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Extended Ethernet Frame Size Support for IP and CLNS

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2. Abstract

This document presents an extension to the current Ethernet Frame standards to support payloads greater than 1500 Bytes for IP and ISO CLNS. This is useful for Gigabit Ethernet technology, providing a means to carry large MTU packets without fragmentation over a high-speed broadcast network.

3. Overview

There are two fundamental frame types defined for Ethernet: Ethernet II [[ETH](#)] [[RFC894](#)] and 802.3 [[IEEE802.3](#)]. 802.3 headers may be followed by a Logical Link Control header, 802.2 [[IEEE802.2](#)]. Both types of encapsulations can co-exist on the same media at the same time. Encodings for Ethernet II and 802.3 frames evolved such that, as long as payloads were less than 1500 bytes, Ethernet II frames could always be distinguished from IEEE 802.3 frames.

However, when the payload is greater than 1500 bytes frames may not be uniquely distinguishable as conforming to Ethernet II or 802.3 formats. This document extends the Ethernet frame format to allow frames with IP or CLNS payloads larger than 1500 bytes to be uniquely distinguished.

4. Ethernet Frame Formats

A. Ethernet II

```
+-----+-----+-----+-----+-----+
| DA | SA | Type | Data | FCS |
+-----+-----+-----+-----+-----+
```

DA	Destination MAC Address	(6 bytes)
SA	Source MAC Address	(6 bytes)
Type	Protocol Type	(2 bytes)
Data	Protocol Data	(46 - 1500 bytes)
FCS	Frame Checksum	(4 bytes)

B. IEEE 802.3 and derivatives

```
+-----+-----+-----+-----+-----+
| DA | SA | Len | Data | FCS |
+-----+-----+-----+-----+-----+
```

DA	Destination MAC Address	(6 bytes)
SA	Source MAC Address	(6 bytes)
Len	Length of Data field	(2 bytes)
Data	Protocol Data	(46 - 1500 bytes)
FCS	Frame Checksum	(4 bytes)

The derivatives include LLC (802.2) and SNAP which prefix the data field with an LLC header. In these instances the Len field then corresponds to the combined size of both the data portion of the frame and the LLC header.

On reception, the two formats are differentiated based on the magnitude of the Type/Length field, as follows:

- > 1500 bytes: value corresponds to a type field. The frame is an Ethernet II frame, with type values starting at 1536 (600 hex).
- <= 1500 bytes: value corresponds to a length field. The frame is an IEEE 802.3 format (or derivative) with a maximum data length of 1500 bytes.

5. Problem with Large CLNS Frames in the presence of IP Frames

Some ISO protocols commonly used in the Internet, such as ESIS and ISIS are carried as CLNS packets. There is no reserved Ethertype for CLNS. CLNS packets can only use the IEEE 802.3/802.2 encoding, and so are limited in length to 1500 bytes.

IP packets are encapsulated within Ethernet II frames, which do not have length fields, and so IP packets are not limited in length to 1500 bytes by framing.

6. Proposed Ethernet Frame Extension

Large CLNS frames may be supported by the following:

- + Define an Ethertype, 0x8872, for CLNS and encoding these frames as 802.2 within Ethernet II:

```

+-----+-----+-----+-----+-----+-----+-----+-----+
| DA | SA | Type | DSAP | SSAP | Ctrl | Data | FCS |
+-----+-----+-----+-----+-----+-----+-----+-----+
                        === 802.2 Header ===

```

DA	Destination MAC Address	(6 bytes)
SA	Source MAC Address	(6 bytes)
Type	Ethertype for CLNS	(2 bytes)
DSAP	802.2 Destination Service Access Point	(1 byte)
SSAP	802.2 Source Service Access Point	(1 byte)
Ctrl	802.2 Control Field	(1 byte)
Data	Protocol Data	(> 46 bytes)
FCS	Frame Checksum	(4 bytes)

- + Allow Ethernet II frames to have payloads greater than 1500 bytes.

There is no loss of information from CLNS packets encapsulated as 802.3/802.2 because although the 802.3 length field is missing, the frame length is known by virtue of the frame being accepted by the network interface.

In this manner, all Ethernet II packets, including IP and CLNS, can be larger than 1500 bytes, yet are uniquely identified.

7. References

[ETH] "The Ethernet - A Local Area Network", version 1.0, Digital Equipment Corporation, September 1980, and "The Ethernet, A Local Area Network" Data Link Layer and Physical Layer Specifications", Digital, Intel, and Xerox, November, 1982.

[RFC894] IETF [RFC 894](#)

[IEEE802.3] IEEE Std 802.3

[IEEE802] IEEE Std 802

[IEEE802.3Z] IEEE Std 802.3z

[EXT.FRAME] "Use of Extended Frame Sizes in Ethernet Networks", draft 2.1, Alteon Networks, Inc.

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