International Standard

ISO/IEC/IEEE 8802-A

First edition
2015-12-15

AMENDMENT 3
2025-02

Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks —

Part A: Overview and architecture

AMENDMENT 3: YANG data model for EtherTypes

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseaux locaux et métropolitains —

Partie A: Présentation et architecture

AMENDEMENT 3

Reference number
ISO/IEC/IEEE 8802-A:2015/Amd.3:2025(en)

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Published in Switzerland

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IEEE Std 802f™-2023
(Amendment to IEEE Std 802®-2014
as amended by IEEE Std 802c™-2017 and
IEEE Std 802d™-2017)

IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture

Amendment 3: YANG Data Model for EtherTypes

Developed by the

LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 21 September 2023

IEEE SA Standards Board

Abstract: The YANG module containing the EtherType information, including a compact human-readable name and description, for a subset of EtherTypes taken from the IEEE Registration Authority EtherType public listing is specified in this amendment. This amendment also addresses errors and omissions in IEEE Std 802 description of existing functionality.

Keywords: BANs, body area networks, EtherTypes, IEEE 802®, IEEE 802f™, IEEE 802 architecture, IEEE 802 reference model, LANs, local area networks, MANs, metropolitan area networks, object identifiers, PANs, personal area networks, RANs, regional area networks, protocol development, protocol types, YANG

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PDF: ISBN 979-8-8557-0279-8 STD26593
Print: ISBN 979-8-8557-0280-4 STDPD26593

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Introduction

This introduction is not part of IEEE Std 802f-2023, IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture—Amendment 3: YANG Data Model for EtherTypes.

This amendment specifies a YANG module that contains the EtherType information, including a compact human-readable name and description, for a subset of EtherTypes taken from the IEEE Registration Authority EtherType public listing. This amendment also addresses errors and omissions in IEEE Std 802, description of existing functionality.

Contents

IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture

Amendment 3: YANG Data Model for Ethertypes

(This amendment is based on IEEE Std 802®-2014, as previously amended by IEEE Std 802d™-2017 and IEEE Std 802c™-2017.)

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 either 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. Insertions may require renumbering. If so, renumbering instructions are given in the editing instruction. ***Replace*** is used to make large changes in existing text, subclauses, tables, or figures by removing existing material and replacing it with new material. Editorial notes 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.

2. Normative references

Delete the following normative reference in Clause 2 as follows:

~~IEEE Std 802.1D™, IEEE Standard for Local and metropolitan area networks—Media Access Control (MAC) Bridges.~~[1,2]

Insert the following normative reference in the appropriate collating sequence:

IEEE Std 802.1Q™, IEEE Standard for Local and metropolitan area networks—Virtual Bridged Local Area Networks.[7, 8]

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[8]IEEE publications are available from The Institute of Electrical and Electronics Engineers. (https://standards.ieee.org).

5. Reference models (RMs)

5.3.2.1 Bridges and bridged IEEE 802 networks

Change the text of the first paragraph in 5.3.2.1 as follows:

Bridges are stations that interconnect multiple access domains. IEEE Std 802.1~~D~~Q[9] provides the basic specification for bridge interworking among IEEE 802 networks. A bridged IEEE 802 network consists of one or more bridges together with the complete set of access domains that they interconnect. A bridged IEEE 802 network provides end stations belonging to any of its access domains with the connectivity of a network that contains the whole set of attached end stations. IEEE Std 802.1Q ~~adds additional capabilities to the bridge specification in IEEE Std 802.1D including virtual local area networks (VLANs), priorities, and provider bridging, as described in 5.3.2.5~~ includes provisions for MAC Bridging, virtual local area networks (VLANs), priorities and provider bridging.

Change the text in the last paragraph in 5.3.2.1 as follows:

The term *switch* is often used to refer to some classes of bridge. However, there is no consistent meaning applied to the distinction between the terms *bridge* and *switch*, and IEEE Std 802.1~~D~~Q does not make any such distinction. Hence, this standard only uses the term *bridge*.

5.3.2.3 Resolving topologies with multiple paths

Change the text in the first paragraph in 5.3.2.3 as follows:

A key aspect of ~~IEEE Std 802.1D and~~ IEEE Std 802.1Q is the specification of the rapid spanning tree protocol (RSTP), which is used by bridges to configure their interconnections in order to prevent looping data paths in the bridged IEEE 802 network. If the basic interconnection topology of bridges and networks contains multiple possible paths between certain points, use of the RSTP blocks some paths in order to produce a simply connected active topology for the flow of MAC user traffic between end stations. For each point of attachment of a bridge to a network, the RSTP selects whether MAC user traffic is to be received and transmitted by the bridge at that point of attachment.

5.3.2.4 Transparent bridging

Change the text in 5.3.2.4 as follows:

~~IEEE Std 802.1D and~~ IEEE Std 802.1Q ~~specify~~ specifies transparent bridging operation, so called because the MAC bridging function does not require the MAC user frames transmitted and received to carry any additional information relating to the operation of the bridging functions; end-station operation is unchanged by the presence of bridges.

[9] Information on normative references can be found in Clause 2.

7. IEEE 802 network management

7.2.2 Management architecture

Change the last paragraph in 7.2.2 as follows:

The Simple Network Management Protocol (SNMP), as described in IETF RFC 3411 [B5], and Network Configuration Protocol (NETCONF), as described in RFC 6241 [B15], are examples of ~~provides a~~ general-purpose management protocols that can be used for the management of IEEE 802 network equipment.

7.2.3 Managed object definitions

Change text in 7.2.3 as follows:

In order for an IEEE 802 standard to specify management facilities, it is necessary for it to specify managed objects that model the operations that can be performed on the communications resources specified in the standard. The components of a managed object definition are as follows:

a) A definition of the functionality provided by the managed object, and the relationship between this functionality and the resource to which it relates.
b) A definition of the syntax that is used to convey management operations, and their arguments and results, in a management protocol.
c) An address that allows the management protocol to specifically communicate with the managed object in question. In IEEE 802 this is done with an object identifier (OID), as described in Clause 10, or a Uniform Resource Name (URN), as described in Clause 11.

The functionality of a managed object can be described in a manner that is independent of the protocol that is used; this abstract definition can then be used in conjunction with a definition of the syntactic elements required in order to produce a complete definition of the object for use with specific management protocols.

SNMP is used in many cases together with the structure of management information known as SMIv2 (IETF RFC 2578, IETF RFC 2579 [B3], and IETF RFC 2580 [B4]), which uses a set of macros based on a subset of ASN.1 for defining managed objects. YANG (IETF RFC 7950) is a data modeling language used to model configuration data, state data, remote procedure calls, and notifications for network management protocols.

The choice of notational tools for defining managed objects depends on ~~which of~~ the available management protocols the standard supports.

8. MAC addresses

8.2.2 Assignment of universal addresses

Change the last paragraph before Figure 10 in 8.2.2. as follows:

A universal address consists of two parts: the leading bits (24, 28, or 36) are assigned by the IEEE RA with the U/L bit set to zero and the remaining bits by that assignee. An example of an EUI-48 is shown in Figure 10. For MA-M and MA-S, the final 4 bits of the assigned number are in a nibble that is not adjacent to the other bits in the assigned number when displayed with LSB on the left and most significant bit (MSB) on the right. For example, when using an MA-S to create an EUI-48, the MA-S value is contained in octets 0, 1, 2, 3 and the ~~least~~ most significant ~~nibble~~ four bits of octet 4, and the value assigned by the assignee is contained in the ~~most~~ least significant ~~nibble~~ four bits of octet 4 and in octet 5.

Change the NOTE in 8.2.4 as follows:

NOTE—While some implementations have used a single EUI-48 or EUI-64 to identify all of the system's points of attachment to IEEE 802 networks, this approach does not inherently meet the requirements of IEEE 802.1~~D~~Q™ ~~MAC bridging~~.

8.3 Interworking with 48-bit and 64-bit MAC addresses

Change the text in 8.3 as follows:

In response to concerns that the EUI-48 space could be exhausted by the breadth of products requiring unique identifiers, 64-bit MAC addresses were introduced. Initially, new IEEE standards projects that did not require backward compatibility with EUI-48 were requested to use 64-bit MAC addresses. This led to some IEEE 802 standards adopting 64-bit MAC addressing, which cannot be bridged onto IEEE 802 networks that use 48-bit MAC addressing. The reason is that the bridging function in ~~IEEE Std 802.1D and~~ IEEE Std 802.1Q assumes that 48-bit MAC addresses are unique among all the connected networks. Truncating a~~n~~ 64-bit MAC address into a~~n~~ 48-bit field can lead to two stations having the same 48-bit value. Instead, traffic between 64-bit and 48-bit MAC addressed networks needs to be routed at a layer above the DLL.

9. Protocol identifiers and context-dependent identifiers

9.2 EtherTypes

9.2.1 Format, function, and administration

Change the footnote in the first paragraph of 9.2.1 (the paragraph is shown for convenience of the user) as follows:

EtherType protocol identification values are assigned by the IEEE RA[10] and are used to identify the protocol that is to be invoked to process the user data in the frame. An EtherType is a sequence of 2 octets, interpreted as a 16-bit numeric value with the first octet containing the most significant 8 bits and the second octet containing the least significant 8 bits. Values in the 0–1535 range are not available for use in order to retain legacy compatibility with Length field based protocols, e.g., IEEE Std 802.3.

Change the third paragraph in 9.2.1 as follows:

Examples of EtherTypes are ~~0x0800 and 0x86DD~~ 0x08-00 and 0x86-DD, which are used to identify IPv4 and IPv6, respectively.

Insert the following subclause 9.2.1a, and renumber the existing subclauses accordingly.

9.2.1a Public EtherType assignments subset

The IEEE Registration Authority (RA) provides a public listing of EtherType assignments.[11] Many of these are for private or proprietary purposes. However, others are incorporated into well-known standards. In some cases, the IEEE RA Public Listing for an EtherType identifies an assignee without explicitly identifying the standards in which the use of that EtherType is specified. For ready reference by users and developers of such standards, Annex F identifies some well-known EtherTypes and the protocols they identify. This subset is derived by combining the EtherTypes listed in the ietf-ethertypes YANG module specified in IETF RFC 8519 [B11] with the subset of EtherTypes defined by IEEE 802 Standards (e.g., IEEE 802.1Q, 802.3, etc.) and as provided by participants that developed this standard. Information on products released after that date can be found on the IEEE SA Registration Authority web site: https://standards.ieee.org/products-programs/regauth/ethertype/ and https://regauth.standards.ieee.org/standards-ra-web/pub/view.html#registries. The subset in Table F.1 and in F.3 is provided solely for the convenience of users of this standard and does not constitute an endorsement by IEEE of the listed protocols.

The EtherType public listing includes the following fields, specified by the EtherType assignee:

- **Assignment** — The hexadecimal representation of the EtherType.
- **Assignment Type** — The type is EtherType.[12]
- **Company Name** — The registrant of the Assignment.
- **Company Address** — The address of the registrant.
- **Protocol** — A brief protocol description, as provided by the registrant.

This standard includes the following fields in Table F.1 for use by the YANG module:

[10]More information on EtherTypes can be found ~~at http://standards.ieee.org/develop/regauth/lle~~ on the IEEE RA web site, https://standards.ieee.org/products-programs/regauth/ethertype and https://regauth standards.ieee.org/standards-ra-web/pub/view.html#registries.

[11]The EtherType public listing is the public view of the EtherType registry managed by the Registration Authority (see https://regauth.standards.ieee.org/).

[12]EtherType is the only assignment type for the records in the EtherType public listing.

a) **Friendly Name** — A short alphanumeric name for the Assignment that is unique within the YANG module in F.2 and is used to enumerate the entry.

b) **Short Description** — A short description of the assigned protocol per its typical usage.

c) **Reference** — A reference to a standard associated with the EtherType assignment.

A YANG model representation can be found in F.3.2.

Annex A

(informative)

Bibliography

Insert the following bibliographical references into Annex A in alphanumeric order:

[B11] IETF RFC 8519, YANG Data Model for Network Access Control Lists (ACLs), March 2019.

[B15] IETF RFC 6241, Network Configuration Protocol (NETCONF), June 2011.

Annex D

(informative)

List of IEEE 802 standards

Delete the following standard as follows:

~~IEEE Std 802.1D™, IEEE Standard for Local and metropolitan area networks: Media Access Control (MAC) Bridges.~~

Insert new Annex F as follow:

Annex F

(informative)

EtherType listing subset

F.1 Introduction

This annex lists the subset of EtherType assignments described in 9.2.1 in tabular form (Table F.1) and in the form of a YANG module (F.2). This subset is provided solely for the convenience of the users of this standard and does not constitute an endorsement by IEEE of the listed protocols.

F.2 Tabular format

A subset of EtherType assignments by the IEEE RA is given in Table F.1. Each Friendly Name in Table F.1 is unique and is used as an identifier in the YANG module. The Short Description identifies the protocol, protocol message, or protocol field that uses the assignment as specified in the Reference, or the EtherType assignment itself as named in the Reference. Where the Reference specifies more than one name or use (distinguished for example by sub-type) these are included in the Short Description field.

NOTE—The fields “Friendly Names” and “Short Descriptions” in Table F.1 may include trademarks that are owned by their respective trademark owners. The information in these fields is provided solely for the convenience of users of this standard and does not constitute an endorsement by IEEE of those products or the companies producing those products.

Table F.1 — EtherType listing subset[a]

EtherType Assignment (HEX)	Friendly Name	Short Description	Reference
08-00	ipv4	Internet Protocol version 4 (IPv4)	IETF RFC 894
08-06	arp	Address Resolution Protocol (ARP)	IETF RFC 826, IETF RFC 7042
08-42	wol	Wake-on-LAN	IEEE Std 802
22-E2	msp	MAC Status Protocol (MSP)	IEEE Std 802.1Q
22-E7	cnm	Congestion Notification Message (CNM)	IEEE Std 802.1Q
22-E9	cn-tag	Congestion Notification Tag (CN-TAG)	IEEE Std 802.1Q
22-EA	msrp	Multiple Stream Reservation Protocol (MSRP)	IEEE Std 802.1Q

Table F.1 — EtherType listing subset[a] *(continued)*

EtherType Assignment (HEX)	Friendly Name	Short Description	Reference
22-F3	trill	Transparent Interconnection of Lots of Links	IETF RFC 6325
60-03	decnet	DECnet DNA Routing	DECnet DIGITAL Network Architecture—Ethernet Data Link Architectural Specification v1.0.0
80-35	rarp	Reverse Address Resolution Protocol	IETF RFC 903
80-9B	appletalk	Appletalk (Ethertalk)	Inside Appletalk, Second Edition
80-F3	aarp	Appletalk Address Resolution Protocol	Inside Appletalk, Second Edition
81-00	c-tag	Customer VLAN Tag (C-TAG)	IEEE Std 802.1Q
81-37	ipx	Internetwork Packet Exchange (IPX)	Internetwork Packet Exchange —Novell, Inc.
82-04	qnx	QNX Qnet	QNX—Quantum Software Systems, Ltd.
86-DD	ipv6	Internet Protocol Version 6 (IPv6)	IETF RFC 2464
88-08	efc	Multipoint Control Protocol (MPCP)	IEEE Std 802.3
88-09	esp	Ethernet Slow Protocol	IEEE Std 802.3
88-19	cobranet	CobraNet	CobraNet Programmer's Reference, Version 2.5
88-47	mpls-unicast	Multiprotocol Label Switching (MPLS) unicast traffic	IETF RFC 3031
88-48	mpls-multicast	Multiprotocol Label Switching (MPLS) multicast	IETF RFC 3031
88-63	pppoe-discovery	Point-to-Point Protocol over Ethernet (PPPoE) Discovery Stage	IETF RFC 2516
88-64	pppoe-session	Point-to-Point Protocol over Ethernet (PPPoE) Session Stage	IETF RFC 2516
88-6D	intel-ans	Intel Advanced Networking Services Probe Packets	Intel® Advanced Network Services (Intel® ANS) Advanced Settings for Teams
88-70	llc-encaps	LLC Encapsulation	IEEE Std 802.1AC
88-7B	homeplug	Homeplug	INT51X1 datasheet
88-8E	eapol	Port Access Entity (PAE) EtherType, Extensible Authentication Protocol over LANs (EAPOL)	IEEE Std 802.1X

Table F.1 — EtherType listing subset[a] *(continued)*

EtherType Assignment (HEX)	Friendly Name	Short Description	Reference
88-92	profinet	PROFINET	IEC 61158-6-10
88-9A	hyperscsi	Small Computer System Interface (SCSI) over Ethernet.	An Ethernet Based Data Storage Protocol for Home Network
88-A2	aoe	Advanced Technology Attachment (ATA) over Ethernet.	AoE (ATA over Ethernet)
88-A4	ethercat	Ethernet for Control Automation Technology (EtherCAT)	IEC 61158-4-12
88-A8	s-tag	Service VLAN Tag (S-TAG) or Backbone VLAN Tag (B-TAG)	IEEE Std 802.1Q
88-AB	ethernet-powerlink	Ethernet Powerlink	IEC 61158-4-13
88-B5	exp1	Local experimental EtherType 1	IEEE Std 802
88-B6	exp2	Local experimental EtherType 2	IEEE Std 802
88-B7	oui-ext	OUI Extended EtherType	IEEE Std 802
88-B8	goose	IEC 61850 Generic Object Oriented Substation Event (GOOSE)	IEC 61850-8-1
88-B9	gse	IEC 61850 Generic Substation Events (GSE) management services	IEC 61850-8-1
88-BA	sv	IEC 61850 Sampled Value Transmission (SV)	IEC 61850-8-2
88-C7	pre-auth	RSNA Pre-Authentication	IEEE Std 802.11
88-CC	lldp	Link Layer Discovery Protocol (LLDP)	IEEE Std 802.1AB
88-CD	sercos	Sercos Interface	IEC 61158-4-19
88-DC	wsmp	WAVE Short Message Protocol (WSMP)	IEEE Std 1609
88-E1	homeplug-av-mme	HomePlug AV Mobile Management Entity (MME)	HomePlug AV Specification
88-E3	mrp	Media Redundancy Protocol	IEC 62439-2
88-E5	macsec	MACsec EtherType	IEEE Std 802.1AE
88-E7	i-tag	Backbone Service Instance Tag	IEEE Std 802.1Q
88-F5	mvrp	Multiple VLAN Registration Protocol (MVRP)	IEEE Std 802.1Q
88-F6	mmrp	Multiple MAC Registration Protocol (MMRP)	IEEE Std 802.1Q
88-F7	ptp	Precision Time Protocol	IEEE Std 1588

Table F.1 — EtherType listing subset[a] *(continued)*

EtherType Assignment (HEX)	Friendly Name	Short Description	Reference
89-02	cfm	IEEE 802.1Q Connectivity Fault Management (CFM) PDU Encapsulation EtherType	IEEE Std 802.1Q
89-06	fcoe	Fibre Channel over Ethernet (FCoE)	T11 FC-BB-5
89-0D	wlan-mgmt	IEEE 802.11 Management Protocol	IEEE Std 802.11
89-10	encap	Backbone Service Encapsulated Addresses	IEEE Std 802.1Q
89-14	fip	FCoE Initialization Protocol	T11 FC-BB-5
89-15	roce	Remote Direct Memory Access (RDMA) over Converged Ethernet (RoCEv1)	InfiniBand™ Architecture Specification
89-17	mis	Media Independent Service (MIS) Protocol	IEEE Std 802.21
89-1D	tte	Time-Triggered Ethernet (TTE) Protocol Control Frame	SAE AS6802
89-29	mirp	Multiple I-SID Registration Protocol (MIRP)	IEEE Std 802.1Q
89-2F	hsr	High-availability Seamless Redundancy (HSR)	IEC 62439-3
89-3F	e-tag	Bridge Port Extension Tag (E-TAG)	IEEE Std 802.1BR
89-40	ecp	Edge Control Protocol	IEEE Std 802.1Q
89-4B	f-tag	Flow Filtering Tag (F-TAG)	IEEE Std 802.1Q
89-52	drcp	Distributed Relay Control Protocol (DRCP)	IEEE Std 802.1AX
89-A2	cim	Congestion Isolation Message (CIM)	IEEE Std 802.1Q
C9-D1	llc-legacy	LLC Encapsulation (obsolete)	IEEE Std 802.1AC
E2-3B	mpp	MAC Privacy protection Protocol	IEEE Std 802.1AE
F1-C1	r-tag	Frame Replication and Elimination for Reliability (FRER) Redundancy Tag (R-TAG)	IEEE Std 802.1CB

[a]Hexadecimal values in the Assignment field are provided from the public listing, while the information in the other fields (i.e., Friendly Name, Short Description, and Reference) is specified herein.

F.3 YANG module for EtherType subset

F.3.1 YANG Framework

The YANG module representation of the EtherType subset (as defined in Table F.1) is provided in this annex.

Changes to the ieee802-ethertypes.yang module, adding or revising entries, are made by amending or revising this standard and will add a new revision statement to the module. YANG augmentation should not be used to extend the module.

NOTE—The ietf-ethertypes.yang module (as defined in rfc8519) is currently used by the ietf-packet-fields.yang module (as defined in rfc8519) and the ietf-detnet.yang module. Moving forward it is anticipated that the YANG module (ieee802-ethertype.yang) defined in F.3.2 will supersede ietf-ethertypes.yang, which would result in ietf-ethertypes.yang being deprecated.

F.3.2 Definition for ieee802-ethertype YANG module[13,14]

```
module ieee802-ethertype {

  namespace "urn:ieee:std:802.1Q:yang:ieee802-ethertype";
  prefix "ieee-ethertype";

  organization
    "IEEE 802.1 Working Group";

  contact
    "WG-URL: http://ieee802.org/1/
     WG-EMail: stds-802-1@ieee.org

     Contact: IEEE 802.1 Working Group Chair
     Postal: C/O IEEE 802.1 Working Group
             IEEE Standards Association
             445 Hoes Lane
             Piscataway
             NJ 08854
             USA

     E-mail: stds-802-1-chairs@ieee.org";

  description
    "This module contains a subset of commonly used 802 network EtherTypes.

     Copyright (C) IEEE (2023).

     This version of this YANG module is part of the IEEE Std 802;
     see the standard itself for full legal notices.";

  revision "2023-04-17" {
    description
      "Initial revision.";
    reference
      "IEEE Std 802f, Overview and Architecture -
       YANG Data Model for EtherTypes";
```

[13]Copyright release for YANG: Users of this standard may freely reproduce the YANG modules contained in this standard so that they can be used for their intended purpose.

[14]An ASCII version of the YANG module is attached to the PDF of this standard and can also be obtained from the IEEE 802.1 Website at https://1.ieee802.org/yang-modules/.

```
}

typedef ethertype {
  type enumeration {
    enum ipv4 {
      value 2048;
      description
        "08-00  Internet Protocol version 4 (IPv4)";
      reference
        "Organization: Xerox, US
        Reference: IETF RFC 894";
    }
    enum arp {
      value 2054;
      description
        "08-06  Address Resolution Protocol (ARP)";
      reference
        "Organization: Symbolics, Inc.
        Reference: IETF RFC 826, IETF RFC 7042";
    }
    enum wol {
      value 2114;
      description
        "08-42  Wake-on-LAN";
      reference
        "Organization: None
        Reference: IEEE Std 802";
    }
    enum msp {
      value 8930;
      description
        "22-E2  MAC Status Protocol (MSP)";
      reference
        "Organization: IEEE 802.1 Working Group
        Reference: IEEE Std 802.1Q";
    }
    enum cnm {
      value 8935;
      description
        "22-E7  Congestion Notification Message (CNM)";
      reference
        "Organization: IEEE 802.1 Working Group
        Reference: IEEE Std 802.1Q";
    }
    enum cn-tag {
      value 8937;
      description
        "22-E9  Congestion Notification Tag (CN-TAG)";
      reference
        "Organization: IEEE 802.1 Working Group
        Reference: IEEE Std 802.1Q";
    }
    enum msrp {
      value 8938;
      description
        "22-EA  Multiple Stream Reservation Protocol (MSRP)";
      reference
        "Organization: IEEE 802.1 Working Group
        Reference: IEEE Std 802.1Q";
    }
    enum trill {
      value 8947;
      description
        "22-F3  Transparent Interconnection of Lots of Links";
```

```
    reference
      "Organization: IETF TRILL Working Group
      Reference: IETF RFC 6325";
  }
  enum decnet {
    value 24579;
    description
      "60-03  DECnet DNA Routing";
    reference
      "Organization: DEC
      Reference: DECnet DIGITAL Network Architecture - Ethernet
      Data Link Architectural Specification v1.0.0";
  }
  enum rarp {
    value 32821;
    description
      "80-35  Reverse Address Resolution Protocol";
    reference
      "Organization: Private
      Reference: IETF RFC 903";
  }
  enum appletalk {
    value 32923;
    description
      "80-9B  Appletalk (Ethertalk)";
    reference
      "Organization: Private
      Reference: Inside Appletalk, Second Edition";
  }
  enum aarp {
    value 33011;
    description
      "80-F3  Appletalk Address Resolution Protocol";
    reference
      "Organization: Private
      Reference: Inside Appletalk, Second Edition";
  }
  enum c-tag {
    value 33024;
    description
      "81-00  Customer VLAN Tag (C-TAG)";
    reference
      "Organization: IEEE 802.1 Working Group
      Reference: IEEE Std 802.1Q";
  }
  enum ipx {
    value 33079;
    description
      "81-37  Internetwork Packet Exchange (IPX)";
    reference
      "Organization: Novell, Inc.
      Reference: Internetwork Packet Exchange - Novell, Inc.";
  }
  enum qnx {
    value 33284;
    description
      "82-04  QNX Qnet";
    reference
      "Organization: Quantum Software Systems, Ltd.
      Reference: QNX - Quantum Software Systems, Ltd.";
  }
  enum ipv6 {
    value 34525;
    description
```

```
      "86-DD  Internet Protocol Version 6 (IPv6)";
    reference
      "Organization: USC/ISI
      Reference: IETF RFC 2464";
  }
  enum efc {
    value 34824;
    description
      "88-08  Multipoint Control Protocol (MPCP)";
    reference
      "Organization: IEEE 802.3 Working Group
      Reference: IEEE Std 802.3";
  }
  enum esp {
    value 34825;
    description
      "88-09  Ethernet Slow Protocol";
    reference
      "Organization: IEEE 802.3 Working Group
      Reference: IEEE Std 802.3";
  }
  enum cobranet {
    value 34841;
    description
      "88-19  CobraNet";
    reference
      "Organization: Peak Audio
      Reference: CobraNet Programmer's Reference, Version 2.5";
  }
  enum mpls-unicast {
    value 34887;
    description
      "88-47  Multiprotocol Label Switching (MPLS) unicast
      traffic";
    reference
      "Organization: Cisco Systems
      Reference: IETF RFC 3031";
  }
  enum mpls-multicast {
    value 34888;
    description
      "88-48  Multiprotocol Label Switching (MPLS) multicast";
    reference
      "Organization: Cisco Systems
      Reference: IETF RFC 3031";
  }
  enum pppoe-discovery {
    value 34915;
    description
      "88-63  Point-to-Point Protocol over Ethernet (PPPoE)
      Discovery Stage";
    reference
      "Organization: UUNET Technologies, Inc.
      Reference: IETF RFC 2516";
  }
  enum pppoe-session {
    value 34916;
    description
      "88-64  Point-to-Point Protocol over Ethernet (PPPoE)
      Session Stage";
    reference
      "Organization: UUNET Technologies, Inc.
      Reference: IETF RFC 2516";
  }
```

```
enum intel-ans {
  value 34925;
  description
    "88-6D  Intel Advanced Networking Services Probe Packets";
  reference
    "Organization: Intel Corporation
    Reference: Intel(R) Advanced Network Services (Intel(R) ANS)
    Advanced Settings for Teams";
}
enum llc-encaps {
  value 34928;
  description
    "88-70  LLC Encapsulation";
  reference
    "Organization: IEEE 802.1 Working Group
    Reference: IEEE Std 802.1AC";
}
enum homeplug {
  value 34939;
  description
    "88-7B  Homeplug";
  reference
    "Organization: Intellon Corporation
    Reference: INT51X1 datasheet";
}
enum eapol {
  value 34958;
  description
    "88-8E  Port Access Entity (PAE) EtherType, Extensible
    Authentication Protocol over LANs (EAPOL)";
  reference
    "Organization: IEEE 802.1 Working Group
    Reference: IEEE Std 802.1X";
}
enum profinet {
  value 34962;
  description
    "88-92  PROFINET";
  reference
    "Organization: PROFIBUS International
    Reference: IEC 61158-6-10";
}
enum hyperscsi {
  value 34970;
  description
    "88-9A  Small Computer System Interface (SCSI) over
    Ethernet.";
  reference
    "Organization: Data Storage Institute
    Reference: An Ethernet Based Data Storage Protocol for Home
    Network";
}
enum aoe {
  value 34978;
  description
    "88-A2  Advanced Technology Attachment (ATA) over Ethernet.";
  reference
    "Organization: Coraid Inc
    Reference: AoE (ATA over Ethernet)";
}
enum ethercat {
  value 34980;
  description
    "88-A4  Ethernet for Control Automation Technology
```