L2SS' Channel Type MUST be set to TBD3 to indicate "S-BFD Control, PW-ACH/ L2SS-encapsulated" (i.e., S-BFD without IP/UDP headers; see Section 5.3). This is to allow the identification of the encased S-BFD payload when demultiplexing the VCCV control channel.

2.4. S-BFD CV Types

3. Capability Selection

When multiple S-BFD CV Types are advertised, and after applying the rules in [RFC5885], the set that both ends of the pseudowire have in common is determined. If the two ends have more than one S-BFD CV Type in common, the following list of S-BFD CV Types is considered in the order of the lowest list number CV Type to the highest list number CV Type, and the CV Type with the lowest list number is used:

1. TBD1 - S-BFD IP/UDP-encapsulated, for PW Fault Detection only.

2. TBD2 - S-BFD PW-ACH/ L2SS-encapsulated (without IP/UDP headers), for PW Fault Detection only.

The order of capability selection between S-BFD and BFD is defined as follows:

Advertised capabilities of	BFD	SBFD	Both S-BFD and

PE1/ PE2	Only	Only	BFD
BFD Only	BFD	None	BFD Only
S-BFD Only	None	S-BFD	S-BFD only
Both S-BFD and BFD	BFD only	S-BFD only	Both SBFD and BFD

Table 2: Capability Selection Matrix for BFD and S-BFD

4. Security Considerations

Security considerations for VCCV are addressed in Section 10 of [RFC5085]. The introduction of the S-BFD Connectivity Verification (CV) Types introduces no new security risks for VCCV. Implementations of the additional CV Types defined herein are subject to the same security considerations as defined in [RFC5085] as well as [I-D.ietf-bfd-seamless-base].

The IP/UDP encasulation of S-BFD makes use of the TTL/Hop Limit procedures described in the Generalized TTL Security Mechanism (GTSM) [RFC5082]) as a security mechanism.

This specification does not raise any additional security issues beyond these.

5. IANA Considerations

5.1. MPLS CV Types for the VCCV Interface Parameters Sub-TLV

The VCCV Interface Parameters Sub-TLV codepoint is defined in [RFC4446], and the VCCV CV Types registry is defined in [RFC5085].

This section lists the new BFD CV Types.

IANA has augmented the "MPLS VCCV Connectivity Verification (CV) Types" registry in the Pseudowire Name Spaces reachable from

[IANA-PWE3]. These are bitfield values. CV Type values are

specified in Section 2 of this document.

MPLS Connectivity Verification (CV) Types:

Bit (Value)	Description	Reference
TBD1(0xY)	S-BFD IP/UDP-encapsulated, for PW Fault Detection only	This document
TBD2(0xZ)	S-BFD PW-ACH-encapsulated, for PW Fault Detection only	This document

5.2. L2TPv3 CV Types for the VCCV Capability AVP

This section lists the new requests for S-BFD "L2TPv3 Connectivity Verification (CV) Types" to be added to the existing "VCCV Capability AVP" registry in the L2TP name spaces. The Layer Two Tunneling Protocol "L2TP" Name Spaces are reachable from [IANA-L2TP]. IANA is requested to assign the following L2TPv3 Connectivity Verification (CV) Types in the VCCV Capability AVP Values registry.

VCCV Capability AVP (Attribute Type 96) Values

L2TPv3 Connectivity Verification (CV) Types:

Bit (Value)	Description	Reference
TBD1(0xY)	S-BFD IP/UDP-encapsulated, for PW Fault Detection only	This document
TBD2(0xZ)	S-BFD L2SS-encapsulated, for PW Fault Detection only	This document

5.3. PW Associated Channel Type

As per the IANA considerations in [RFC5586], IANA is requested to allocate the following Channel Types in the "MPLS Generalized Associated Channel (G-ACh) Types" registry:

IANA has reserved a new Pseudowire Associated Channel Type value as follows:

Registry:

Value	Description	TLV Follows	Reference
TBD3	S-BFD Control, PW-ACH/L2SS encapsulation (without IP/UDP Headers)	No	[This document]

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