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S. Sivabalan
S. Boutros
Cisco Systems, Inc.
H. Shah
Ciena Corp.
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MAC Address Withdrawal over Static Pseudowire
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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].

Status of This Memo

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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.

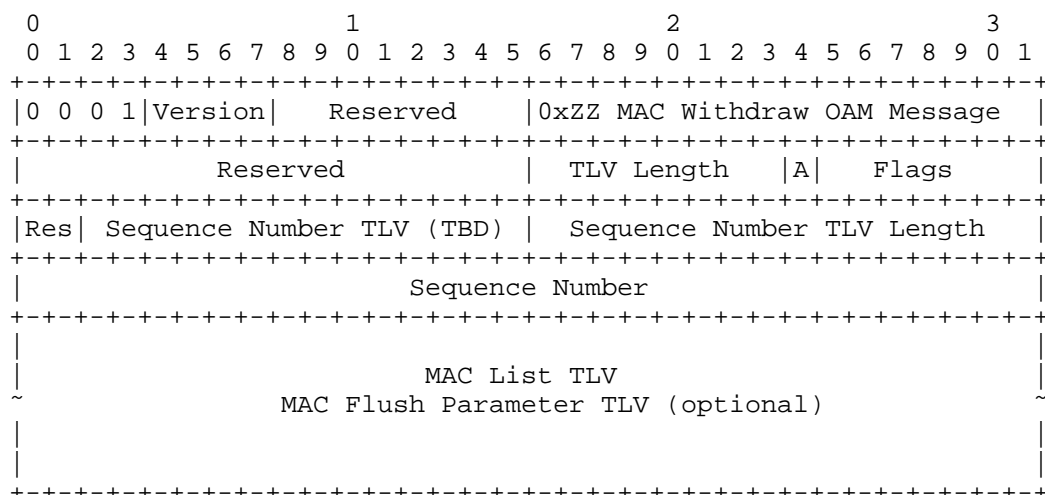


Figure 1: MAC Address Withdraw PW OAM Packet Format

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.

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 sender expects an ACK from the receiver within a time interval which we call "Retransmit Time" which can be either a default or configured value. If the ACK arrives within the Retransmit Time, the sender assumes that the message transmission is successful. Otherwise, it retransmits the message with the same sequence number as the original message.

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.

5. IANA Considerations

The proposed mechanism requests IANA to 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.
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- [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