



IEEE Standard for Local and metropolitan area networks— Station and Media Access Control Connectivity Discovery Amendment 2: Support for Multiframe Protocol Data Units

IEEE Computer Society

Developed by the
LAN/MAN Committee

IEEE Std 802.1ABdh™-2021
(Amendment to IEEE Std 802.1AB™-2016
as amended by IEEE Std 802.1ABcu™-2021)

STANDARDS

IEEE Standard for Local and metropolitan area networks—

Station and Media Access Control Connectivity Discovery

Amendment 2: Support for Multiframe Protocol Data Units

Developed by the
LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 8 December 2021
IEEE SA Standards Board

Abstract: This amendment to IEEE Std 802.1AB™-2016 specifies protocols, procedures, and managed objects that support the transmission and reception of a set of Link Layer Discovery Protocol (LLDP) Type/Length/Values (TLVs) that exceed the space available in a single frame.

Keywords: IEEE 802®, IEEE 802.1AB™, IEEE 802.1ABdh™, link layer discovery protocol, management information base, multiframe LLDPDUs, topology discovery, topology information

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Introduction

This introduction is not part of IEEE Std 802.1ABdh-2021, IEEE Standard for Local and metropolitan area networks—Station and Media Access Control Connectivity Discovery—Amendment 2: Support for Multiframe Protocol Data Units.

The first edition of IEEE Std 802.1AB™ was published in 2005, and revisions were published in 2009 and 2016. An amendment, IEEE Std 802.1ABcu™-2021, specifies a Unified Modeling Language (UML)-based information model and a YANG data model. This amendment, IEEE Std 802.1ABdh™-2021, specifies protocols, procedures, and managed objects that support the transmission and reception of a set of Link Layer Discovery Protocol (LLDP) Type/Length/Values (TLVs) that exceed the space available in a single frame.

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IEEE Standard for Local and metropolitan area networks—

Station and Media Access Control Connectivity Discovery

Amendment 2: Support for Multiframe Protocol Data Units

(This amendment is based on IEEE Std 802.1AB™-2016 as amended by IEEE Std 802.1ABcu™-2021.)

NOTE—The editing instructions contained in this amendment define how to merge the material contained therein into the existing base standard and its amendments to form the comprehensive standard.

The editing instructions are shown in ***bold italic***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make corrections in existing text or tables. The editing instruction specifies the location of the change and describes what is being changed by using ~~strikethrough~~ (to remove old material) and underscore (to add new material). ***Delete*** removes existing material. ***Insert*** adds new material without disturbing the existing material. Deletions and insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make changes in figures or equations by removing the existing figure or equation and replacing it with a new one. Editing instructions, change markings, and this NOTE will not be carried over into future editions because the changes will be incorporated into the base standard.⁶

⁶ Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

3. Definitions and numerical representation

3.1 Definitions

Insert the following new definitions in 3.1 in alphanumerical order:

Extended Link Layer Discovery Protocol (XLLDP): An LLDP extension used to retrieve the frames beyond the Normal LLDPDU of a multi-frame LLDP database.

Extension LLDPDU (XPDU): An LLDPDU containing an Extension Identifier TLV and not containing a Time to Live TLV or Extension Request TLV.

Extension Request LLDPDU (XREQ): An LLDPDU containing an Extension Request TLV and not containing a Time to Live TLV or Extension Identifier TLV.

Manifest LLDPDU: A Normal LLDPDU containing a Manifest TLV.

Normal LLDPDU: An LLDPDU containing a Time To Live TLV and not containing an Extension Request TLV or an Extension Identifier TLV.

Scope MAC Address: The MAC address used as the destination address in Normal LLDPDUs, which determines the limits of propagation in the network.

shutdown LLDPDU: A Normal LLDPDU with a TTL value of zero.

4. Acronyms and abbreviations

Insert the following new abbreviations in Clause 4 in alphabetical order:

XLLDP	Extended Link Layer Discovery Protocol
XPDU	Extension LLDPDU
XREQ	Extension Request LLDPDU

5. Conformance

5.3 Required capabilities

Change list items j), k), and l) in the lettered list in 5.3 as follows:

- j) If receipt of LLDPDUs is supported, for every set of TLVs (the basic management set, [extended LLDP set](#), and any organizationally specific sets) supported, support shall be implemented for receipt of every TLV defined in the set.
- k) If transmission of LLDPDUs is supported, for every set of TLVs (the basic management set, [extended LLDP set](#), and any organizationally specific sets) supported, support shall be implemented for transmission of every TLV defined in the set.
- l) If transmission of LLDPDUs is supported, for every set of TLVs (the basic management set, [extended LLDP set](#), and any organizationally specific sets) supported, a capability shall be implemented for users to determine which optional TLVs are transmitted in any particular LLDPDU.

Insert new item p) at the end of the lettered list in 5.3 (as modified by IEEE Std 802.1ABcu-2021) as follows:

- p) If the Extended Link Layer Discovery Protocol is supported, then
 - 1) The extended LLDP set of TLVs shall be implemented as defined in 8.5a.
 - 2) The Extension Request and Extension LLDPDU formats (8.2) and addressing (7.1.2) shall be implemented.
 - 3) The extended receive state machine (Figure 9-2a) shall be implemented.

6. Principles of operation

Change the first sentence of the second paragraph of the introduction to Clause 6 as follows:

This clause describes general principles of LLDP and Extended LLDP (XLLDP) operation.

6.1 Transmission and reception

Change 6.1 as follows:

The information fields in each LLDP frame are contained in a Link Layer Discovery Protocol Data Unit (LLDPDU) as a sequence of variable length information elements, that each include type, length, and value fields (known as TLVs), where

- ~~a)~~ Type identifies what kind of information is being sent.
- ~~b)~~ Length indicates the length of the information string in octets.
- ~~c)~~ Value is the actual information that needs to be sent (for example, a binary bit map or an alpha-numeric string that can contain one or more fields).

~~Each LLDPDU contains the following three mandatory TLVs (see Table 8-1), and can contain optional TLVs as selected by network management. Each LLDPDU begins with a mandatory sequence of three TLVs, as specified in 8.2, and can contain zero or more additional optional TLVs as selected by network management. The first three TLVs are:~~

- 1) ~~d)~~ A Chassis ID TLV.
- 2) ~~e)~~ A Port ID TLV.
- 3) ~~f)~~ A Time To Live TLV or, if XLLDP is supported, an Extension Request TLV or an Extension Identifier TLV.
- ~~g) Zero or more optional TLVs, as allowed by the maximum size of the LLDPDU.~~
- ~~h) An optional End Of LLDPDU TLV.~~

The first two TLVs contain the chassis ID and the port ID values. These are concatenated to form a logical MSAP identifier. The combination of the MSAP identifier and the Scope MAC Address identify the ~~that is used by the recipient to identify the sending~~ LLDP agent/port that is the source of the information in the TLVs. Both the chassis ID and port ID values can be defined in a number of convenient forms. Once selected, however, the chassis ID/port ID value combination remains the same as long as the particular port remains operable (8.5.2, 8.5.3, 9.2.4.1).

~~NOTE 1—The statement above is true for any LLDP agent; however, there can be multiple LLDP agents sending and receiving LLDPDUs using different MAC addresses.~~

~~A non-zero value in the time to live (TTL) field of the Time To Live TLV tells the receiving LLDP agent how long all information pertaining to this LLDPDU's MSAP identifier is valid so that all the associated information can later be automatically discarded by the receiving LLDP agent if the sender fails to update it in a timely manner. A zero value indicates that any information pertaining to this LLDPDU's MSAP identifier is to be discarded immediately.~~

The third TLV differentiates between three types of LLDPDUs:

- a) A Normal LLDPDU, where the third TLV is a Time To Live TLV that tells the receiving LLDP agent how long all information pertaining to this LLDPDU's MSAP identifier is valid so that all of the associated information can later be automatically discarded by the receiving LLDP agent if the

sender fails to update it in a timely manner. It is useful to further differentiate two special cases of a Normal LLDPDU:

- 1) A shutdown LLDPDU, where the third TLV is a Time To Live TLV with a TTL value of zero indicating that any information pertaining to this LLDPDU's MSAP identifier is to be discarded immediately. A TTL value of zero can be used, for example, to signal that the sending port has initiated a port shutdown procedure.
- 2) A Manifest LLDPDU, where the third TLV is a Time To Live TLV with a non-zero TTL value and one of the subsequent TLVs is a Manifest TLV.
- b) An Extension Request LLDPDU (XREQ), where the third TLV is an Extension Request TLV that the recipient of a Normal LLDPDU containing a Manifest TLV uses to request one or more of the Extension LLDPDUs described in the Manifest TLV. The Extension Request LLDPDU does not contain a Time to Live TLV.
- c) An Extension LLDPDU (XPDU), where the third TLV is an Extension Identifier TLV. The Extension LLDPDU does not contain a Time to Live TLV.

~~NOTE 2—A TTL value of zero can be used, for example, to signal that the sending port has initiated a port shutdown procedure.~~

NOTE—The receive state machine (in 9.2.9 and in prior versions of this standard) specifies that an implementation not supporting XLLDP will discard any received LLDPDUs not containing a TTL TLV as the third TLV (i.e., will discard any received Extension Request or Extension LLDPDUs). The state machine further specifies that only implementations supporting XLLDP will process a Manifest TLV and subsequently transmit Extension Request LLDPDUs, and that only implementations supporting XLLDP will process Extension Request TLVs and subsequently transmit Extension LLDPDUs.

~~The~~An optional End Of LLDPDU TLV marks the end of the LLDPDU.

The format for the LLDPDU is defined in 8.2. The TLV categories and the basic TLV format are defined in 8.3 and 8.4. The specific format and field contents for the Chassis ID TLV are defined in 8.5.2; for the Port ID TLV, in 8.5.3; for the Time To Live TLV in 8.5.4; and for the End Of LLDPDU TLV, in 8.5.1.

6.2 LLDP operational modes

Change 6.2 as follows:

~~LLDP is a one-way protocol. The information advertised by LLDP is transferred in a single direction. An LLDP agent can transmit periodically advertise~~ information about the capabilities and current status of the system associated with its MSAP identifier. The LLDP agent can also ~~receive-collect~~ information about the capabilities and current status of the system associated with a remote MSAP identifier. LLDP does not itself contain a mechanism for ~~soliciting the LLDP agent to solicit~~ specific information from other LLDP agents ~~beyond what is being advertised by those LLDP agents~~, nor does it provide a specific means of confirming the receipt of information. Extended LLDP allows an LLDP agent collecting information to request detailed information (via an Extension Request LLDPDU) that is only advertised in a summary form (in a Manifest TLV), however this does not change the inherent LLDP property that the choice of information provided is at the discretion of the advertising LLDP agent.

NOTE—The LLDP protocol is designed to advertise information useful for discovering pertinent information about a remote port and to populate topology MIBs. It is not intended to act as a configuration protocol for remote systems, nor as a mechanism to signal control information between ports. During the operation of LLDP, it may be possible to discover configuration inconsistencies between systems on the same IEEE 802 LAN. LLDP does not provide a mechanism to resolve those inconsistencies. Rather, it provides a means to report discovered information to higher layer management entities.

LLDP allows the ~~transmitter and the receiver~~ advertising function and collecting function of the LLDP agent to be separately enabled, making it possible to configure an implementation so the local LLDP agent can