               Virtual Circuit Connectivity Verification (VCCV)
           Capability Advertisement for MPLS Transport Profile (MPLS-TP)

Abstract

   This document specifies how signaling and selection processes for
   Pseudowire (PW) Virtual Circuit Connectivity Verification (VCCV) are
   modified to ensure backward compatibility and allow use of proactive
   Connectivity Verification (CV), Continuity Check (CC), and Remote
   Defect Indication (RDI) over MPLS Transport Profile (MPLS-TP) PWs.
   This document introduces four new CV types and, to accommodate them,
   a new VCCV Extended CV parameter for PW Interface Parameters Sub-TLV
   is defined.

Status of This Memo

   This is an Internet Standards Track document.

   This document is a product of the Internet Engineering Task Force
   (IETF). It represents the consensus of the IETF community. It has
   received public review and has been approved for publication by the
   Internet Engineering Steering Group (IESG). Further information on
   Internet Standards is available in Section 2 of RFC 5741.

   Information about the current status of this document, any errata,
   and how to provide feedback on it may be obtained at
   http://www.rfc-editor.org/info/rfc7189.

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1. Introduction

   Proactive Connectivity Verification (CV), Continuity Check (CC), and
   Remote Defect Indication (RDI) for the MPLS Transport Profile
   [RFC6428] are applicable to all constructs of the MPLS-TP, including
   pseudowires (PWs). If the control plane is used to operate and
   manage PWs then the procedures defined in [RFC5085] and [RFC5885]
   should be used to select the proper type of Control Channel and the
   corresponding type of Connectivity Verification. This document
   specifies how signaling and selection processes are modified to
   ensure backward compatibility and allow use of proactive CV-CC-RDI
   over MPLS-TP PWs.

1.1. Conventions Used in This Document

1.1.1. Terminology

   BFD: Bidirectional Forwarding Detection

   CC: Continuity Check

   CV: Connectivity Verification

   PE: Provider Edge

   VCCV: Virtual Circuit Connectivity Verification

1.1.2. 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
[RFC2119].

2. MPLS-TP CC-CV on Pseudowires

PW VCCV can support several CV Types, and it can support an arbitrary
combination of CV modes advertised in the CV Types field of the VCCV
Interface Parameter sub-TLV [RFC4446] [RFC4447]. Currently, six
types of CV have been defined for PW VCCV. This document introduces
four new CV types and, to accommodate them, a new VCCV Extended CV
parameter for the PW Interface Parameters Sub-TLV is defined.

2.1. VCCV Extended CV Advertisement Sub-TLV

The format of the VCCV Extended CV Advertisement is a TLV where the
format is as follows:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Type = 0x19 |     Length      |    CV Type    |    Reserved    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
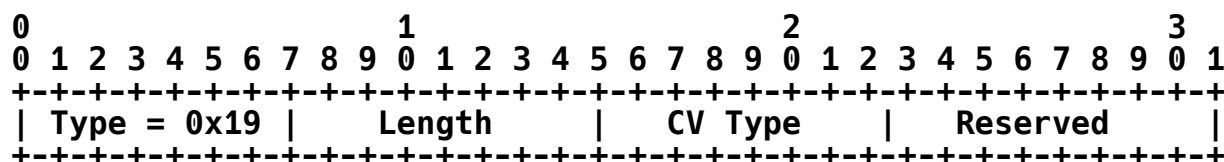
                   Figure 1: VCCV Extended CV Parameter Format

The Length field is the length of the sub-TLV, including type and the
Length field itself. The minimum length is 4. It is recommended
that extensions to the sub-TLV be done in 4-byte increments.

The Reserved field MUST be set to zeroes on transmit and ignored on
receive.

The CV Type field is a bitmask that lists types of CV monitoring that
a PE is capable of supporting. The VCCV Extended CV parameter sub-
TLV MUST appear in combination with the VCCV parameter sub-TLV. If
the VCCV parameter sub-TLV is missing, then the VCCV Extended CV
parameter sub-TLV SHOULD be ignored.

2.2. MPLS-TP CC-CV Types

[RFC6428] defines coordinated and independent modes of monitoring
point-to-point bidirectional connection that can be applied to
monitoring PWs. At the same time, [RFC6310] defines how BFD-based

Operations, Administration, and Maintenance (OAM) can map to the
status of an Attachment Circuit. Thus, there could be four MPLS-TP
CV types for each combination of mode and functionality:

Modes	Fault Detection Only	Fault Detection and Status Signaling
Independent Mode	0x01	0x02
Coordinated Mode	0x04	0x08

Table 1: Bitmask Values for MPLS-TP CV Types

2.3. MPLS-TP CC-CV Type Operation

According to [RFC6428], connectivity verification is part of MPLS-TP
CC/CV operation that can be used with VCCV Control Channel Type 1
[RFC5085]. If VCCV Control Channel Type 1 is selected, then PEs MAY
select one of the MPLS-TP CC-CV types as the VCCV CV mechanism to be
used for this PW.

2.4. CV Type Selection

CV selection rules that have been defined in Section 7 of [RFC5085]
and updated in Section 4 of [RFC5885] are augmented in this document.

If VCCV Control Channel Type 1 is chosen according to Section 7 of
[RFC5085] and a common set of proactive CV types that are advertised
by both PEs includes MPLS-TP CC-CV types and some BFD CV types, then
MPLS-TP CC-CV takes precedence over any type of BFD CV. If multiple
MPLS-TP CV types are advertised by both PEs, then the following list
(ordered by descending priority) is used:

1. 0x08 - Coordinated mode for PW Fault Detection and AC/PW Fault
    Status Signaling

2. 0x04 - Coordinated mode for PW Fault Detection only

3. 0x02 - Independent mode for PW Fault Detection and AC/PW Fault
    Status Signaling

4. 0x01 - Independent mode for PW Fault Detection only

3. IANA Considerations

The PW Interface Parameters Sub-TLV registry is defined in [RFC4446].

IANA has reserved a new PW Interface Parameters Sub-TLV type as follows:

+-----------+---------+-----------------------------+---------------+
| Parameter | Length | Description | Reference |
| ID | | | |
+-----------+---------+-----------------------------+---------------+
| 0x19 | variable | VCCV Extended CV Parameter | This document |
+-----------+---------+-----------------------------+---------------+

              Table 2: New PW Interface Parameters Sub-TLV

3.1. VCCV Extended CV Types

IANA has set up a registry of VCCV Extended CV Types. These are
8-bit values. Extended CV Type values 0x01, 0x02, 0x04, and 0x08 are
specified in Section 2.2 of this document. The remaining values
(0x10 through 0x80) are to be assigned by IANA using the "IETF
Review" policy defined in [RFC5226]. A VCCV Extended Connectivity
Verification Type description and a reference to an RFC approved by
the IESG are required for any assignment from this registry.

+--------------+--+
| Bit(Value) | Description |
+--------------+--+
Bit 0 (0x01)	Independent mode for PW Fault Detection only
Bit 1 (0x02)	Independent mode for PW Fault Detection and AC/PW
	Fault Status Signaling
Bit 2 (0x04)	Coordinated mode for PW Fault Detection only
Bit 3 (0x08)	Coordinated mode for PW Fault Detection and AC/PW
	Fault Status Signaling
Bit 4 (0x10)	Unassigned
Bit 5 (0x20)	Unassigned
Bit 6 (0x40)	Unassigned
Bit 7 (0x80)	Unassigned
+--------------+--+

      Table 3: VCCV Extended Connectivity Verification (CV) Types

4. Security Considerations

   Routers that implement the additional CV Type defined herein are
   subject to the same security considerations as defined in [RFC5085],
   [RFC5880], [RFC5881], and [RFC6428]. This specification does not
   raise any additional security issues beyond those.

5. Acknowledgements

   The author gratefully acknowledges the thoughtful review, comments,
   and explanations provided by Dave Allan and Carlos Pignataro.

6. References

6.1. Normative References

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