IEEE Std 802a™-2003
(Amendment to IEEE Std 802®-2001)

IEEE Standards

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

Amendment 1: Ethertypes for Prototype and Vendor-Specific Protocol Development

IEEE Computer Society

Sponsored by the
LAN/MAN Standards Committee

IEEE

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LAN/MAN Standards Committee
of the
IEEE Computer Society

Approved 22 September 2003
American National Standards Institute

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IEEE-SA Standards Board

Abstract: IEEE Std 802-2001, IEEE Local and Metropolitan Area Networks: Overview and Architecture, provides an overview to the family of IEEE 802 Standards. This amendment to IEEE Std 802 identifies a set of Ethertypes that may be used for prototype and vendor specific use, and defines how the ethertypes should be used.
Keywords: Ethertype protocol development, Local Area Networks (LANs), LAN/MAN architecture, LAN/MAN reference model, Metropolitan Area Networks (MANs), protocol identifier, protocol type

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Introduction

(This introduction is not part of IEEE Std 802a-2003, IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture— Amendment 1: Ethertypes for Prototype and Vendor-Specific Protocol Development).

IEEE Std 802a-2003

IEEE Std 802-2001 provides an overview to the family of IEEE 802 Standards, describes the relationship of the IEEE 802 Standards to the Open Systems Interconnection Basic Reference Model [ISO/IEC 7498-1: 1994] and explains the relationship of these standards to higher layer protocols, provides a standard for the structure of LAN MAC addresses, and provides a standard for the identification of public, private, and standard protocols. This Amendment to IEEE Std 802-2001 provides a means whereby prototype protocols and vendor-specific protocols may be developed and implemented without the need to register a distinct Ethertype value.

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Robert W. Hott	Loren Larsen	Michel Thorsen
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The following members of the balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

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

Amendment 1: Ethertypes for Prototype and Vendor-Specific Protocol Development

[This amendment to IEEE Std 802®-2001 defines the changes necessary in order to provide a mechanism for making a number of Ethertype values available for use in prototype and vendor-specific protocol development. These changes are defined as a series of additions to, and modifications of, the existing text of IEEE Std 802-2001; this amendment therefore assumes all material, including references, abbreviations, definitions, procedures, services and protocols defined in the base text.]

NOTE— The editing instructions contained in this amendment define how to merge the material contained herein into the existing base standard to form the comprehensive standard

The editing instructions are shown in ***bold italics***. Four editing instructions are used: change, delete, insert, and replace. ***Change*** is used to make small corrections to 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) or 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 of IEEE Std 802-2001.

Change the Abstract and Keywords in the front matter of IEEE Std 802-2001 as follows:

Abstract: IEEE Std 802-2001, IEEE Standards for Local and Metropolitan Area Networks: Overview and Architecture, provides an overview to the family of IEEE 802 Standards. It ~~defines compliance with the family of IEEE 802 Standards; it~~ describes the relationship of the IEEE 802 Standards to the Open Systems Interconnection Basic Reference Model [ISO/IEC 7498-1:1994] and explains the relationship of these standards to the higher layer protocols; it provides a standard for the structure of LAN MAC addresses; and it provides a standard for identification of public, private, prototype, and standard protocols.

Keywords: IEEE 802 ~~standards compliance,~~ Local Area Networks (LANs), LAN/MAN architecture, LAN/MAN reference model, Metropolitan Area Networks (MANs), Protocol development, Ethertypes.

1. Scope

1.1 General

Change the text of subclause 1.1 as shown below:

This document serves as the foundation for the family of IEEE 802 Standards published by IEEE for Local Area Networks (LANs) and Metropolitan Area Networks (MANs). It contains descriptions of the networks considered as well as a reference model (RM) for protocol standards. ~~Compliance with the family of IEEE 802 Standards is defined, and a~~ A standard for the identification of public, private, prototype, and standard protocols is included, using either Ethertype values or LLC addresses.

Insert the following Clause as a new Clause 12:

12. Ethertypes for prototype and vendor-specific protocol development

12.1 Introduction

The existing Ethernet Type number space is a finite resource. In order to develop protocols that will use an Ethernet Type value as a protocol identifier, it has historically been necessary for vendors to apply for type values from this limited number space, both for development purposes and for assignment to the final protocol. This can lead to waste of the number space for no useful purpose, as some of these protocol developments do not result in viable or usable protocols. The mechanisms identified in this clause will allow prototype and experimental protocols to be developed without consuming type values, and will also provide a means whereby protocol developers can assign permanent protocol identifier values without consuming type values from this limited number space.

These objectives are supported by three Ethertype assignments, and associated rules for their use:

a) Two Ethertype values, known as the *Local Experimental Ethertypes* (12.2), assigned, as the name implies, for experimental use within a local area; and
b) A single Ethertype value, known as the *OUI Extended Ethertype* (12.3), assigned for the identification of vendor-specific protocols.

The values assigned for these purposes, and the requirements for use of these values, are defined in the following subclauses.

12.2 Local Experimental Ethertypes

The Local Experimental Ethertypes are intended for use in conjunction with experimental protocol development within a privately administered development network; for example within an experimental LAN that has no wide area connectivity. Within that network, a local administrator is free to use a Local Experimental Ethertype and to assign subtypes for protocol development purposes. However, by virtue of the way these Ethertypes are intended to be used, the following practical and administrative constraints apply to their use:

a) Since the format for protocols using the Local Experimental Ethertypes does not contain a means to identify the administrative domain, it may not be possible to identify the protocol of a frame if protocols developed within different administrative domains using Local Experimental Ethertypes are used in the same network. Hence, the use of these Ethertypes to identify protocols can only be achieved reliably if all uses of the Ethertypes are within the control of a single administrative

domain. **Therefore, these Ethertypes shall not be used in protocols or products that will be released for use in the wider networking community, as freeware, shareware, or as any part of a company's commercial product offering. Product must and shall be transitioned to a product Ethertype before it is deployed in an environment outside the developing organization's administrative control**; for example, when deployed with a customer or any other internet working environments for testing.

b) Any request by any individual or organization to have the value of a Local Experimental Ethertype permanently assigned for use with a given protocol or protocols will be summarily refused.

c) It is recommended that devices which bound any administrative domain be configured to prevent frames containing a Local Experimental Ethertype from passing either into or out of a domain in which its contents may be misinterpreted. For example, the default configuration of any firewall should be to not pass this Ethertype.

A Local Experimental Ethertype is used in the normal way, as a value that is placed in the Type/Length field of an Ethernet frame, or as described in 10.5 for encapsulation of Ethernet frames over LLC using SNAP (10.3).

In order to allow for different experimental protocols, sub-protocols, and versions, to co-exist within the same experimental network, a protocol subtype and a protocol version identifier shall be used in conjunction with the Local Experimental Ethertype value. This is illustrated in Figure 1, which shows the format of an Ethernet frame carrying a Local Experimental Ethertype, and Figure 2 shows the format of an IEEE 802.5™ frame carrying a Local Experimental Ethertype. Note that in the case of the 802.5 frame, the Ethertype is carried as part of a SNAP protocol identification field (see Clause 10). The sizes of the protocol subtype and the protocol version identifier fields, and their order of appearance within the frame, are not constrained by this standard.

Two Local Experimental Ethertype values are provided, to allow protocols that will need more than one distinct Ethertype value, or two distinct protocols, to be developed within a single administrative domain. In particular, the provision of two Local Experimental Ethertypes allows for cases where it is necessary to be able to distinguish protocols or sub-protocols at the Ethertype level, in order to facilitate the use of filtering actions in Bridges.

The combination of the Local Experimental Ethertype value, the protocol subtype, and the protocol version, provide the protocol identifier for the experimental protocol. The values assigned to the protocol subtype and protocol version are locally administered; their meaning cannot therefore be correctly interpreted outside of the administrative domain within which the value was allocated.

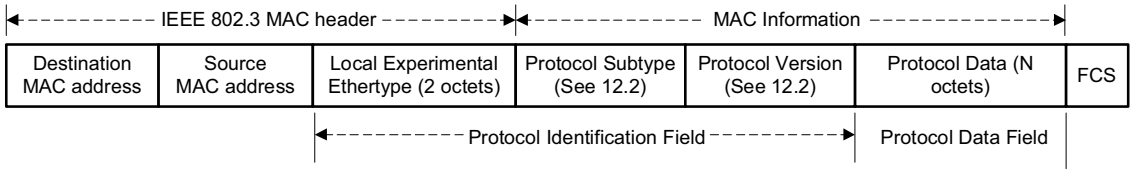

Figure 1—Example of an 802.3 frame carrying the Local Experimental Ethertype

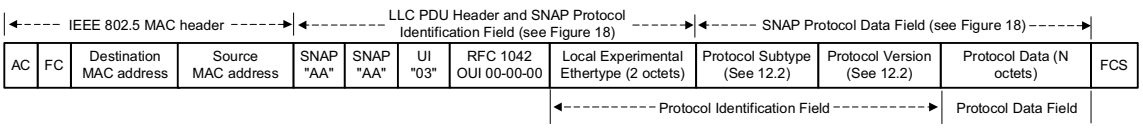

Figure 2—Example of an 802.5 frame carrying the Local Experimental Ethertype

NOTE—The use of this format provides for a simple migration path to the use of a distinct Ethertype permanently assigned to the protocol. The routine examination of proposals made to the IEEE Registration Authority for the allocation of Ethertypes includes a check that the proposed protocol format has sufficient subtype capability to withstand enhancement by the originator without the need for the assignment of a further Ethertype in the future, and inclusion of the subtype and version values could be deemed to meet this requirement. While the existence of such a mechanism in the protocol specification is not in itself sufficient to ensure that an application for an Ethertype will succeed, its existence is a necessary element of an acceptable protocol design. The subtyping mechanism defined here offers one way that this requirement may be met.

12.3 OUI Extended Ethertype

The OUI Extended Ethertype provides a means of protocol identification similar to that offered by the Subnetwork Access Protocol described in Clause 10. Like the SNAP, the OUI Extended Ethertype allows an organization to use protocol identifiers (see 9.3). An organization allocates protocol identifiers to its own protocols, in a manner that ensures that the protocol identifier is globally unique.

NOTE 1—The requirement for global uniqueness of protocol identifiers means that if protocol identifier X has been allocated for use by protocol Y, then that protocol identifier can be used with either SNAP or the OUI Extended Ethertype to identify Protocol Y. Conversely, it means that protocol identifier X cannot be used to identify any other protocol.

The OUI Extended Ethertype is used in the normal way, as a value that is placed in the Type/Length field of an Ethernet frame, or as described in 10.5 for encapsulation of Ethernet frames over LLC. Immediately following the Ethertype value is a protocol identifier (see 9.3), consisting of a 3-octet OUI value followed by 2 octets administered by the OUI assignee. The OUI value provides an administrative context within which the assignee can allocate values to a 16-bit protocol subtype. This approach is closely similar to the LLC-based SNAP mechanism defined in Clause 10; however, the OUI Extended Ethertype is used in place of the LLC header.

NOTE 2—The two octets of the protocol identifier that are administered by the OUI assignee can be used in any way that the assignee chooses; however, as OUIs are a finite resource, it is advisable not to choose an allocation approach that is wasteful, as would be the case, for example, if the assignee chose to use these two octets to encode a length value.

Figure 3 shows the format of an 802.3™ frame carrying the OUI Extended Ethertype in the Length/Type field. The value used for the OUI component of the protocol identifier is an OUI value assigned to the organization that has developed the vendor-specific protocol. The combination of the OUI Extended Ethertype, the OUI value, and the 16-bit value administered by the OUI assignee provide a unique protocol identifier for the vendor-specific protocol. The 16-bit values are administered by the organization to which the OUI has been assigned; their meaning can therefore only be correctly interpreted by reference to the organization that owns the OUI concerned.

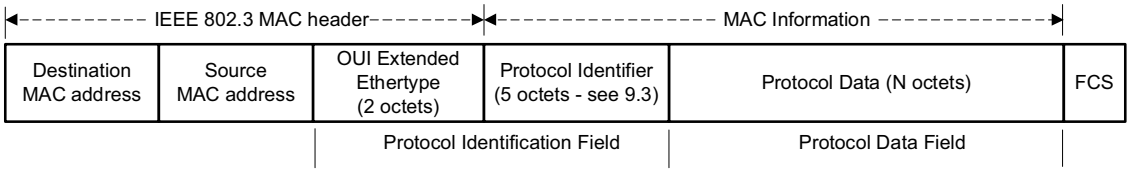

Figure 3—802.3 frame with the OUI Extended Ethertype encoded in the Length/Type field

NOTE 3—As the protocol designer is free to define the structure of the Protocol Data Field, pad bytes can be included in the definition of this field, for example, for the purposes of alignment with 4-byte or 8-byte boundaries.

As discussed in 12.2, it is good protocol development practice to use a protocol subtype, along with a protocol version identifier in order to avoid having to allocate a new protocol identifier when a protocol is

revised or enhanced. Users of the OUI Extended Ethertype are therefore encouraged to include protocol subtype and version information in the specification of the protocol data for their protocols.

It is the intention that this method of protocol identification be used in products or protocols that are planned to be released into multi-vendor environments outside of the control of the administration that assigns the protocol identifier. The use of this mechanism allows such protocols to be developed and distributed without the need for a specific Ethertype to be assigned for the use of each protocol.

As the OUI Extended Ethertype is a normal Ethernet Type value, it is possible to use the encoding described in 10.5 to carry its value within an LLC PDU, using SNAP with the RFC 1042 OUI. Figure 4 and Figure 5 show the format of an 802.3 and 802.5 frame, respectively, carrying the OUI Extended Ethertype encoded in this way. In both cases, it would be more appropriate to use SNAP directly (i.e., omit the RFC 1042 OUI and OUI Extended Ethertype fields shown in Figure 4 and Figure 5); however, this is a valid encoding of the OUI Extended Ethertype that can result from the application of the encapsulation described in 10.5.

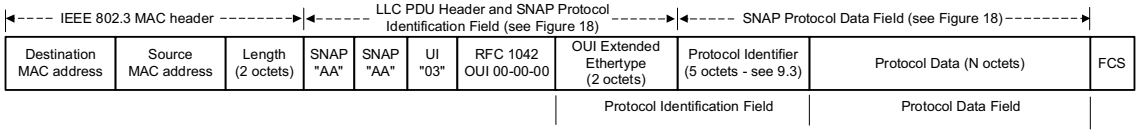

Figure 4—802.3 frame with the OUI Extended Ethertype encoded in an LLC PDU

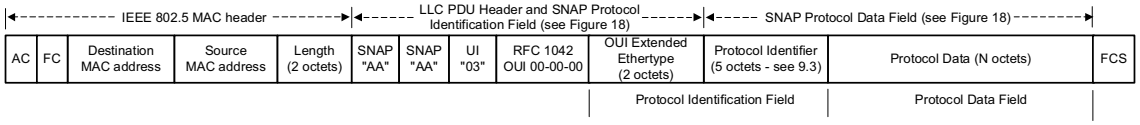

Figure 5—802.5 frame with the OUI Extended Ethertype encoded in an LLC PDU

12.4 Ethertype values for local and vendor-specific use

The values of the Local Experimental Ethertypes and the OUI Extended Ethertype are as defined in Table 1.

Table 1—Assigned Ethertype values

Name	Value
Local Experimental Ethertype 1	88-B5
Local Experimental Ethertype 2	88-B6
OUI Extended Ethertype	88-B7