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Independent

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MAC Address for Layer 3 Link Local Discovery Protocol (LLDP)
draft-eastlake-lldp-mac-04

Abstract

IEEE 802 has defined a number of protocols which can operate between adjacent Ethernet stations at Layer 2, including bridges, and may be useful between Layer 3 aware stations such as IP routers and hosts. An example is the Link Layer Discover Protocol (IEEE Std 802.1AB, LLDP). This document specifies a MAC address that can be used for this purpose for interoperability despite intervening bridges.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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Table of Contents

1. Introduction

IEEE 802 [IEEE802] has defined a number of protocols which operate between adjacent Ethernet stations at Layer 2, including bridges, such as the Link Layer Discover Protocol ([IEEE802.1AB] LLDP) and the Link Aggregation Control Protocol ([IEEE802.1AX] LACP). LLDP and other such protocols may be useful between adjacent Layer 3 [ISO] aware stations such as IP routers and hosts. This document specifies a MAC address that can be used for that purpose despite intervening bridges.

1.1. Notations Used in This Document

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 BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

In this document the terms/acronyms listed below have the indicated meaning:

"LACP" Link Aggregation Control Protocol [IEEE802.1AX].

"Layer 2" Layer 2 in the ISO model [ISO].

"Layer 3" Layer 3 in the ISO model [ISO].

"LLDP" Link Layer Discovery Protocol [IEEE802.1AB].

"MAC" Media Access Control [RFC9542] (not Message Authentication Code).

"PDU" Protocol Data Unit.

2. Network Layers and MAC Addresses

LLDP [IEEE802.1AB] is a Layer 2 [ISO] protocol providing for the unacknowledged announcement of information by an Ethernet station to other stations on the same Ethernet link. There are proposals for the use of LLDP between L3 aware stations such as between a host and its first hop IP router or between IP adjacent routers. Examples are [LLDP1] [LLDP2] [LLDP3].

As illustrated in the figure below, uses of LLDP and similar protocols between Ethernet stations have a scope of adjacency controlled by the multicast destination MAC address [RFC9542] of the Ethernet frame used to transmit the LLDP PDU.

* Customer bridges use 0x0180C2000000 for LLDP and the like. Frames sent to that address are transparently forwarded through any lower level bridges, such as the provider bridges shown below. On the other hand, IP routers do not forward frames sent to unknown multicast addresses unless configured to do so. Thus, frames sent to this address by the customer bridge shown near the bottom of the figure will not reach either of the customer bridges shown higher up in the figure due to the intervening IP router.

* Provider bridges use 0x0180C2000008 for LLDP. Frames sent to that address are transparently forwarded by lower level bridges (not shown in the figure) and are blocked by higher level bridges, such as customer bridges. They are also blocked as described in the previous point by IP routers.

LLDP or similar Ethernet frames intended to be between adjacent IP routers or between a host and its first hop IP router need to avoid use of a destination MAC address that might be intercepted by any intervening bridge. The multicast destination MAC addresses used by bridges are the block from 0x0180C2000000 to 0x0180C200003F but it would be best to be conservative and avoid all addresses from 0x0180C2000000 to 0x0180C2FFFFFF. An address meeting this criterion is specified in Section 3 below and its use is RECOMMENDED.

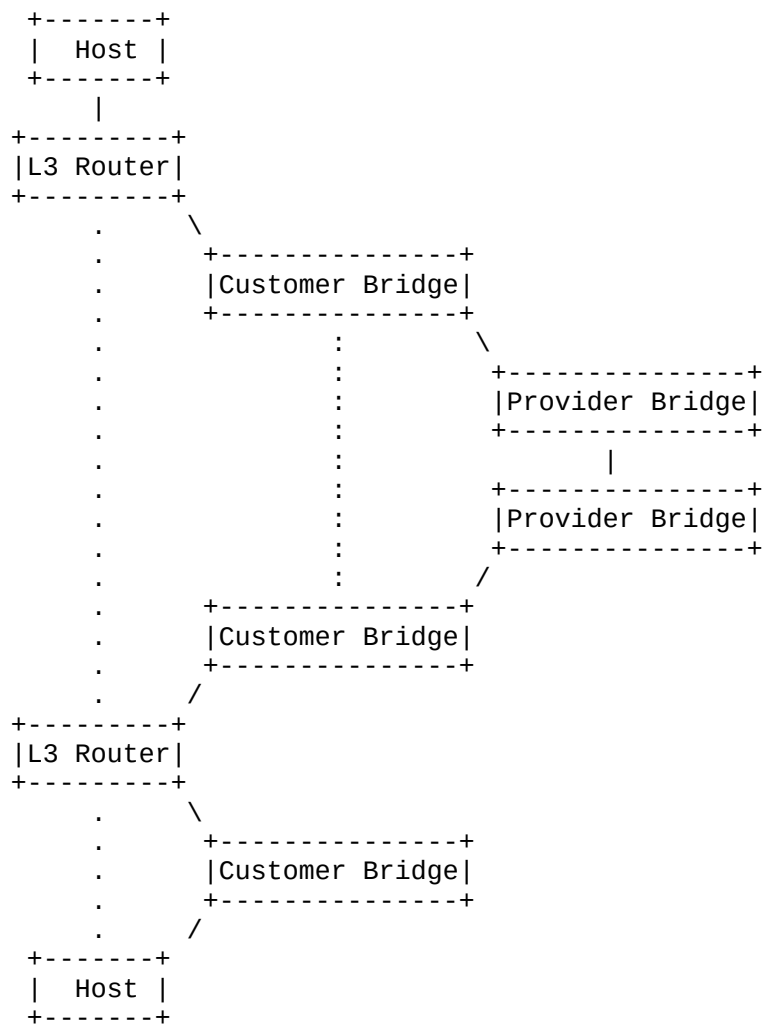

Figure 1: Geneve Header

Note: The above figure is simplified. For example, where one or two customer bridges or provider bridges are shown, there could be zero or some larger number. There could also be one or more bridges between the host shown at the top of the figure and its first hop IP router. Only two levels of bridge are shown (customer and provider) but [IEEE802.1Q] specifies additional levels of bridges.

3. IANA Considerations

IANA is requested to assign a 48-bit multicast MAC address [0x00000E900004 suggested] under the IANA OUI for use with Link Layer Discovery Protocol and similar protocols between Layer 3 routers as per the request in Appendix A. The entry in the "IANA Multicast 48-bit MAC Addresses" registry is as follows:

Addresses	Usage	Reference
[tbd]	Layer 3 LLDP and the like	[this document]

(Alternatively, there could be more than on MAC address assigned for different L3 or higher layer [ISO] purposes.)

4. Security Considerations

TBD

5. Normative References

[IEEE802.1AB] 802, IEEE., "IEEE Standard for Local and metropolitan area networks - Station and Media Access Control Connectivity Discovery", IEEE Std 802.1AB-2016, 29 January 2016.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

[RFC9542] Eastlake 3rd, D., Abley, J., and Y. Li, "IANA Considerations and IETF Protocol and Documentation Usage for IEEE 802 Parameters", BCP 141, RFC 9542, DOI 10.17487/RFC9542, April 2024, <https://www.rfc-editor.org/info/rfc9542>.

6. Informative References

[IEEE802.1AX] 802, IEEE., "IEEE Standard for Local and metropolitan area networks - Link Aggregation", IEEE Std 802.1AX-2014.

[IEEE802.1Q] 802.1 WG, IEEE., "Bridges and Bridged Networks", IEEE Std 802.1Q-2014, 3 November 2014.

[IEEE802] 802, IEEE., "IEEE 802 LAN/MAN Standards Committee", IEEE Std 802, <http://www.ieee802.org>.

[ISO] ISO/IEC, "Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model", ISO/IEC 7498-1:1994(E), 15 June 1996.

[LLDP1] Lindem, A., Patel, K., Zandi, S., Haas, J., and X. Xu, "BGP Logical Link Discovery Protocol (LLDP) Peer Discovery", Work in progress, <https://datatracker.ietf.org/doc/draft-acee-idr-lldp-peer-discovery/>.

[LLDP2] Congdon, P. and P. Bottorff, "LSVR IETF Organizationally Specific TLVs for IEEE Std 802.1AB (LLDP)", work in progress, <https://datatracker.ietf.org/doc/draft-congdon-lsvr-lldp-tlvs/>.

[LLDP3] Richardson, M. and L. Xia, "Autonomic Control Plane design for Layer-Two Switched Networks", Work in progress, <https://datatracker.ietf.org/doc/draft-richardson-anima-l2-friendly-acp/>.

Appendix A. EUI-48 Assignment Request

(not yet submitted)

Applicant Name: Donald E. Eastlake III

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Applicant Telephone: +1-508-333-2270

Use Name: L3-LLDP

Document: [this document]

Specify whether this is an application for EUI-48 or EUI-64 identifiers: EUI-48

Size of Block requested: 1

Specify multicast, unicast, or both: multicast

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