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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 will be extended in future to include definition of procedures for S-BFD over Tunnels. This document extends the CV values defined in [RFC5885](#).

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Internet-Draft

Seamless BFD for VCCV

February 2016

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## Table of Contents

|                          |  |                    |
|--------------------------|--|--------------------|
| <a href="#">1.</a>       | Background . . . . .   | <a href="#">2</a>  |
| <a href="#">1.1.</a>     | Requirements Language . . . . .  | <a href="#">3</a>  |
| <a href="#">2.</a>       | S-BFD Connectivity Verification . . . . .  | <a href="#">3</a>  |
| <a href="#">2.1.</a>     | Co-existence of S-BFD and BFD capabilities . . . . .                                     | <a href="#">4</a>  |
| <a href="#">2.2.</a>     | S-BFD CV Operation . . . . .   | <a href="#">4</a>  |
| <a href="#">2.2.1.</a>   | S-BFD Initiator Operation . . . . .  | <a href="#">4</a>  |
| <a href="#">2.2.2.</a>   | S-BFD Reflector Operation . . . . .  | <a href="#">4</a>  |
| <a href="#">2.2.2.1.</a> | S-BFD Reflector Demultiplexing . . . . .   | <a href="#">5</a>  |
| <a href="#">2.2.2.2.</a> | S-BFD Reflector transmission of control packets .  | 5                  |
| <a href="#">2.2.2.3.</a> | S-BFD Reflector advertisement of target<br>discriminators using LDP . . . . .            | <a href="#">5</a>  |
| <a href="#">2.2.2.4.</a> | S-BFD Reflector advertisement of target<br>discriminators using L2TP . . . . .           | <a href="#">5</a>  |
| <a href="#">2.2.2.5.</a> | Provisioning of S-BFD Reflector target<br>discriminators . . . . .                       | <a href="#">5</a>  |
| <a href="#">2.2.2.6.</a> | Probing of S-BFD Reflector target discriminators<br>using alert discriminators . . . . . | <a href="#">5</a>  |
| <a href="#">2.3.</a>     | S-BFD Encapsulation . . . . .  | <a href="#">6</a>  |
| <a href="#">2.4.</a>     | S-BFD CV Types . . . . .   | <a href="#">6</a>  |
| <a href="#">3.</a>       | Capability Selection . . . . .   | <a href="#">6</a>  |
| <a href="#">4.</a>       | Security Considerations . . . . .  | <a href="#">7</a>  |
| <a href="#">5.</a>       | IANA Considerations . . . . .  | <a href="#">7</a>  |
| <a href="#">5.1.</a>     | MPLS CV Types for the VCCV Interface Parameters Sub-TLV .                                | 7                  |
| <a href="#">5.2.</a>     | L2TPv3 CV Types for the VCCV Capability AVP . . . . .                                    | <a href="#">8</a>  |
| <a href="#">5.3.</a>     | PW Associated Channel Type . . . . .   | <a href="#">8</a>  |
| <a href="#">6.</a>       | Acknowledgements . . . . .   | <a href="#">9</a>  |
| <a href="#">7.</a>       | Contributing Authors . . . . .   | <a href="#">9</a>  |
| <a href="#">8.</a>       | References . . . . .   | <a href="#">9</a>  |
| <a href="#">8.1.</a>     | Normative References . . . . .   | <a href="#">9</a>  |
| <a href="#">8.2.</a>     | Informative References . . . . .   | <a href="#">10</a> |
|                          | Authors' Addresses . . . . .   | <a href="#">10</a> |

[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 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.

### 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 S-BFD discriminator advertisement for the SBD reflector and the procedure for 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.

Internet-Draft

Seamless BFD for VCCV

February 2016

|  | Fault Detection Only | Fault Detection and Status Signaling |
|--|----------------------|--------------------------------------|
| S-BFD, IP/UDP Encapsulation (with IP/UDP Headers)  | TBD1 (Note1)         | N/A                                  |
| S-BFD, PW-ACH Encapsulation when using MPLS PW or L2SS Encapsulation when using L2TP PW (without IP/UDP Headers) | TBD2 (Note2)         | 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 capabilities

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 through one or more of the following methods:

1. Advertisements of S-BFD discriminators made through AVP/ TLVs defined in L2TP/ LDP.
2. Provisioning of S-BFD discriminators.
3. Probing remote S-BFD discriminators through 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 as pseudowire signalling protocol such as LDP or L2TPv3 is in use the S-BFD Reflector advertises its target discriminators using that signalling 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 fields of the L2TPv3 headers.

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

#### [2.2.2.1.](#) S-BFD Reflector Demultiplexing

TBD

#### [2.2.2.2.](#) S-BFD Reflector 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.](#) S-BFD Reflector advertisement of target discriminators using LDP

TBD.

#### [2.2.2.4.](#) S-BFD Reflector 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 S-BFD Reflector target discriminators

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

#### [2.2.2.6.](#) Probing of S-BFD Reflector target discriminators using alert discriminators

S-BFD alert discriminators MAY be used to probe S-BFD target discriminators. If a node implements S-BFD reflector, it SHOULD

respond to Alert discriminator requests received from potential S-BFD Initiators.

### [2.3.](#) S-BFD Encapsulation

Unless specified differently below, the encapsulation of S-BFD packets is the identical the method specified in Sec.3.2 [\[RFC5885\]](#) and in [\[RFC5880\]](#) for the encapsulation of BFD packets.

- o IP/UDP BFD Encapsulation (BFD with IP/UDP Headers)
  - \* The destination UDP port for the IP encapsulated S-BFD packet MUST be 7784 [\[I-D.ietf-bfd-seamless-base\]](#).
  - \* The encapsulation of the S-BFD header fields MUST be according

to Sec.7.2.2 of [[I-D.ietf-bfd-seamless-base](#)].

- o PW-ACH/ L2SS BFD Encapsulation (BFD without IP/UDP Headers)
  - \* The encapsulation of S-BFD packets using this format MUST be according to Sec.3.2 of [[RFC5885](#)] with the exception of 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 TBD2 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 PE1/ PE2 | BFD Only | SBFD Only | Both S-BFD and BFD |
|-------------------------------------|----------|-----------|--------------------|
| BFD Only                            | BFD      | None      | BFD Only           |

|                    |                 |               |                      |
|--------------------|-----------------|---------------|----------------------|
|                    |                 | (Note1)       |                      |
| S-BFD Only         | None<br>(Note1) | S-BFD         | S-BFD only           |
| Both S-BFD and BFD | BFD only        | S-BFD<br>only | Both SBFD and<br>BFD |

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

Note1: Can we mandate failing the bringup of the PW in case of a capability mismatch?

#### 4. Security Considerations

Security measures described in [[RFC5885](#)] and [[I-D.ietf-bfd-seamless-base](#)] are to be followed.

#### 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 "VCCV Connectivity Verification (CV) Types" registry in the Pseudowire Name Spaces reachable from [[IANA](#)]. These are bitfield values. CV Type values TBD are specified in [Section 2](#) of this document.

| Bit (Value) | Description  | Reference     |
|-------------|--|---------------|
| =====       | =====  | =====         |
| TBD1(0xY)   | S-BFD IP/UDP-encapsulated,<br>for PW Fault Detection only      | this document |
| TBD2(0xZ)   | S-BFD PW-ACH/L2SS-encapsulated,<br>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 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]. 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,<br>for PW Fault Detection only | this document |
| TBD2(0xZ)   | S-BFD L2SS-encapsulated,<br>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       |
|-------|--|-------------|-----------------|
| ----- | -----  | -----       | -----           |
| TBD2  | S-BFD Control, PW-ACH/L2SS encapsulation<br>(without IP/UDP Headers) | No          | [This document] |

## [6.](#) Acknowledgements

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Internet-Draft

Seamless BFD for VCCV

February 2016

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