Network Working Group   S. Sivabalan
Internet-Draft   S. Boutros
Intended status: Standards Track   Cisco Systems, Inc.
Expires: January 2, 2015   H. Shah
                                                          Ciena Corp.
                                                           S. Aldrin
                                                 Huawei Technologies.
                                                       M. Venkatesan
                                                            Comcast.
                                                       July 01, 2014

           MAC Address Withdrawal over Static Pseudowire
                draft-ietf-l2vpn-mpls-tp-mac-wd-00.txt

Abstract

   This document specifies a mechanism to signal MAC address withdrawal
   notification using PW Associated Channel (ACH). Such notification is
   useful when statically provisioned PWs are deployed in VPLS/H-VPLS
   environment.

Requirements Language

   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].

Copyright Notice

Table of Contents

1. Introduction

   An LDP-based MAC Address Withdrawal Mechanism is specified in
   [RFC4762] to remove dynamically learned MAC addresses when the source
   of those addresses can no longer forward traffic. This is
   accomplished by sending an LDP Address Withdraw Message with a MAC
   List TLV containing the MAC addressed to be removed to all other PEs
   over LDP sessions. When the number of MAC addresses to be removed is
   large, empty MAC List TLV may be used. [MAC-OPT] describes an
   optimized MAC withdrawal mechanism which can be used to remove only
   the set of MAC addresses that need to be re-learned in H-VPLS
   networks. The solution also provides optimized MAC Withdrawal
   operations in PBB-VPLS networks.

   A PW can be signaled via LDP or can be statically provisioned. In
   the case of static PW, LDP based MAC withdrawal mechanism cannot be
   used. This is analogous to the problem and solution described in
   [RFC4762] where PW OAM message has been introduced to carry PW
   status TLV using in-band PW Associated Channel. In this document, we

propose to use PW OAM message to withdraw MAC address(es) learned via
static PW.

2. Terminology

The following terminologies are used in this document:

ACK: Acknowledgement for MAC withdraw message.

LDP: Label Distribution Protocol.

MAC: Media Access Control.

PE: Provide Edge Node.

MPLS: Multi Protocol Label Switching.

PW: PseudoWire.

PW OAM: PW Operations, Administration and Maintenance.

TLV: Type, Length, and Value.

VPLS: Virtual Private LAN Services.

3. MAC Withdraw OAM Message

LDP provides a reliable packet transport for control plackets for
dynamic PWs. This can be contrasted with static PWs which rely on
re-transmission and acknowledgments (ACK) for reliable OAM packet
delivery as described in [RFC6478]. The proposed solution for MAC
withdrawal over static PW also relies on re-transmissions and ACKs.
However, ACK is mandatory. A given MAC withdrawal notification is
sent as a PW OAM message, and the sender keeps re-transmitting the
message until it receives an ACK for that message. Once a receiver
successfully remove MAC address(es) in response to a MAC address
withdraw OAM message, it should not unnecessarily remove MAC
address(es) upon getting refresh message(s). To facilitate this, the
proposed mechanism uses sequence number, and defines a new TLV to
carry the sequence number.

The format of the MAC address withdraw OAM message is shown in
Figure 1. The PW OAM message header is exactly the same as what is
defined in [RFC6478]. Since the MAC withdrawal PW OAM message is not
refreshed forever. A MAC address withdraw OAM message MUST contain a
"Sequence Number TLV" otherwise the entire message is dropped. It
MAY contain MAC Flush Parameter TLVs defined in [MAC-OPT] when
static PWs are deployed in H-VPLS and PBB-VPLS scenarios. The first

2 bits of the sequence number TLV are reserved and MUST be set to 0
on transmit and ignored on receipt.

```
  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
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |0 0 0 1|Version|   Reserved    |0xZZ MAC Withdraw OAM Message  |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |            Reserved           |  TLV Length   |A|R| Flags     |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |Res| Sequence Number TLV (TBD) | Sequence Number TLV Length    |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                        Sequence Number                        |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                                                               |
 |                        MAC List TLV                           |
 ~               MAC Flush Parameter TLV (optional)              ~
 |                                                               |
 |                                                               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
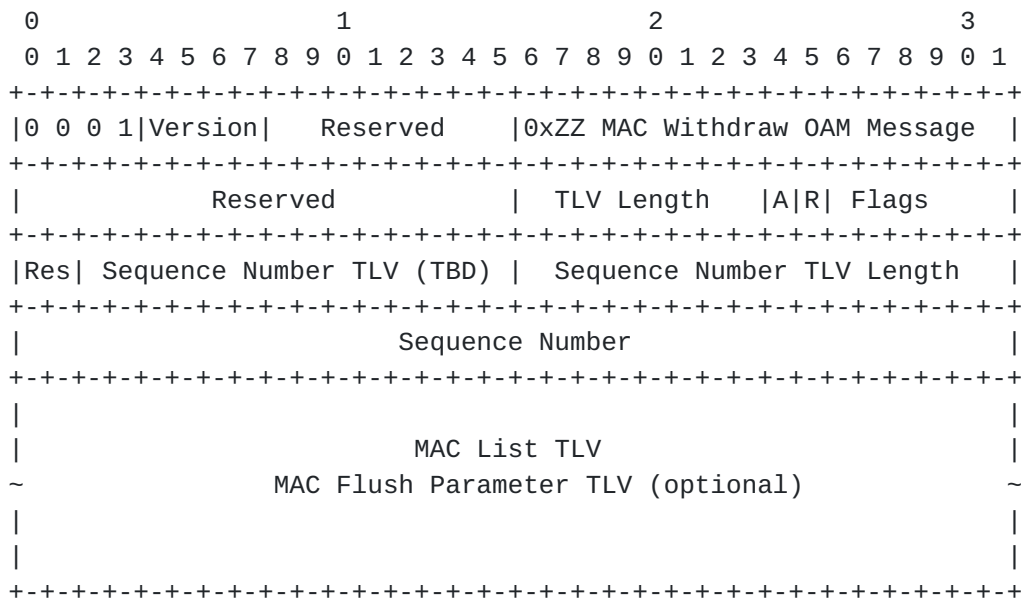
Figure 1: MAC Address Withdraw PW OAM Packet Format

In this section, MAC List TLV and MAC Flush Parameter TLV are
collectively referred to as "MAC TLV(s)". The processing rules of
MAC List TLV are governed by [RFC4762], and the corresponding rules
of MAC Flush Parameter TLV are governed by [MAC-OPT].

"TLV Length" is the total length of all TLVs in the message, and
"Sequence Number TLV Length" is the length of the sequence number
field.

A single bit (called A-bit) is set to indicate if a MAC withdraw
message is for ACK. Also, ACK does not include MAC TLV(s).

Only half of the sequence number space is used. Modular arithmetic
is used to detect wrapping of sequence number. When sequence number
wraps, all MAC addresses are flushed and the sequence number is
reset.

A single bit (called R-bit) is set to indicate if the sender is
requesting reset of the sequence numbers. The sender sets this bit

   when the Pseudowire is restarted and has no local record of send and
   expected receive sequence number.

4. Operation

   This section describes how the initial MAC withdraw OAM messages are
   sent and retransmitted, as well as how the messages are processed and
   retransmitted messages are identified.

4.1. Operation of Sender

   Each PW is associated with a counter to keep track of the sequence
   number of the transmitted MAC withdrawal messages. Whenever a node
   sends a new set of MAC TLVs, it increments the transmitted sequence
   number counter, and include the new sequence number in the message.
   The transmit sequence number is initialized to 1 at the onset.

   The sender expects an ACK from the receiver within a time interval
   which we call "Retransmit Time" which can be either a default (1
   second) or configured value. If the ACK does not arrive within the
   Retransmit Time, the sender retransmits the message with the same
   sequence number as the original message. The retransmission is
   ceased anytime when ACK is received or after three retries. This
   avoids unended retransmissions in the absence of acknowledgements.
   In addition, if during the period of retransmission, if a need to
   send a new MAC withdraw message with updated sequence number arises
   then retransmission of the older unacknowledged withdraw message is
   suspended and retransmit time for the new sequence number is
   initiated. In essence, sender engages in retrasmission logic only
   for the latest send withdraw message for a given PW.

   In the event that a Pseudowire was deleted and re-added or the router
   is restarted with configuration, the local node may lose information
   about the send sequence number of previous incarnation. This becomes
   problematic for the remote peer as it will continue to ignore the
   received MAC withdraw messages with lower sequence numbers. In such
   cases, it is desirable to reset the sequence numbers at both ends of
   the Pseudowire. The 'R' reset bit is set in the first MAC withdraw
   to notify the remote peer to reset the send and receive sequence
   numbers. The 'R' bit must be cleared in subsequent MAC withdraw
   messages after the acknowledgement is received

4.2. Operation of Receiver

   Each PW is associated with a register to keep track of the sequence
   number of the MAC withdrawal message received last. Whenever a MAC
   withdrawal message is received, and if the sequence number on the
   message is greater than the value in the register, the MAC

address(es) contained in the MAC TLV(s) is/are removed, and the
register is updated with the received sequence number. The receiver
sends an ACK whose sequence number is the same as that in the
received message.

If the sequence number in the received message is smaller than or
equal to the value in the register, the MAC TLV(s) is/are not
processed. However, an ACK with the received sequence number MUST be
sent as a response. The receiver processes the ACK message as an
acknowledgement for all the MAC withdraw messages sent up to the
sequence number present in the ACK message and terminates
retransmission.

As mentioned above, since only half of the sequence number space is
used, the receiver MUST use modular arithmetic to detect wrapping of
the sequence number.

A MAC withdraw message with 'R' bit set MUST be processed by
resetting the send and receive sequence number first. The rest of
MAC withdraw message processing is performed as described above. The
acknowledgement is sent with 'R' bit cleared.

5. IANA Considerations

The proposed mechanism requests IANA to a assign new channel type
(recommended value 0x0028) from the registry named "Pseudowire
Associated Channel Types". The description of the new channel type
is "Pseudowire MAC Withdraw OAM Channel".

IANA needs to create a new registry for Pseudowire Associated Channel
TLVs, and create an entry for "Sequence Number TLV". The recommended
value is 0x0001.

6. References

6.1. Normative References

[MAC-OPT]   Dutta, P., Balus, F., Stokes, O., and G. Calvinac, "LDP
            Extensions for Optimized MAC Address Withdrawal in
            H-VPLS", draft-ietf-l2vpn-vpls-ldp-mac-opt-08.txt (work in
            progress), February 2013.

[RFC4762]   Lasserre, M. and V. Kompella, "Virtual Private LAN Service
            (VPLS) Using Label Distribution Protocol (LDP) Signaling",
            RFC 4762, January 2007.

   [RFC6478]   Martini, L., Swallow, G., Heron, G., and M. Bocci,
               "Pseudowire Status for Static Pseudowires", RFC 6478, May
               2012.

6.2. Informative References

   [RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate
               Requirement Levels", BCP 14, RFC 2119, March 1997.

Authors' Addresses

   Siva Sivabalan
   Cisco Systems, Inc.
   2000 Innovation Drive
   Kanata, Ontario K2K 3E8
   Canada

   Email: msiva@cisco.com

   Sami Boutros
   Cisco Systems, Inc.
   170 West Tasman Dr.
   San Jose, CA 95134
   US

   Email: sboutros@cisco.com

   Himanshu Shah
   Ciena Corp.
   3939 North First Street
   San Jose, CA 95134
   US

   Email: hshah@ciena.com

   Sam Aldrin
   Huawei Technologies.
   2330 Central Express Way
   Santa Clara, CA 95051
   US

   Email: aldrin.ietf@gmail.com

Mannan Venkatesan
Comcast.
1800 Bishop Gate Blvd
Mount Laurel, NJ 08075
US

Email: mannan_venkatesan@cable.comcast.com