

Network Working Group  
INTERNET-DRAFT  
Obsoletes: [7042](#)  
Intended Status: Best Current Practice  
Expires: September 6, 2022

D. Eastlake  
Futurewei Technologies  
J. Abley  
Hopcount  
March 7, 2022

IANA Considerations and IETF Protocol and Documentation Usage  
for IEEE 802 Parameters  
<[draft-eastlake-rfc7042bis-06.txt](#)>

## Abstract

Some IETF protocols make use of Ethernet frame formats and IEEE 802 parameters. This document discusses several uses of such parameters in IETF protocols, specifies IANA considerations for assignment of points under the IANA OUI (Organizationally Unique Identifier), and provides some values for use in documentation. This document obsoletes [RFC 7042](#).

## Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Distribution of this document is unlimited. Comments should be sent to the authors.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <https://www.ietf.org/lid-abstracts.html>. The list of Internet-Draft Shadow Directories can be accessed at <https://www.ietf.org/shadow.html>.

INTERNET-DRAFT

IANA/IETF and IEEE 802 Parameters

March 2022

## Table of Contents

<a href="#">1. Introduction.....</a>	<a href="#">4</a>
<a href="#">1.1 Notations Used in This Document.....</a>	<a href="#">4</a>
<a href="#">1.2 Changes from <a href="#">RFC 7042</a>.....</a>	<a href="#">5</a>
<a href="#">1.3 The IEEE Registration Authority.....</a>	<a href="#">6</a>
<a href="#">1.4 The IANA Organizationally Unique Identifier.....</a>	<a href="#">6</a>
<a href="#">1.5 CFM Code Points.....</a>	<a href="#">6</a>
<a href="#">2. Ethernet Identifier Parameters.....</a>	<a href="#">8</a>
<a href="#">2.1 48-Bit MAC Identifiers, OUIs, and Other Prefixes.....</a>	<a href="#">8</a>
<a href="#">2.1.1 Special First Octet Bits.....</a>	<a href="#">9</a>
<a href="#">2.1.2 OUIs and CIDs.....</a>	<a href="#">10</a>
<a href="#">2.1.3 EUI-48 Assignments under the IANA OUI.....</a>	<a href="#">11</a>
<a href="#">2.1.4 EUI-48 Documentation Values.....</a>	<a href="#">12</a>
<a href="#">2.1.5 EUI-48 IANA Assignment Considerations.....</a>	<a href="#">12</a>
<a href="#">2.2 64-Bit MAC Identifiers.....</a>	<a href="#">13</a>
<a href="#">2.2.1. IPv6 Use of Modified EUI-64 Identifiers.....</a>	<a href="#">13</a>
<a href="#">2.2.2 EUI-64 IANA Assignment Considerations.....</a>	<a href="#">15</a>
<a href="#">2.2.3 EUI-64 Documentation Values.....</a>	<a href="#">16</a>
<a href="#">2.3 Other 48-bit MAC Identifiers Used by the IETF.....</a>	<a href="#">17</a>
<a href="#">2.3.1 Identifiers Prefixed '33-33'.....</a>	<a href="#">17</a>
<a href="#">2.3.2 The 'CF Series'.....</a>	<a href="#">17</a>
<a href="#">2.3.2.1 Changes to <a href="#">RFC 2153</a>.....</a>	<a href="#">18</a>
<a href="#">2.4 CBOR Tags.....</a>	<a href="#">18</a>
<a href="#">3. Ethernet Protocol Parameters.....</a>	<a href="#">19</a>
<a href="#">3.1 Ethernet Protocol Assignment under the IANA OUI.....</a>	<a href="#">20</a>
<a href="#">3.2 Documentation Protocol Number.....</a>	<a href="#">21</a>
<a href="#">4. Other OUI-Based Parameters.....</a>	<a href="#">22</a>
<a href="#">4.1 LLDP IETF Vendor-Specific TLV Type.....</a>	<a href="#">22</a>
<a href="#">5. IANA Considerations.....</a>	<a href="#">23</a>
<a href="#">5.1 Expert Review and IESG Ratification.....</a>	<a href="#">23</a>
<a href="#">5.2 IANA Web Page Changes.....</a>	<a href="#">24</a>
<a href="#">5.3 MAC Address AFNs and RRTYPEs.....</a>	<a href="#">25</a>
<a href="#">5.4 Informational IANA Web Page Material.....</a>	<a href="#">25</a>
<a href="#">5.5 OUI Exhaustion.....</a>	<a href="#">25</a>

<a href="#">5.6</a>	<a href="#">IANA OUI MAC Address Table.....</a>	<a href="#">26</a>
<a href="#">5.7</a>	<a href="#">IANA LLDP TLV Subtypes.....</a>	<a href="#">26</a>
<a href="#">5.8</a>	<a href="#">CBOR Tag Assignments.....</a>	<a href="#">26</a>
<a href="#">6.</a>	<a href="#">Security Considerations.....</a>	<a href="#">27</a>
<a href="#">7.</a>	<a href="#">Acknowledgements.....</a>	<a href="#">27</a>
	<a href="#">Normative References.....</a>	<a href="#">28</a>
	<a href="#">Informative References.....</a>	<a href="#">28</a>

## Table of Contents (continued)

<a href="#">Appendix A.</a>	<a href="#">Templates.....</a>	<a href="#">32</a>
<a href="#">A.1</a>	<a href="#">EUI-48/EUI-64 Identifier or Identifier Block Template.</a>	<a href="#">32</a>
<a href="#">A.2</a>	<a href="#">IANA OUI/CID-Based Protocol Number Template.....</a>	<a href="#">32</a>
<a href="#">A.3</a>	<a href="#">Other IANA OUI/CID-Based Parameter Template.....</a>	<a href="#">33</a>
<a href="#">Appendix B.</a>	<a href="#">Ethertypes.....</a>	<a href="#">34</a>
<a href="#">B.1</a>	<a href="#">IESG Statement on Ethertypes.....</a>	<a href="#">34</a>
	<a href="#">Authors' Addresses.....</a>	<a href="#">35</a>

## 1. Introduction

Some IETF protocols use Ethernet or other IEEE 802-related communication frame formats and parameters [[IEEE802](#)]. These include MAC (Media Access Control) addresses and protocol identifiers.

This document specifies IANA considerations for the assignment of code points under the IANA OUI, including MAC addresses and protocol identifiers, and provides some values for use in documentation. As noted in [[RFC2606](#)] and [[RFC5737](#)], the use of designated code values reserved for documentation and examples reduces the likelihood of conflicts and confusion arising from their duplication of code points assigned for some deployed use. This document also discusses several other uses by the IETF of IEEE 802 code points, including IEEE 802 Connectivity Fault Management (CFM) code points [[RFC7319](#)] and IEEE 802 Link Local Discovery Protocol (LLDP [802.1AB]) Vendor-Specific TLV Sub-Types [[RFC8520](#)]. It also specifies CBOR tags for MAC addresses and OUI/CIDs.

[RFC8126] is incorporated herein except where there are contrary provisions in this document. In this document, "IESG Ratification" is used in some cases. IESG Ratification is specified in [Section 5.1](#). It is not the same as "IESG Approval" in [[RFC8126](#)].

## 1.1 Notations Used in This Document

This document uses hexadecimal notation. Each octet (that is, 8-bit byte) is represented by two hexadecimal digits giving the value of the octet as an unsigned integer. Successive octets are separated by a hyphen. This document consistently uses IETF ("network") bit ordering although the physical order of bit transmission within an octet on an IEEE [[802.3](#)] link is from the lowest order bit to the highest order bit (i.e., the reverse of the IETF's ordering).

In this document:

"AFN"      Address Family Number [[RFC4760](#)].

"CBOR"      Concise Binary Object Representation [[RFC8949](#)].

"CFM"      Connectivity Fault Management [[RFC7319](#)].

"CID"      Company Identifier.

"EUI"      Extended Unique Identifier.

"IAB"      Individual Address Block, not Internet Architecture Board.

"IEEE"      Institute for Electrical and Electronics Engineers  
([www.ieee.org](http://www.ieee.org)).

"IEEE-SA"      IEEE Standards Association ([standards.ieee.org](http://standards.ieee.org)).

"MA-L"      MAC Address Block Large, commonly referred to as an OUI.

"MA-M"      MAC Address Block Medium.

"MA-S"      MAC Address Block Small.

"MAC"      Media Access Control, not Message Authentication Code.

"MAC-48"      A 48-bit MAC address. This term is obsolete. If globally unique, use EUI-48.

"OUI"      Organizationally Unique Identifier. An OUI is now officially called an "MA-L" by the IEEE.

"RRTYPE"   A DNS Resource Record type [[RFC6895](#)].

"SLAP"      IEEE 802 Structured Local Address Plan [802\_0&A].

"tag"       "Tag" is used in two contexts in this document. For "Ethernet tag", see [Section 3](#). For "CBOR tag", see [Section 2.4](#).

"TLV"       Type, Length, Value.

"\*\*"        The double asterisk symbol indicates exponentiation. For example, 2\*\*24 is two to the twenty-fourth power.

## [1.2](#) Changes from [RFC 7042](#)

This document obsoletes [[RFC7042](#)] and makes the changes listed below. However, the completed application template based upon which an IANA OUI-based protocol number value was assigned for document use remains that in [Appendix C of RFC 7042](#).

- o Adds information on MA-M (28-bit) and MA-S (36-bit) EUI prefixes that the IEEE Registration Authority assigns.
- o Adds information on the restructuring of the "local" MAC address space into four quadrants under the Structured Local Address Plan (SLAP [802\_0&A]).
- o Includes the IESG Statement on Ethertypes (See [Appendix B.1](#)).

- o Mentions that IEEE 802 CFM Codepoints that have been allocated to the IETF (see [Section 1.5](#)).
- o Mentions the vendor specific LLDP data element that has been assigned under the IANA OUI (see [Section 4.1](#)).
- o Clarifies minor details in [Section 5.1](#) on Expert Review and IESG

Ratification.

- o Specified CBOR tags for MAC addresses and OUI/CIDs (see [Section 2.4](#)).

### [1.3](#) The IEEE Registration Authority

Originally the responsibility of Xerox Corporation, the registration authority for Ethernet parameters is now the IEEE Registration Authority, available on the web at:

<http://standards.ieee.org/regauth/>

The IEEE Registration Authority operates under the direction of the IEEE-SA Board of Governors. Anyone may apply to that Authority for parameter assignments. The IEEE Registration Authority may impose fees or other requirements but commonly waives fees for applications from standards development organizations.

Lists of assignments and their holders are downloadable from the IEEE Registration Authority site.

### [1.4](#) The IANA Organizationally Unique Identifier

The Organizationally Unique Identifier (OUI) 00-00-5E has been assigned to IANA by the IEEE Registration Authority.

There is no OUI value reserved at this time for documentation, but there are documentation code points under the IANA OUI specified below.

### [1.5](#) CFM Code Points

The IEEE has allocated two blocks of 802 Connectivity Fault Management (CFM) code points to the IETF, one for CFM OpCodes and one for CFM TLV Types. For further information see [\[RFC7319\]](#). The IANA "Connectivity Fault Management (CFM) OAM IETF Parameters" Registry

has subregistries for these code points. This document does not further discuss these blocks of code points.



## 2. Ethernet Identifier Parameters

[Section 2.1](#) discusses 48-bit MAC identifiers, their relationship to OUIs and other prefixes, and assignment under the IANA OUI. [Section 2.2](#) extends this to 64-bit identifiers. [Section 2.3](#) discusses other IETF MAC identifier use not under the IANA OUI. [Section 2.4](#) specifies CBOR tags for MAC addresses and OUI/CIDs.

([\[RAC OUI\]](#) indicates that the IEEE Registration Authority Committee was at one time exploring the feasibility of defining 128-bit identifiers. [\[RAC OUI\]](#) is an expired draft that also provides additional historic information on [\[IEEE802\]](#) registries.)

### 2.1 48-Bit MAC Identifiers, OUIs, and Other Prefixes

48-bit MAC "addresses" are the most commonly used Ethernet interface identifiers. Those that are globally unique are also called EUI-48 identifiers (Extended Unique Identifier 48). An EUI-48 is structured into an initial prefix assigned by the IEEE Registration Authority and additional bits assigned by the prefix owner. Currently there are three lengths of prefixes assigned as shown in the table below; however, some prefix bits have special meaning as shown in Figure 1.

Prefix Length in bits	Name	Owner Supplied Bits for EUI-48
24	MAC-L (OUI)	24
28	MAC-M	20
36	MAC-S	12

The bottom four bits, as shown in Figure 1, of the first octet of the 3-octet 48-bit MAC have special meaning and are referred to below as the M, X, Y, and Z bits.

0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	.	.	.	.	Z	Y	X	M		.	.	.	.	.	.	.
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.
+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

octets 0&1

octets 2&3

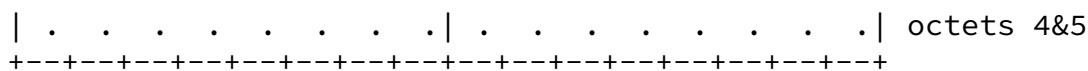


Figure 1. 48-bit MAC Address Structure

Except for certain combinations of the Z, Y, and X bits as discussed in [Section 2.1.1](#), a MAC address begins with 3 octets or a larger

initial prefix indicating the assignee of the block of MAC addresses followed by a sequence of additional octets so as to add up to the total MAC address length, usually 48 bits. For example, the IEEE has assigned IABs (Individual Address Blocks), where the first 4 1/2 octets (36 bits) are assigned, giving the holder of the IAB 1 1/2 octets (12 bits) they can control in constructing 48-bit MAC addresses; however, IABs have become historic, and a wider range of prefix lengths are available [[RAC OUI](#)].

The IEEE describes its assignment procedures and policies for IEEE 802-related identifiers in [802\_0&A]. An IEEE tutorial on EUIs, OUIs, and CIDs is available at [[IEEEtutorial](#)].

### [2.1.1](#) Special First Octet Bits

Four bits within the initial octet of an IEEE MAC interface identifier, such as an EUI-48, have special significance [802\_0&A] as follows:

- M bit --- This bit always indicates a group address and is frequently referred to as the group bit. If it is zero, the MAC address is unicast. If it is a one, the address is groupcast (multicast or broadcast). This meaning is independent of the values of the X, Y, and Z bits.
- X bit --- This bit was previously called the "local" bit. If it is zero, the MAC address is a global address under the control of the owner of the IEEE assigned prefix. Previously, if it was a one, the MAC address was considered "local" and under the assignment and control of the local network operator (but see [Section 2.3](#)). Now, if it is a one, the nature of the MAC address is optionally

determined by the Y and Z bits under the IEEE 802 Structured Local Address Plan (SLAP) as described below.

Y&Z bits - These two bits have no special meaning if the X bit is zero. If the X bit is one, these two bits divide the formerly uniform "local" MAC address space into four quadrants, as follows. These quadrants are further described below.

Y bit	Z bit	Quadrant
-----	-----	-----
0	0	Administratively Assigned
0	1	Extended Local
1	0	Reserved
1	1	Standard Assigned

While a local network administrator can assign any addresses with the X bit a one, the optional SLAP characterizes the four quadrants of the "local" address space using the Y and Z bits as follows:

Administratively Assigned - MAC addresses in this quadrant are called Administratively Assigned Identifiers. This is intended for arbitrary local assignment, such as random assignment; however, see [Section 2.3.1](#).

Extended Local - MAC addresses in this quadrant are called Extended Local Identifiers. These addresses are not actually "local" under SLAP. They are available to the organization that has been assigned the CID (see [Section 2.1.2](#)) specifying the other 20 bits of the 24-bit prefix with X, Y, and Z bits having the values 1, 0, and 1 respectively.

Reserved - MAC addresses in this quadrant are reserved for future use under the SLAP. Until such future use, they could be locally assigned as Administratively Assigned Identifiers are assigned but there is a danger that future SLAP use would conflict with such local assignments.

Standard Assigned - MAC addresses in this quadrant are known as Standard Assigned Identifiers. It is intended that such addresses be assigned and possibly revoked through a

local protocol. There is work in the IEEE [[802.1CQ](#)] and the IETF [[RFC8947](#)] [[RFC8948](#)] related to such protocols.

### [2.1.2](#) OUIs and CIDs

OUI, MAC-M, and MAC-S MAC prefixes are assigned with the Local bit zero and the Group bit unspecified. Multicast identifiers may be constructed by turning on the Group bit, and unicast identifiers may be constructed by leaving the Group bit zero.

The Local bit is zero for globally unique EUI-48 identifiers assigned by the owner of an OUI or owner of a longer prefix. If the Local bit is a one, the identifier has historically been a local identifier under the control of the local network administrator; however, there are now recommendations on optional management of the local address space as discussed in [Section 2.1.1](#). If the Local bit is on, the holder of an OUI has no special authority over MAC identifiers whose first 3 octets correspond to their OUI or the beginning of their longer prefix.

A CID is a 24-bit Company Identifier. It is assigned for organizations that need such an identifier, that can be used in place

of an OUI, but do not need to assign subsidiary MAC addresses. A CID can be recognized by its X and Z bits having the value 1 and its Y bit having the value 0 (see Figure 1).

An AFN and a DNS RRTYPE have been assigned for 48-bit MAC addresses as discussed in [Section 5.2](#).

### [2.1.3](#) EUI-48 Assignments under the IANA OUI

The OUI 00-00-5E has been assigned to IANA as stated in [Section 1.4](#) above. This includes 2\*24 EUI-48 multicast identifiers from 01-00-5E-00-00-00 to 01-00-5E-FF-FF-FF and 2\*24 EUI-48 unicast identifiers from 00-00-5E-00-00-00 to 00-00-5E-FF-FF-FF.

Of these EUI-48 identifiers, the sub-blocks reserved or thus far assigned by IANA for purposes of documentation are as follows:

Unicast, all blocks of 2\*\*8 addresses thus far:

00-00-5E-00-00-00 through 00-00-5E-00-00-FF: reserved and require IESG Ratification for assignment (see [Section 5.1](#)).

00-00-5E-00-01-00 through 00-00-5E-00-01-FF: assigned for the Virtual Router Redundancy Protocol (VRRP) [[RFC5798](#)].

00-00-5E-00-02-00 through 00-00-5E-00-02-FF: assigned for the IPv6 Virtual Router Redundancy Protocol (IPv6 VRRP) [[RFC5798](#)].

00-00-5E-00-52-00 through 00-00-5E-00-52-FF: used for very small assignments. Currently, 4 out of these 256 values have been assigned.

00-00-5E-00-53-00 through 00-00-5E-00-53-FF: assigned for use in documentation.

00-00-5E-90-01-00 through 00-00-5E-90-01-FF: used for very small assignments that need parallel unicast and multicast MAC addresses. Currently 1 out of these 256 values has been assigned.

Multicast:

01-00-5E-00-00-00 through 01-00-5E-7F-FF-FF: 2\*\*23 addresses assigned for IPv4 multicast [[RFC1112](#)].

01-00-5E-80-00-00 through 01-00-5E-8F-FF-FF: 2\*\*20 addresses assigned for MPLS multicast [[RFC5332](#)].

01-00-5E-90-00-00 through 01-00-5E-90-00-FF: 2\*\*8 addresses being used for very small assignments. Currently, 4 out of these 256 values have been assigned.

01-00-5E-90-01-00 through 01-00-5E-90-01-FF: used for very small assignments that need parallel unicast and multicast MAC addresses. Currently 1 out of these 256 values has been assigned.

01-00-5E-90-10-00 through 01-00-5E-90-10-FF: 2\*\*8 addresses for

use in documentation.

For more detailed and up-to-date information, see the "Ethernet Numbers" registry at <http://www.iana.org>.

#### [2.1.4](#) EUI-48 Documentation Values

The following values have been assigned for use in documentation:

00-00-5E-00-53-00 through 00-00-5E-00-53-FF for unicast and

01-00-5E-90-10-00 through 01-00-5E-90-10-FF for multicast.

#### [2.1.5](#) EUI-48 IANA Assignment Considerations

EUI-48 assignments under the current or a future IANA OUI (see [Section 5.4](#)) must meet the following requirements:

- o must be for standards purposes (either for an IETF Standard or other standard related to IETF work),
- o must be for a power-of-two size block of identifiers starting at a boundary that is an equal or greater power of two, including the assignment of one ( $2^{*0}$ ) identifier,
- o must not be used to evade the requirement for vendors to obtain their own block of identifiers from the IEEE, and
- o must be documented in an Internet-Draft or RFC.

In addition, approval must be obtained as follows (see the procedure in [Section 5.1](#)):

Small to medium assignments of a block of 1, 2, 4, ..., 32768, 65536 ( $2^{*0}$ ,  $2^{*1}$ ,  $2^{*2}$ , ...,  $2^{*15}$ ,  $2^{*16}$ ) EUI-48 identifiers require Expert Review (see [Section 5.1](#)).

Large assignments of 131072 ( $2^{*17}$ ) or more EUI-48 identifiers require IESG Ratification (see [Section 5.1](#)).

## [2.2](#) 64-Bit MAC Identifiers

IEEE also defines a system of 64-bit MAC identifiers including EUI-64s. EUI-64 identifiers are currently used as follows:

- o In a modified form to construct some IPv6 interface identifiers as described in [Section 2.2.1](#)
- o In IEEE Std 1394 (also known as FireWire and i.Link)
- o In IEEE Std 802.15.4 (also known as ZigBee)
- o In [[InfiniBand](#)]

Adding a 5-octet (40-bit) extension to a 3-octet (24-bit) OUI, or a shorter extension to longer assigned prefixes [[RAC OUI](#)] so as to total 64 bits, produces an EUI-64 identifier under that OUI or longer prefix. As with EUI-48 identifiers, the first octet has the same Group and Local bits.

An AFN and a DNS RRTYPE have been assigned for 64-bit MAC addresses as discussed in [Section 5.2](#).

The discussion below is almost entirely in terms of the "Modified" form of EUI-64 identifiers; however, anyone assigned such an identifier can also use the unmodified form as a MAC identifier on any link that uses such 64-bit identifiers for interfaces.

### [2.2.1](#). IPv6 Use of Modified EUI-64 Identifiers

MAC-64 identifiers are used to form the lower 64 bits of some IPv6 addresses ([Section 2.5.1](#) and [Appendix A of \[RFC4291\]](#) and [Appendix A of \[RFC5214\]](#)). When so used, the MAC-64 is modified by inverting the Local/Global bit to form an IETF "Modified EUI-64 identifier". Below is an illustration of a Modified EUI-64 unicast identifier under the IANA OUI, where aa-bb-cc-dd-ee is the extension.

02-00-5E-aa-bb-cc-dd-ee

The first octet is shown as 02 rather than 00 because, in Modified EUI-64 identifiers, the sense of the Local/Global bit is inverted compared with EUI-48 identifiers. It is the globally unique values (universal scope) that have the 02 bit on in the first octet, while

those with this bit off are locally assigned and out of scope for global assignment.

The Local/Global bit was inverted to make it easier for network operators to type in local-scope identifiers. Thus, such Modified EUI-64 identifiers as 1, 2, etc. (ignoring leading zeros) are local. Without the modification, they would have to be 02-00-00-00-00-00-00-01, 02-00-00-00-00-00-00-02, etc. to be local.

As with 48-bit MAC identifiers, the 01 bit on in the first octet indicates a group identifier.

When the first two octets of the extension of a Modified EUI-64 identifier are FF-FE, the remainder of the extension is a 24-bit value as assigned by the OUI owner for an EUI-48. For example:

02-00-5E-FF-FE-yy-yy-yy  
or  
03-00-5E-FF-FE-yy-yy-yy

where yy-yy-yy is the portion (of an EUI-48 global unicast or multicast identifier) that is assigned by the OUI owner (IANA in this case). Thus, any holder of one or more EUI-48 identifiers under the IANA OUI also has an equal number of Modified EUI-64 identifiers that can be formed by inserting FF-FE in the middle of their EUI-48 identifiers and inverting the Local/Global bit.

(Note: [\[EUI-64\]](#) defines FF-FF as the bits to be inserted to create an IEEE EUI-64 identifier from a EUI-48 identifier. That document says the FF-FE value is used when starting with an EUI-48 identifier. The IETF uses only FF-FE to create Modified EUI-64 identifiers from 48-bit Ethernet station identifiers regardless of whether they are EUI-48 or 48-bit local MAC identifiers. EUI-48 and local 48-bit MAC identifiers are syntactically equivalent, and this doesn't cause any problems in practice.)

In addition, certain Modified EUI-64 identifiers under the IANA OUI are reserved for holders of IPv4 addresses as follows:

02-00-5E-FE-xx-xx-xx-xx

where xx-xx-xx-xx is a 32-bit IPv4 address. The owner of an IPv4 address has both a unicast- and multicast-derived EUI-64 address. Modified EUI-64 identifiers from

02-00-5E-FE-F0-00-00-00 to 02-00-5E-FE-FF-FF-FF-FF



are effectively reserved pending the specification of IPv4 Class E addresses. However, for Modified EUI-64 identifiers based on an IPv4 address, the Local/Global bit should be set to correspond to whether

the IPv4 address is local or global. (Keep in mind that the sense of the Modified EUI-64 identifier Local/Global bit is reversed from that in (unmodified) MAC-64 identifiers.)

### [2.2.2](#) EUI-64 IANA Assignment Considerations

The following table shows which Modified EUI-64 identifiers under the IANA OUI are reserved, assigned, or available as indicated. As noted above, the corresponding MAC addresses can be determined by complementing the 02 bit in the first octet. In all cases, the corresponding multicast 64-bit MAC addresses formed by complementing the 01 bit in the first octet have the same status as the modified 64-bit unicast address blocks listed below.

02-00-5E-00-00-00-00-00 to 02-00-5E-0F-FF-FF-FF-FF reserved

02-00-5E-10-00-00-00-00 to 02-00-5E-10-00-00-00-FF assigned for documentation use

02-00-5E-10-00-00-01-00 to 02-00-5E-EF-FF-FF-FF-FF available for assignment

02-00-5E-F0-00-00-00-00 to 02-00-5E-FD-FF-FF-FF-FF reserved

02-00-5E-FE-00-00-00-00 to 02-00-5E-FE-FF-FF-FF-FF assigned to IPv4 address holders as described above

02-00-5E-FF-00-00-00-00 to 02-00-5E-FF-FD-FF-FF-FF reserved

02-00-5E-FF-FE-00-00-00-00 to 02-00-5E-FF-FE-FF-FF-FF assigned for holders of EUI-48 identifiers under the IANA OUI as described above

02-00-5E-FF-FF-00-00-00-00 to 02-00-5E-FF-FF-FF-FF-FF reserved

The reserved identifiers above require IESG Ratification (see [Section](#)

[5.1](#)) for assignment. IANA EUI-64 identifier assignments under the IANA OUI must meet the following requirements:

- o must be for standards purposes (either for an IETF Standard or other standard related to IETF work),
- o must be for a power-of-two size block of identifiers starting at a boundary that is an equal or greater power of two, including the assignment of one ( $2^{*0}$ ) identifier,
- o must not be used to evade the requirement for vendors to obtain their own block of identifiers from the IEEE, and

- o must be documented in an Internet-Draft or RFC.

In addition, approval must be obtained as follows (see the procedure in [Section 5.1](#)):

Small to medium assignments of a block of 1, 2, 4, ..., 134217728, [268435456](#) ( $2^{*0}$ ,  $2^{*1}$ ,  $2^{*2}$ , ...,  $2^{*27}$ ,  $2^{*28}$ ) EUI-64 identifiers require Expert Review (see [Section 5.1](#)).

Assignments of any size, including 536870912 ( $2^{*29}$ ) or more EUI-64 identifiers, may be made with IESG Ratification (see [Section 5.1](#)).

### [2.2.3](#) EUI-64 Documentation Values

The following blocks of unmodified 64-bit MAC addresses are for documentation use. The IPv4-derived addresses are based on the IPv4 documentation addresses [[RFC5737](#)], and the MAC-derived addresses are based on the EUI-48 documentation addresses above.

Unicast Values for Documentation Use:

00-00-5E-EF-10-00-00-00 to 00-00-5E-EF-10-00-00-FF general

00-00-5E-FE-C0-00-02-00 to 00-00-5E-FE-C0-00-02-FF and

00-00-5E-FE-C6-33-64-00 to 00-00-5E-FE-C6-33-64-FF and

00-00-5E-FE-CB-00-71-00 to 00-00-5E-FE-CB-00-71-FF IPv4 derived

00-00-5E-FF-FE-00-53-00 to 00-00-5E-FF-FE-00-53-FF EUI-48 derived

00-00-5E-FE-EA-C0-00-02 and

00-00-5E-FE-EA-C6-33-64 and

00-00-5E-FE-EA-CB-00-71 IPv4 multicast derived from IPv4 unicast  
[[RFC6034](#)]

#### Multicast Values for Documentation Use:

01-00-5E-EF-10-00-00-00 to 01-00-5E-EF-10-00-00-FF general

01-00-5E-FE-C0-00-02-00 to 01-00-5E-FE-C0-00-02-FF and

01-00-5E-FE-C6-33-64-00 to 01-00-5E-FE-C6-33-64-FF and

01-00-5E-FE-CB-00-71-00 to 01-00-5E-FE-CB-00-71-FF IPv4 derived

01-00-5E-FE-EA-C0-00-02 and

01-00-5E-FE-EA-C6-33-64 and

01-00-5E-FE-EA-CB-00-71 IPv4 multicast derived from IPv4 unicast  
[[RFC6034](#)]

01-00-5E-FF-FE-90-10-00 to 01-00-5E-FF-FE-90-10-FF EUI-48 derived

### [2.3](#) Other 48-bit MAC Identifiers Used by the IETF

There are two other blocks of 48-bit MAC identifiers that are used by the IETF as described below.

#### [2.3.1](#) Identifiers Prefixed '33-33'

All 48-bit multicast MAC identifiers prefixed "33-33" (that is, the 2<sup>32</sup> multicast MAC identifiers in the range from 33-33-00-00-00-00 to 33-33-FF-FF-FF-FF) are used as specified in [[RFC2464](#)] for IPv6 multicast. In all of these identifiers, the Group bit (the bottom bit of the first octet) is on, as is required to work properly with existing hardware as a multicast identifier. They also have the Local bit on but any ethernet using standard IPv6 multicast should note that these addresses will be used for that purpose. These multicast MAC addresses fall into the administratively assigned SLAP

quadrant (see [Section 2.1.1](#)).

(Historical notes: It was the custom during IPv6 design to use "3" for unknown or example values and 3333 Coyote Hill Road, Palo Alto, California, is the address of PARC (Palo Alto Research Center, formerly "Xerox PARC"). Ethernet was originally specified by the Digital Equipment Corporation, Intel Corporation, and Xerox Corporation. The pre-IEEE [\[802.3\]](#) Ethernet protocol has sometimes been known as "DIX" Ethernet from the first letters of the names of these companies.)

### [2.3.2](#) The 'CF Series'

The Informational [\[RFC2153\]](#) declared the 3-octet values from CF-00-00 through CF-FF-FF to be OUIs available for assignment by IANA to software vendors for use in PPP [\[RFC1661\]](#) or for other uses where vendors do not otherwise need an IEEE-assigned OUI. It should be noted that, when used as 48-bit MAC prefixes, these values have all of the Z, Y, X (Local), and M (Group) special bits at the bottom of the first octet equal to one, while all IEEE-assigned OUIs thus far have the X and M bits zero. Multicast MAC addresses constructed with a "CF" series OUI would fall into the standard assigned SLAP quadrant (see [Section 2.1.1](#)). The Group bit is meaningless in PPP. To quote [\[RFC2153\]](#): "The 'CF0000' series was arbitrarily chosen to match the PPP NLPID 'CF', as a matter of mnemonic convenience." (For further information on NLPIDs, see [\[RFC6328\]](#).)

CF-00-00 is reserved, and IANA lists multicast identifier CF-00-00-00-00-00-00 as used for Ethernet loopback tests.

In over a decade of availability, only a handful of values in the CF Series have been assigned. (See "Ethernet Numbers" [<http://www.iana.org/assignments/ethernet-numbers>](http://www.iana.org/assignments/ethernet-numbers) and "PPP Numbers" [<http://www.iana.org/assignments/ppp-numbers>](http://www.iana.org/assignments/ppp-numbers)).

#### [2.3.2.1](#) Changes to [RFC 2153](#)

The IANA Considerations in [\[RFC2153\]](#) were updated as follows by the approval of [RFC 5342](#) and remain so updated (no technical changes have

been made):

- o Use of these 'CF Series' identifiers based on IANA assignment was deprecated.
- o IANA was instructed not to assign any further values in the 'CF Series'.

## [2.4](#) CBOR Tags

The Concise Binary Object Representation (CBOR [[RFC8949](#)]) is a data format whose design goals include the possibility of very small code size, fairly small message size, and extensibility. In CBOR, a data item can be enclosed by a CBOR tag to give it some additional semantics identified by that tag.

IANA has assigned TBD1 as the CBOR tag to indicate a MAC address. The enclosed data item is a byte string. The length of the byte string indicates whether a 48-bit (6 byte) or 64-bit (8 byte) MAC address is encoded. Should some other multiple of 8 bits length MAC addresses be used in the future, such as a 128-bit (16 byte) MAC address, the TBD1 tag will be used.

IANA has assigned TDB2 as the CBOR tag to indicate an OUI/CID. The enclosed data item is a byte string of length 4 to hold the 32-bit OUI or CID (see [Section 2.1.2](#)).

## [3](#). Ethernet Protocol Parameters

Ethernet protocol parameters provide a means of indicating the contents of a frame -- for example, that its contents are IPv4 or IPv6.

The concept has been extended to labeling by Ethernet "tags". An Ethernet tag in this sense is a prefix whose type is identified by an Ethertype that is then followed by either another tag, an Ethertype, or an LSAP (Link-Layer Service Access Point) protocol indicator for the "main" body of the frame, as described below. Traditionally, in the [802\_0&A] world, tags are a fixed length and do not include any encoding of their own length. Any device that is processing a frame cannot, in general, safely process anything in the frame past an Ethertype it does not understand. An example is the C-Tag (formerly the Q-Tag) [802.1Q]. It provides customer VLAN and priority information for a frame.

There are two types of protocol identifier parameters that can occur in Ethernet frames after the initial MAC-48 destination and source identifiers:

Ethertypes: These are 16-bit identifiers appearing as the initial two octets after the MAC destination and source (or after a tag), which, when considered as an unsigned integer, are equal to or larger than 0x0600.

LSAPs: These are 8-bit protocol identifiers that occur in pairs immediately after an initial 16-bit (two-octet) remaining frame length, which is in turn after the MAC destination and source (or after a tag). Such a length must, when considered as an unsigned integer, be less than 0x5DC, or it could be mistaken as an Ethertype. LSAPs occur in pairs where one is intended to indicate the source protocol handler and one the destination protocol handler; however, use cases where the two are different have been relatively rare.

Neither Ethertypes nor LSAPs are assigned by IANA; they are assigned by the IEEE Registration Authority (see [Section 1.3](#) above and [Appendix B](#)). However, both LSAPs and Ethertypes have extension mechanisms so that they can be used with five-octet Ethernet protocol identifiers under an OUI, including those assigned by IANA under the IANA OUI.

When using the IEEE 802 Logical Link Control (LLC) format (Subnetwork Access Protocol (SNAP)) [802\_0&A] for a frame, an OUI-based protocol identifier can be expressed as follows:

xx-xx-AA-AA-03-yy-yy-yy-zz-zz

where xx-xx is the frame length and, as above, must be small enough not to be confused with an Ethertype; "AA" is the LSAP that indicates this use and is sometimes referred to as the SNAP Service Access Point (SAP); "03" is the LLC control octet indicating datagram service; yy-yy-yy is an OUI; and zz-zz is a protocol number, under that OUI, assigned by the OUI owner. The five-octet length for such OUI-based protocol identifiers was chosen so that, with the LLC control octet ("03"), the result is 16-bit aligned.

When using an Ethertype to indicate the main type for a frame body, the special "OUI Extended Ethertype" 88-B7 is available. Using this Ethertype, a frame body can begin with

88-B7-yy-yy-yy-zz-zz

where yy-yy-yy and zz-zz have the same meaning as in the SNAP format described above.

It is also possible, within the SNAP format, to use an arbitrary Ethertype. Putting the Ethertype as the zz-zz field after an all-zeros OUI (00-00-00) does this. It looks like

xx-xx-AA-AA-03-00-00-00-zz-zz

where zz-zz is the Ethertype.

(Note that, at this point, the 802 protocol syntax facilities are sufficiently powerful that they could be chained indefinitely. Whether support for such chaining is generally required is not clear, but [802\_0&A] requires support for

xx-xx-AA-AA-03-00-00-00-88-B7-yy-yy-yy-zz-zz

although this could be more efficiently expressed by simply pinching out the "00-00-00-88-B7" in the middle.)

As well as labeling frame contents, 802 protocol types appear within NBMA (Non-Broadcast Multi-Access) Next Hop Resolution Protocol [RFC2332] messages. Such messages have provisions for both two-octet Ethernets and OUI-based protocol types. 16-bit Ethernets also occur in the Generic Router Encapsulation (GRE [RFC2784]) header.

### 3.1 Ethernet Protocol Assignment under the IANA OUI

Two-octet protocol numbers under the IANA OUI are available, as in

INTERNET-DRAFT

IANA/IETF and IEEE 802 Parameters

March 2022

where qq-qq is the protocol number.

A number of such assignments have been made out of the 2\*16 protocol numbers available from 00-00-5E-00-00 to 00-00-5E-FF-FF (see [[IANA](#)]). The extreme values of this range, 00-00-5E-00-00 and 00-00-5E-FF-FF, are reserved and require IESG Ratification for assignment (see [Section 5.1](#)). New assignments of SNAP SAP protocol (qq-qq) numbers under the IANA OUI must meet the following requirements:

- o the assignment must be for standards use (either for an IETF Standard or other standard related to IETF work),
- o it must be documented in an Internet-Draft or RFC, and
- o such protocol numbers are not to be assigned for any protocol that has an Ethertype (because that can be expressed by putting an all-zeros "OUI" before the Ethertype as described above).

In addition, the Expert Review (or IESG Ratification for the two reserved values) must be obtained using the procedure specified in [Section 5.1](#).

### [3.2](#) Documentation Protocol Number

0x0042 is a protocol number under the IANA OUI (that is, 00-00-5E-00-42) to be used as an example for documentation purposes.



#### [4.](#) Other OUI-Based Parameters

Some IEEE 802 and other protocols provide for parameters based on an OUI beyond those discussed above. Such parameters most commonly consist of an OUI plus one octet of additional value. They are usually called "vendor specific" parameters, although "organization specific" might be more accurate. They would look like

yy-yy-yy-zz

where yy-yy-yy is the OUI and zz is the additional specifier. An example is the Cipher Suite Selector in IEEE [[802.11](#)].

Values may be assigned under the IANA OUI for such other OUI-based parameter usage by Expert Review except that, for each use, the additional specifier values consisting of all zero bits and all one bits (0x00 (00-00-5E-00) and 0xFF (00-00-5E-FF) for a one-octet specifier) are reserved and require IESG Ratification (see [Section 5.1](#)) for assignment; also, the additional specifier value 0x42 (00-00-5E-42) is assigned for use as an example in documentation.

Assignments of such other IANA OUI-based parameters must be for standards use (either for an IETF Standard or other standard related to IETF work) and be documented in an Internet-Draft or RFC. The first time a value is assigned for a particular parameter of this type, an IANA registry will be created to contain that assignment and any subsequent assignments of values for that parameter under the IANA OUI. The Expert will specify the name of the registry.

If different policies from those above are required for such a parameter, a BCP or Standards Track RFC must be adopted to update this BCP and specify the new policy and parameter.

#### [4.1](#) LLDP IETF Vendor-Specific TLV Type

An example of such an "other IANA OUI based parameter" is specified in [[RFC8520](#)]. This provides for a "vendor based" TLV type for announcing a Manufacturer Usage Description (MUD) Uniform Resource Locator (URL) in the IEEE Link Local Discover Protocol (LLDP [802.1AB]). (See also [Section 5.7.](#))

### [5.](#) IANA Considerations

This document concerns IANA considerations for the assignment of Ethernet parameters in connection with the IANA OUI and related matters.

NOTE: The "IETF OUI Ethernet Numbers" IANA web page is for registries of numbers assigned under the IETF OUI while the "IEEE 802 Numbers" IANA web page has Informational lists of numbers assigned by the IEEE Registration Authority.

This document does not create any new IANA registries.

The MAC address values assigned for documentation and the protocol number for documentation were both assigned by [[RFC7042](#)].

No existing assignment is changed by this document.

#### [5.1](#) Expert Review and IESG Ratification

This section specifies the procedure for Expert Review and IESG Ratification of MAC, protocol, and other IANA OUI-based identifiers. The Expert(s) referred to in this document shall consist of one or

more persons appointed by and serving at the pleasure of the IESG.

The procedure described for Expert Review assignments in this document is fully consistent with the IANA Expert Review policy described in [[RFC8126](#)].

While finite, the universe of code points from which Expert-judged assignments will be made is felt to be large enough that the requirements given in this document and the Experts' good judgment are sufficient guidance. The idea is for the Expert to provide a light sanity check for small assignments of EUI identifiers, with increased scrutiny by the Expert for medium-sized assignments of EUI identifiers and assignments of protocol identifiers and other IANA OUI-based parameters. However, it can make sense to assign very large portions of the MAC identifier code point space. (Note that existing assignments include one for 1/2 of the entire multicast IANA EUI-48 code point space and one for 1/16 of that multicast code point space.) In those cases, and in cases of the assignment of "reserved" values, IESG Ratification of an Expert Review approval recommendation is required as described below. The procedure is as follows:

The applicant always completes the appropriate template from [Appendix A](#) below and sends it to IANA <iana@iana.org>.

IANA always sends the template to an appointed Expert. If the Expert recuses themselves or is non-responsive, IANA may choose an alternative appointed Expert or, if none is available, will contact the IESG.

In all cases, if IANA receives a disapproval from an Expert selected to review an application template, the application will be denied. The Expert should provide a reason for refusal which IANA will communicate back to the applicant.

If the assignment is based on Expert Review:

If IANA receives approval and code points are available, IANA will make the requested assignment.

If the assignment is based on IESG Ratification:

The procedure starts with the first steps above for Expert Review. If the Expert disapproves the application, they simply inform IANA; however, if the Expert believes the application should be approved, or is uncertain and believes that the circumstances warrant the attention of the IESG, the Expert will inform IANA about their advice, and IANA will forward the application, together with the reasons provided by the Expert for approval or uncertainty, to the IESG. The IESG must decide whether the assignment will be granted. This can be accomplished by a management item in an IESG telechat as is done for other types of requests. If the IESG decides not to ratify a favorable opinion by the Expert or decides against an application where the Expert is uncertain, the application is denied; otherwise, it is granted. The IESG will communicate its decision to the Expert and to IANA. In case of refusal, the IESG should provide a reason which IANA will communicate to the applicant.

## [5.2](#) IANA Web Page Changes

As this document replaces [\[RFC7042\]](#), references to [\[RFC7042\]](#) in IANA registries on both the IANA IEEE 802 Numbers web page and the IANA IETF OUI Ethernet Numbers web pages will be replaced by references to [this document]. Other IANA web page references to [\[RFC7042\]](#) are not changed.

For clarity and parallelism with the IANA "IEEE 802 Numbers" web page, the IANA "Ethernet Numbers" web page is re-named the "IETF OUI Ethernet Numbers" web page.

## [5.3](#) MAC Address AFNs and RRTYPES

IANA has assigned Address Family Numbers (AFNs) for MAC addresses as follows:

AFN	Decimal	Hex	Reference
-----	-----	-----	-----
48-bit MAC	16389	0x4005	<a href="#">[RFC7042]</a>
64-bit MAC	16390	0x4006	<a href="#">[RFC7042]</a>

24-bit OUI            16391            0x4007            [[RFC7961](#)]

MAC/24                16392            0x4008            [[RFC7961](#)]  
Lower 24 bits of a 48-bit MAC address

MAC/40                16393            0x4009            [[RFC7961](#)]  
Lower 40 bits of a 64-bit MAC address

IANA has assigned DNS RRTYPES [[RFC6895](#)] for MAC addresses as follows:

Data	Mnemonic	RRTYPE Code		Reference
		Decimal	Hex	
-----	-----	-----	-----	-----
48-bit MAC	EUI48	108	0x006C	[ <a href="#">RFC7043</a> ]
64-bit MAC	EUI64	109	0x006D	[ <a href="#">RFC7043</a> ]

#### [5.4](#) Informational IANA Web Page Material

IANA maintains an informational listing on its web site concerning Ethertypes, OUIs, and multicast addresses assigned under OUIs other than the IANA OUI. The title of this informational registry is "IEEE 802 Numbers". IANA will update that informational registry when changes are provided or approved by the Expert(s).

#### [5.5](#) OUI Exhaustion

When the available space for either multicast or unicast EUI-48 identifiers under OUI 00-00-5E has been 90% or more exhausted, IANA should request an additional OUI from the IEEE Registration Authority for further IANA assignment. The appointed Expert(s) should monitor for this condition and notify IANA.

#### [5.6](#) IANA OUI MAC Address Table

No changes have been made in the "IANA Unicast 48-bit MAC Addresses" and "IANA Multicast 48-bit MAC Addresses" tables except for the updates to references as specified in [Section 5.2](#).

## [5.7](#) IANA LLDP TLV Subtypes

The IANA Link Layer Discovery Protocol (LLDP) TLV Subtypes" Registry is moved from the IANA 802 Numbers web page to the IANA Ethernet Numbers web page. Three entries in the Registry are updated as follows:

Value	Description	Reference
0	Reserved	[this document]
42	Example for use in documentation	[this document]
255	Reserved	[this document]

The entries for 1 (MUD), 2-41 (unassigned), and 43-254 (unassigned) are unchanged.

## [5.8](#) CBOR Tag Assignments

IANA is requested to assign two CBOR Tags as shown below:. [The values of 48 and 49 are requested for TBD1 and TBD2 respectively.]

Tag	Data Item	Semantics	Reference
TBD1	byte string	IEEE MAC Address	[this document]
TBD2	byte string	IEEE OUI/CID	[this document]

## [6](#). Security Considerations

This document is concerned with assignment of parameters under the IANA OUI and closely related matters. It is not directly concerned with security except as follows:

Confusion and conflict can be caused by the use of MAC addresses or other OUI-derived protocol parameters as examples in documentation. Examples that are "only" to be used in documentation can end up being coded and released or cause conflicts due to later real use and the possible acquisition of intellectual property rights in such addresses or parameters. The reservation herein of MAC addresses and parameters for documentation purposes will minimize such confusion and conflict.

See [[RFC7043](#)] for security considerations in storing MAC addresses in the DNS.

## [7](#). Acknowledgements

The comments and suggestions of the following people, listed in alphabetic order, are gratefully acknowledged:

Comments and suggestions leading to this Document:

TBD

Comments and suggestions leading to [RFC 7042](#) (which is obsoleted by this document):

David Black, Adrian Farrel, Bob Grow, Joel Jaeggli, Pearl Liang, Glenn Parsons, Pete Resnick, and Dan Romascanu.

---

INTERNET-DRAFT

IANA/IETF and IEEE 802 Parameters

March 2022

## Normative References

[802\_0&A] - "IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture", IEEE Std 802-2014, 12 June 2014.

"Standard for Local and Metropolitan Area Networks: Overview and Architecture - Draft Amendment: Local Medium Access Control (MAC) Address Usage", IEEE 802c, Draft 2.2, April 2017.

[RFC8126] - Cotton, M., Leiba, B., and T. Narten, "Guidelines for Writing an IANA Considerations Section in RFCs", [BCP 26](#), [RFC 8126](#), DOI 10.17487/RFC8126, June 2017, <<https://www.rfc-editor.org/info/rfc8126>>.

## Informative References

[802.1CQ] - IEEE 802, "Standard for Local and Metropolitan Area Networks: Multicast and Local Address Assignment", work in progress.

[802.1Q] - "IEEE Standard for Local and metropolitan area networks / Media Access Control (MAC) Bridges and Virtual Bridge Local Area Networks", IEEE Std 802.1Q-2011, 31 August 2011.

[802.3] - "IEEE Standard for Ethernet", IEEE Std 802.3-2012, 28 December 2012.

[802.11] - "IEEE Standard for Information technology / Telecommunications and information exchange between systems / Local and metropolitan area networks / Specific requirements / Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications", IEEE Std 802.11-2012, 29 March 2012.



[EUI-64] - IEEE Registration Authority, "Guidelines for 64-bit Global Identifier (EUI-64(TM))", <<http://standards.ieee.org/regauth/oui/tutorials/EUI64.html>>, November 2012.

[IANA] - Internet Assigned Numbers Authority, <<http://www.iana.org>>.

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

[IEEEtutorial] - IEEE, "Guidelines for Use of Extended Unique Identifier (EUI), Organizationally Unique Identifier (OUI), and Company ID (CID)",  
<<https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/tutorials/eui.pdf>>, 3 August 2017.

[InfiniBand] - InfiniBand Trade Association, "InfiniBand Architecture Specification Volume 1", November 2007.

[RAC\_OUI] - Parsons, G., "OUI Registry Restructuring",  
[draft-ieee-rac-oui-restructuring-01.txt](#), work in Progress,  
September 2013.

[RFC1112] - Deering, S., "Host extensions for IP multicasting", STD 5, [RFC 1112](#), August 1989.

[RFC1661] - Simpson, W., Ed., "The Point-to-Point Protocol (PPP)", STD 51, [RFC 1661](#), July 1994.

[RFC2153] - Simpson, W., "PPP Vendor Extensions", [RFC 2153](#), May 1997.

[RFC2332] - Luciani, J., Katz, D., Piscitello, D., Cole, B., and N. Doraswamy, "NBMA Next Hop Resolution Protocol (NHRP)", [RFC 2332](#), April 1998.

[RFC2464] - Crawford, M., "Transmission of IPv6 Packets over Ethernet

Networks", [RFC 2464](#), December 1998.

[RFC2606] - Eastlake 3rd, D. and A. Panitz, "Reserved Top Level DNS Names", [BCP 32](#), [RFC 2606](#), June 1999.

[RFC2784] - Farinacci, D., Li, T., Hanks, S., Meyer, D., and P. Traina, "Generic Routing Encapsulation (GRE)", [RFC 2784](#), DOI 10.17487/RFC2784, March 2000, <<https://www.rfc-editor.org/info/rfc2784>>.

[RFC3092] - Eastlake 3rd, D., Manros, C., and E. Raymond, "Etymology of "Foo"", [RFC 3092](#), April 1 2001.

[RFC4291] - Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", [RFC 4291](#), February 2006.

[RFC4760] - Bates, T., Chandra, R., Katz, D., and Y. Rekhter, "Multiprotocol Extensions for BGP-4", [RFC 4760](#), January 2007.

[RFC5214] - Templin, F., Gleeson, T., and D. Thaler, "Intra-Site Automatic Tunnel Addressing Protocol (ISATAP)", [RFC 5214](#), March 2008.

[RFC5332] - Eckert, T., Rosen, E., Ed., Aggarwal, R., and Y. Rekhter, "MPLS Multicast Encapsulations", [RFC 5332](#), August 2008.

[RFC5737] - Arkko, J., Cotton, M., and L. Vegoda, "IPv4 Address Blocks Reserved for Documentation", [RFC 5737](#), January 2010.

[RFC5798] - Nadas, S., Ed., "Virtual Router Redundancy Protocol (VRRP) Version 3 for IPv4 and IPv6", [RFC 5798](#), March 2010.

[RFC6034] - Thaler, D., "Unicast-Prefix-Based IPv4 Multicast Addresses", [RFC 6034](#), October 2010.

[RFC6328] - Eastlake 3rd, D., "IANA Considerations for Network Layer Protocol Identifiers", [BCP 164](#), [RFC 6328](#), DOI 10.17487/RFC6328, July 2011, <<https://www.rfc-editor.org/info/rfc6328>>

[RFC6895] - Eastlake 3rd, D., "Domain Name System (DNS) IANA Considerations", [BCP 42](#), [RFC 6895](#), April 2013.

- [RFC7042] - Eastlake 3rd, D. and J. Abley, "IANA Considerations and IETF Protocol and Documentation Usage for IEEE 802 Parameters", [BCP 141](#), [RFC 7042](#), DOI 10.17487/RFC7042, October 2013, <<http://www.rfc-editor.org/info/rfc7042>>.
- [RFC7043] - Abley, J., "Resource Records for EUI-48 and EUI-64 Addresses in the DNS", [RFC 7043](#), October 2013.
- [RFC7319] - Eastlake 3rd, D., "IANA Considerations for Connectivity Fault Management (CFM) Code Points", [BCP 191](#), [RFC 7319](#), DOI 10.17487/RFC7319, July 2014, <<https://www.rfc-editor.org/info/rfc7319>>.
- [RFC7961] - Eastlake 3rd, D. and L. Yizhou, "Transparent Interconnection of Lots of Links (TRILL): Interface Addresses APPsub-TLV", [RFC 7961](#), DOI 10.17487/RFC7961, August 2016, <<https://www.rfc-editor.org/info/rfc7961>>.
- [RFC8520] - Lear, E., Droms, R., and D. Romascanu, "Manufacturer Usage Description Specification", [RFC 8520](#), DOI 10.17487/RFC8520, March 2019, <<https://www.rfc-editor.org/info/rfc8520>>.
- [RFC8947] - Volz, B., Mrugalski, T., and C. Bernardos, "Link-Layer Address Assignment Mechanism for DHCPv6", [RFC 8947](#), DOI 10.17487/RFC8947, December 2020, <<https://www.rfc-editor.org/info/rfc8947>>.

- [RFC8948] - Bernardos, C.J. and A. Mourad, "Structured Local Address Plan (SLAP) Quadrant Selection Option for DHCPv6", [RFC 8948](#), DOI 10.17487/RFC8948, December 2020, <<https://www.rfc-editor.org/info/rfc8948>>.
- [RFC8949] - | Bormann, C. and P. Hoffman, "Concise Binary Object Representation (CBOR)", STD 94, [RFC 8949](#), DOI 10.17487/RFC8949, December 2020, <<https://www.rfc-editor.org/info/rfc8949>>.

## [Appendix A](#). Templates

This appendix provides the specific templates for IANA assignments of

parameters. Explanatory words in parentheses in the templates below may be deleted in a completed template as submitted to IANA.

#### [A.1](#) EUI-48/EUI-64 Identifier or Identifier Block Template

Applicant Name:

Applicant Email:

Applicant Telephone: (starting with country code)

Use Name: (brief name of Parameter use such as "Foo Protocol" [\[RFC3092\]](#))

Document: (ID or RFC specifying use to which the identifier or block of identifiers will be put.)

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

Size of Block requested: (must be a power-of-two-sized block, can be a block of size one ( $2^{*0}$ ))

Specify multicast, unicast, or both:

#### [A.2](#) IANA OUI/CID-Based Protocol Number Template

Applicant Name:

Applicant Email:

Applicant Telephone: (starting with country code)

Use Name: (brief name of use of code point such as "Foo Protocol")

Document: (ID or RFC specifying use to which the protocol identifier will be put.)

Note: (any additional note)

### [A.3](#) Other IANA OUI/CID-Based Parameter Template

Applicant Name:

Applicant Email:

Applicant Telephone: (starting with country code)

Protocol where the OUI/CID-Based Parameter for which a value is being requested appears: (such as: Cipher Suite selection in IEEE 802.11)

Use Name: (brief name of use of code point to be assigned, such as "Foo Cipher Suite" [[RFC3092](#)])

Document: (ID or RFC specifying use to which the other IANA OUI-based parameter value will be put.)

Note: (any additional note)

## [Appendix B](#). Ethertypes

This appendix provides a copy of the IESG Statement issued in October 2012 on obtaining new IETF Ethertypes in Section B.1. Note that there is an informational list on the IANA web site of some important Ethertypes specified for IETF protocols or by IEEE 802 available, currently at [[IANA](#)]. The IEEE Registration Authority page of Ethertypes, <http://standards.ieee.org/regauth/ethertype/eth.txt>, may also be useful. See [Section 3](#) above.

### [B.1](#) IESG Statement on Ethertypes

From: IESG Date: 25 October 2012

The IEEE Registration Authority (IEEE RA) assigns Ethertypes with oversight from the IEEE Registration Authority Committee (IEEE RAC).

(See <http://standards.ieee.org/develop/regauth/ethertype/>.) Some IETF protocol specifications make use of Ethertypes. All Ethertype requests are subject to review by a consultant to the IEEE RA followed by IEEE RAC confirmation.

Since Ethertypes are a fairly scarce resource, the IEEE RAC has let us know that they will not assign a new Ethertype to a new IETF protocol specification until the IESG has approved the protocol specification for publication as an RFC. In exceptional cases, the IEEE RA is willing to consider "early allocation" of an Ethertype for an IETF protocol that is still under development as long as the request comes from and has been vetted by the IESG.

To let the IEEE RAC know that the IESG has approved the request for an Ethernet assignment for an IETF protocol, all future requests for assignment of Ethertypes for IETF protocols will be made by the IESG.

Note that playpen Ethertypes have been assigned in IEEE 802 [[1](#)] for use during protocol development and experimentation.

- [1] IEEE Std 802a-2003 (Amendment to IEEE Std 802-2001). IEEE standard for Local and Metropolitan Area Networks: Overview and Architecture -- Amendment 1: Ethertypes for Prototype and Vendor-Specific Protocol Development.

D. Eastlake & J. Abley Expires September 2022

[Page 34]

---

INTERNET-DRAFT

IANA/IETF and IEEE 802 Parameters

March 2022

#### Authors' Addresses

Donald E. Eastlake 3rd  
Futurewei Technologies  
2386 Panoramic Circle  
Apopka, FL 32703  
USA

Phone: +1-508-634-2066  
EMail: d3e3e3@gmail.com

Joe Abley  
Hopcount Limited  
186 Albert Street, Suite 103  
London, ON N6A 1M1  
Canada

Phone: +1 519 670 9327  
EMail: jabley@hopcount.ca



#### Copyright, Disclaimer, and Additional IPR Provisions

Copyright (c) 2022 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Revised BSD License text as described in [Section 4.e](#) of the Trust Legal Provisions and are provided without warranty as described in the Revised BSD License. This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

