

Transmission of IPv6 Packets over Ethernet Networks
<[draft-ietf-ipngwg-trans-ethernet-03.txt](#)>

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1. Introduction

This document specifies the frame format for transmission of IPv6 packets and the method of forming IPv6 link-local addresses and statelessly autoconfigured addresses on Ethernet networks. It also specifies the content of the Source/Target Link-layer Address option used in Router Solicitation, Router Advertisement, Neighbor Solicitation, Neighbor Advertisement and Redirect messages when those messages are transmitted on an Ethernet.

This document replaces [RFC 1972](#), "A Method for the Transmission of IPv6 Packets over Ethernet Networks", which will become historic.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[KWORLD](#)].

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[2.](#) Maximum Transmission Unit

The default MTU size for IPv6 [[IPV6](#)] packets on an Ethernet is 1500 octets. This size may be reduced by a Router Advertisement [[DISC](#)] containing an MTU option which specifies a smaller MTU, or by manual configuration of each node. If a Router Advertisement received on an Ethernet interface has an MTU option specifying an MTU larger than 1500, or larger than a manually configured value, that MTU option may be logged to system management but must be otherwise ignored.

For purposes of this document, information received from DHCP is considered "manually configured" and the term Ethernet includes CSMA/CD and full-duplex subnetworks based on ISO/IEC 8802-3, with various data rates.

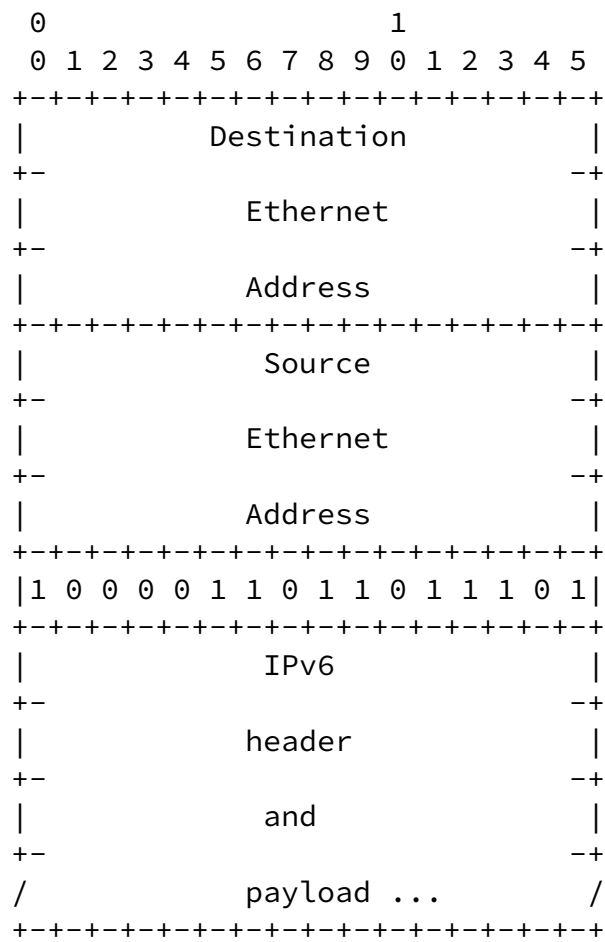
[3.](#) Frame Format

IPv6 packets are transmitted in standard Ethernet frames. The Ethernet header contains the Destination and Source Ethernet addresses and the Ethernet type code, which must contain the value 86DD hexadecimal. The data field contains the IPv6 header followed immediately by the payload, and possibly padding octets to meet the minimum frame size for the Ethernet link.

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(Each tic mark represents one bit.)

4. Stateless Autoconfiguration

The Interface Identifier [[AARCH](#)] for an Ethernet interface is based on the EUI-64 identifier [[EUI64](#)] derived from the interface's built-in 48-bit IEEE 802 address. The EUI-64 is formed as follows. (Canonical bit order is assumed throughout.)

The OUI of the Ethernet address (the first three octets) becomes the company_id of the EUI-64 (the first three octets). The fourth and fifth octets of the EUI are set to the fixed value FFFE hexadecimal. The last three octets of the Ethernet address become the last three octets of the EUI-64.

The Interface Identifier is then formed from the EUI-64 by complementing the "Universal/Local" (U/L) bit, which is the next-to-lowest order bit of the first octet of the EUI-64. Complementing this bit will generally change a 0 value to a 1, since an interface's built-in address is expected to be from a universally

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administered address space and hence have a globally unique value. A universally administered IEEE 802 address or an EUI-64 is signified by a 0 in the U/L bit position, while a globally unique IPv6 Interface Identifier is signified by a 1 in the corresponding position. For further discussion on this point, see [[AARCH](#)].

For example, the Interface Identifier for an Ethernet interface whose built-in address is, in hexadecimal,

34-56-78-9A-BC-DE

would be

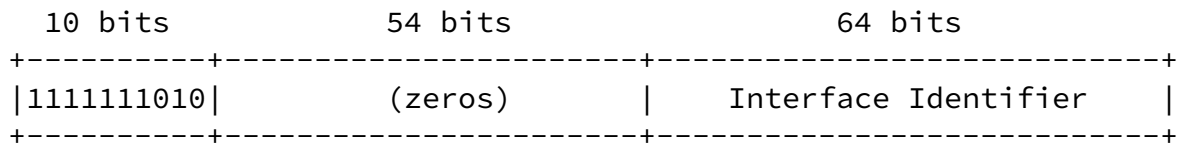
36-56-78-FF-FE-9A-BC-DE.

A different MAC address set manually or by software should not be used to derive the Interface Identifier. If such a MAC address must be used, its global uniqueness property should be reflected in the value of the U/L bit.

An IPv6 address prefix used for stateless autoconfiguration [[ACONF](#)] of an Ethernet interface must have a length of 64 bits.

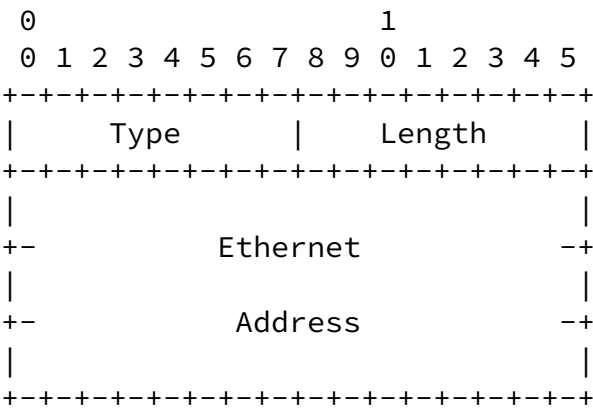
[5.](#) Link-Local Addresses

The IPv6 link-local address [[AARCH](#)] for an Ethernet interface is formed by appending the Interface Identifier, as defined above, to the prefix FE80::/64.



6. Address Mapping -- Unicast

The procedure for mapping IPv6 unicast addresses into Ethernet link-layer addresses is described in [DISC]. The Source/Target Link-layer Address option has the following form when the link layer is Ethernet.



Option fields:

Type 1 for Source Link-layer address.
 2 for Target Link-layer address.

Length 1 (in units of 8 octets).

Ethernet Address

The 48 bit Ethernet IEEE 802 address, in canonical bit order. This is the address the interface currently responds to, and may be different from the built-in address used to derive the Interface Identifier.

7. Address Mapping -- Multicast

An IPv6 packet with a multicast destination address DST, consisting of the sixteen octets DST[1] through DST[16], is transmitted to the Ethernet multicast address whose first two octets are the value 3333 hexadecimal and whose last four octets are the last four octets of DST.

```
+-----+
|0 0 1 1 0 0 1 1|0 0 1 1 0 0 1 1|
+-----+
|   DST[13]      |   DST[14]      |
+-----+
|   DST[15]      |   DST[16]      |
+-----+
```

8. Security Considerations

The method of derivation of Interface Identifiers from MAC addresses is intended to preserve global uniqueness when possible. However, there is no protection from duplication through accident or forgery.

9. References

[AARCH] R. Hinden, S. Deering "IP Version 6 Addressing Architecture", Currently [draft-ietf-ipngwg-addr-arch-v2-02.txt](#).

[ACONF] S. Thomson, T. Narten, "IPv6 Stateless Address

Autoconfiguration", currently [draft-ietf-ipngwg-addrconf-v2-00.txt](#).

[DISC] T. Narten, E. Nordmark, W. A. Simpson, "Neighbor Discovery for IP Version 6 (IPv6)", currently [draft-ietf-ipngwg-discovery-v2-00.txt](#).

[EUI64] "64-Bit Global Identifier Format Tutorial",
<http://standards.ieee.org/db/oui/tutorials/EUI64.html>.

[IPV6] S. Deering, R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", currently [draft-ietf-ipngwg-ipv6-spec-v2-00.txt](#).

[KEYWORD] S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels," [RFC 2119](#).

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