Internet Engineering Task Force
Internet Draft
Intended status: Standards Track
Expires: April 24, 2010

Luca Martini
George Swallow
Cisco

Matthew Bocci
Alcatel-Lucent

October 24, 2009

Pseudowire Status for Static Pseudowires

draft-martini-pwe3-static-pw-status-02.txt

Status of this Memo

Abstract

This document specifies a mechanism to signal Pseudowire (PW) status messages using an PW associated channel (ACh). Such a mechanism is suitable for use where no PW dynamic control plane exits, known as static PWs, or where a Terminating Provider Edge (T-PE) needs to send a PW status message directly to a far end T-PE. The mechanism allows PW OAM message mapping and PW redundancy to operate on static PWs.

Table of Contents

1. Specification of Requirements

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 [RFC2119].

2. Introduction

The default control plane for Pseudowire (PW) technology, as defined in [RFC4447], is based on LDP. However that document also describes a static provisioning mode without control plane. When a static PW is used , there is no method to transmit the status of the PW, or attachment circuit (AC) between the two PEs at each end of the PW. This document defines a method to transport the PW status codes defined in [RFC4447], sec 5.4.2, and [REDUNDANCY] in-band with the PW data using a generic associated channel [RFC5586].

3. Terminology

FEC: Forwarding Equivalence Class

LDP: Label Distribution Protocol

LSP: Label Switching Path

MS-PW: Multi-Segment Pseudowire

PE: Provider Edge

PW: Pseudowire

SS-PW: Single-Segment Pseudowire

S-PE: Switching Provider Edge Node of MS-PW

T-PE: Terminating Provider Edge Node of MS-PW

4. Applicability

The procedures described in this draft are intended for the case where PWs are statically configured. Where an LDP control plane exists, this MUST be used for signaling all PW status messages with the exception of those specified in [REDUNDANCY]. For [REDUNDANCY], the 'S-PE' bypass mode described below MAY be used in the presence of an LDP control plane.

5. Pseudowire Status Operation

5.1. PW OAM Message

The PW status TLV as defined in [RFC4447] sec 5.4.2 is transported in a PW OAM message using the PW associated channel (ACH).

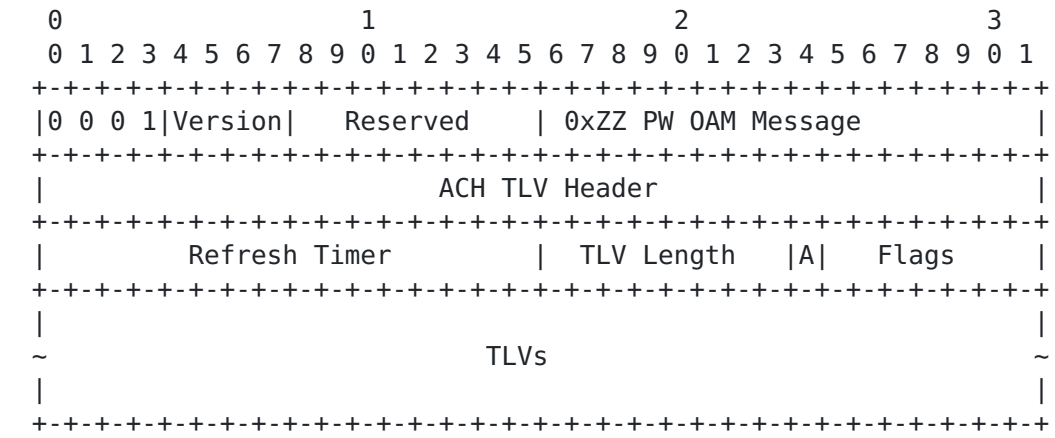

Figure 1: ACH PW OAM Message Packet Header.

The first nibble (0001b) indicates the ACH instead of PW data. The version and the reserved values are both set to 0 as specified in [RFC4385].

The ACH TLV header is defined in [RFC5586] section 3.2, and contains the length of ACH TLVs. In this application the long word is set to 0 as there are no ACH TLVs.

The refresh timer is an unsigned integer and specifies refresh time in seconds with a range from 1 to 65535. The value 0 means that the refresh timer is set indefinitely, and the PW OAM message will never be refreshed, and will never timeout. This mode SHOULD NOT be used other then when specified in this document.

The TLV length field indicates the length of all PW OAM TLVs only.

The A flag bit is used to indicate an acknowledgment of the PW status TLV included. The rest of the flag bits are reserved and they must be set to 0 on transmit, and ignored upon receive. When the A bit is set , the refresh timer value is a requested timer value. PW OAM Message code point = 0xZZ. [ZZ to be assigned by IANA from the PW Associated Channel Type registry.]

TLV types for use in this message are allocated by IANA in the LDP registry named: "TLV TYPE NAME SPACE" .

5.2. Sending a PW Status Message

PW Status messages are indicated by sending in-band PW OAM messages for a particular PW containing the PW status TLV defined in [RFC4447]. The PW TLV format is as follows:

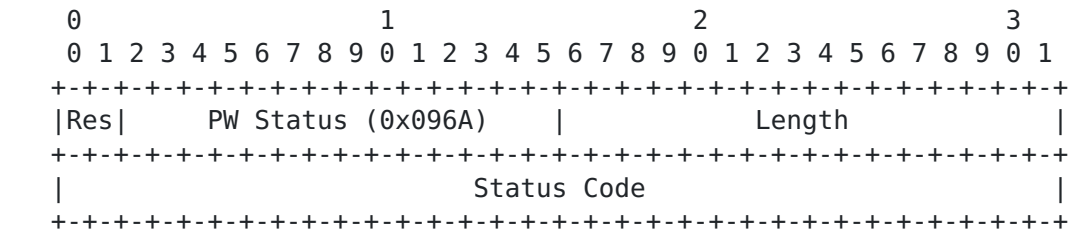

Figure 2: PW Status Message Format.

The first 2 bits are reserved , and MUST be set to zero on transmit , and ignored on receive.

The PW status TLV is prepended with an PW OAM message header and sent on the ACH of the PW to which the status update applies.

To clear a particular status indication, the PE needs to send a new PW OAM message containing a PW Status TLV with the corresponding bit cleared.

The procedures described in [SEGMENTED] that apply to an S-PE and PW using an LDP control plane also apply when sending PW status using the PE OAM channel. The OPTIONAL optional procedures using the S-PE TLV described in [SEGMENTED] can also be applied when sending PW status using the PE OAM channel.

The detailed message transmit, and receive procedures are specified in the next section.

5.3. PW OAM status message transmit and receive

Unlike the PW status procedures defined in [RFC4447] with this method there is no TCP/IP session, or session management. Therefore he PW OAM message containing the PW status TLV needs to be transmitted repeatedly to ensure reliable message delivery.

The PW OAM message containing a PW status TLV with a new status bit set, will be transmitted twice at an initial interval of one second. Subsequently the PW OAM message will be transmitted with an interval specified by refresh timer value in the packet. Note that this value MAY be updated in the new PW OAM message packet, in which case the

new refresh timer value becomes the new packet transmit interval.

The suggested dafult value for the refresh timer is 30 seconds.

When a PW OAM message containing a status TLV is received, a timer is started according to the refresh rate specified in the packet. If another non zero PW status message is not received within 3.5 times specified timer value, the status condition will timeout in 3.5 times the last refresh timer value received, and the default status of zero is assumed on the PW.

To clear a particular status fault the PE need only send an updated message with the corresponding bit cleared. If the PW status word is zero, the PW OAM message will be sent with the method described above , however it MUST be acknowledged with a packet with a timer value of zero. This will cause the PE sending the message to stop sending, and continue normal operation.

5.3.1. Acknowledge of PW status

The PE receiving a PW OAM message containing a PW status message can acknowledge the PW status message by simply building an almost identical reply packet with the A bit set, and transmitting it on the PW ACH back to the source of the PW status message. The timer value set in the reply packet will then be used as the new transmit interval. If the sender PE of a PW status message receives an acknowledge for a particular message where the PW status TLV matches exactly the PW status TLV in the message that is currently being refreshed, the sender PE MUST use the new timer value received.

The suggested default value for the refresh timer value in the acknowledge packet is 600 seconds.

If the sender PE receives an acknowledge message that does not match the current active PW status message being sent, it simply ignores the acknowledgment packet.

If a PE that has a non zero status word for a particular PW, detect by any means that the peer PW has become unreachable, it will follow the standard procedures and consider that PW as having an additional status bit set. This would, normally trigger sending updates again, and canceling the acknowledge refresh timer state.

5.3.2. Applicable PW status Bits

In some situations it might not be useful or possible to transit a PW status message because the remote PE is not reachable. For example a PE that detects a local PSN TX fault condition , will be unable to transmit a PW OAM message with a PW status TLV reflecting that condition. The general rule is that a PE or S-PE should always attempt to send a PW status message.

5.4. MPLS Label Stack

With one exception , all PW OAM status messages are are sent to the adjacent PE across the PSN tunnel. in many cases the transmitting PE has no way to determine whether the adjacent PE is a S-PE , or a T-PE. This is a necessary behavior to preserve backward compatibility with PEs that do not understand MS-PWs. In the procedures described in this document there are two possible destinations for the PW OAM status messages: the adjacent PE, or the T-PE. Sending a PW status message directly to the T-PE is a enhanced method that is only applicable using PW OAM status messages sent in the PW ACH.

5.4.1. Label stack for a message destined to the next PE

A PE that needs to forward a PW OAM status message to the adjacent PE across the PSN tunnel, MUST set the PW label TTL field to 1. Furthermore if the control word is not in use on the particular PW , the PE MUST also place the GAL reserved label [RFC5586], below the PW label also with the TTL field set to 1.

5.4.2. Label stack for a message destined to the egress PE

This is known as 'S-PE bypass mode'. A T-PE that requires sending a PW OAM status message directly to the corresponding T-PE at the other end of the PW MUST set the TTL of the PW label to a value that is sufficient to reach the corresponding T-PE. This value will be greater then one, but will be set according to the local policy on the transmitting T-PE. Furthermore if the control word is not in use on the particular PW , the PE MUST also place the GAL reserved label [RFC5586], below the PW label with the TTL field set to 1.

It should be noted that this S-PE bypass procedure MUST NOT be used for the following PW status codes:
0x00000001 - Pseudowire Not Forwarding
0x00000008 - Local PSN-facing PW (ingress) Receive Fault
0x00000010 - Local PSN-facing PW (egress) Transmit Fault

When a PW status message is sent using this method, the corresponding PW status message to clear the fault MUST also be sent using this method.

Editor's note: The method described above does not funtion properly. Therefore it remains here as a point of further study only.

6. S-PE operation

The S-PE will operate according to the procedures defined in [SEGMENTED]. The following additional procedures apply to the case where a static PW segment is switched to a dynamic PW segment that uses LDP, and the case a static PW segment is switched to another static PW segment.

6.1. Static PW to another Static PW

The procedures that are described in [SEGMENTED] section 10 also apply to the case of a static PW switched to another static PW. The LDP header is simply replaced by the PE OAM header, otherwise the packet format will be identical. The information that is necessary to form a SP-PE TLV MUST be configured in the S-PE, or no S-PE TLV will be sent. The Document [SEGMENTED] defines a IANA registry named "Pseudowire Switching Point PE TLV Type". In order to support the static PW configuration and adressing scheme, a new code point is requested as follows:

Type	Length	Description
0x07	x	Static PW/mpls-tp PW segment ID of last PW segment traversed

6.2. Dynamic PW to Static PW or vice verso

The procedures that are described in [SEGMENTED] section 10 also apply to this situation. However if the PW label of the LDP controlled PW segment is withdrawn, by the adjacent PE, the S-PE will set the PW status code "0x00000001 - Pseudowire Not Forwarding" to the adjacent PW on the static PW segment.

The S-PE will only withdraw its label for the dynamic, ldp controlled, PW segment if the S-PE is un-provisioned.

7. Security Considerations

The security measures described in [RFC4447] and [SEGMENTED] are adequate for the proposed mechanism.

8. IANA Considerations

This document uses a new Associated Channel Type. IANA already maintains a registry of name "Pseudowire Associated Channel Types". A value of 0x0022 is suggested for assignment with TLVs. The description is "PW OAM Message".

This document uses a new Pseudowire Switching Point PE TLV Type. IANA already maintains a registry of name "Pseudowire Switching Point PE TLV Type". A value of 0x07 is suggested for assignment. The description is "Static PW/mpls-tp PW segment ID of last PW segment traversed".

9. References

9.1. Normative References

[RFC2119] Bradner. S, "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, March, 1997.

[RFC4447] "Transport of Layer 2 Frames Over MPLS", Martini, L., et al., rfc4447 April 2006.

[SEGMENTED] Martini et.al. "Segmented Pseudo Wire", draft-ietf-pwe3-segmented-pw-13.txt, IETF Work in Progress, August 2009

[RFC4385] " Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN", S. Bryant, et al., RFC4385, February 2006.

[REDUNDANCY] Muley et.al. "Preferential Forwarding Status bit definition", draft-ietf-pwe3-redundancy-bit-01.txt, IETF Work in Progress, September 2008

9.2. Informative References

[RFC5586] M. Bocci, Ed., M. Vigoureux, Ed., S. Bryant, Ed.,
"MPLS Generic Associated Channel", rfc5586, June 2009

10. Author's Addresses

Luca Martini
Cisco Systems, Inc.
9155 East Nichols Avenue, Suite 400
Englewood, CO, 80112
e-mail: lmartini@cisco.com

George Swallow
Cisco Systems, Inc.
300 Beaver Brook Road
Boxborough, Massachusetts 01719
United States
e-mail: swallow@cisco.com

Matthew Bocci
Alcatel-Lucent
Grove House, Waltham Road Rd
White Waltham, Berks, UK. SL6 3TN
e-mail: matthew.bocci@alcatel-lucent.co.uk

Full Copyright Statement

Expiration Date: April 2010