

Transmission of IPv6 Packets over IEEE 1394 Networks

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Abstract

IEEE Std 1394-1995 is a standard for a High Performance Serial Bus. This document describes the frame format for transmission of IPv6 [[IPV6](#)] packets and the method of forming IPv6 link-local addresses and statelessly autoconfigured addresses on IEEE1394 networks. It also describes the content of the Source/Target Link-layer Address option used in Neighbor Discovery [[DISC](#)] when the messages are transmitted on an IEEE1394 network.

1. INTRODUCTION

IEEE Std 1394-1995 is a standard for a High Performance Serial Bus. IETF IP1394 Working Group is standardizing the method to carry IPv4 datagrams and ARP packets over IEEE1394 subnetwork [[IP1394](#)].

This document describes the frame format for transmission of IPv6 [[IPV6](#)] packets and the method of forming IPv6 link-local addresses and statelessly autoconfigured addresses on IEEE1394 networks. It also describes the content of the Source/Target Link-layer Address option used in Neighbor Discovery [[DISC](#)] when the messages are transmitted on an IEEE1394 network.

This document is a product of the IP1394 working group within the Internet Engineering Task Force. Comments are solicited and should be addressed to the working group's mailing list at ip1394@mailbag.intel.com.

2. SPECIFICATION TERMINOLOGY

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 [RFC 2119](#).

3. IPV6-CAPABLE NODES

An IPv6-capable node SHALL fulfill the following minimum requirements;

- it SHALL implement configuration ROM in the general format specified by ISO/IEC 13213:1994 and SHALL implement the bus information block specified by IEEE P1394a [[P1394a](#)] and a unit directory specified by this document;
- the max_rec field in its bus information block SHALL be at least 8; this indicates an ability to accept block write requests and asynchronous stream packets with data payload of 512 octets. The same ability SHALL also apply to read requests; that is, the node SHALL be able to transmit a block response packet with a data payload of 512 octets;
- it SHALL be isochronous resource manager capable, as specified by 1394;
- it SHALL support both reception and transmission of asynchronous streams as specified by IEEE P1394a;
- it SHALL implement the BROADCAST_CHANNEL register as specified by IEEE P1394a; and

- it SHALL be broadcast channel manager capable.

4. LINK ENCAPSULATION AND FRAGMENTATION

The encapsulation and fragmentation mechanism SHOULD be the same as "5. LINK ENCAPSULATION AND FRAGMENTATION" of [[IP1394](#)].

The ether_type value for IPv6 is 0x86dd.

The default MTU size for IPv6 packets on an IEEE1394 network 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 IEEE1394 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. The mechanism to extend MTU size between particular two nodes is for further study.

5. CONFIGURATION ROM

Configuration ROM for IPv6-capable nodes SHALL contain a unit directory in the format specified by [[IP1394](#)] except following rules.

- The value for Unit_SW_Version is TBD. When this draft is approved it is EXPECTED that Unit_SW_Version will assume the value of the RFC number assigned.
- The textual descriptor for the Unit_SW_Version SHOULD be "IPv6".

6. STATELESS AUTOCONFIGURATION

The Interface Identifier [[AARCH](#)] for an IEEE1394 interface is formed from the interface's built-in 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 administered address space and hence have a globally unique value. A universally administered 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](#)].

An IPv6 address prefix used for stateless autoconfiguration [[ACONE](#)] of an IEEE1394 interface MUST have a length of 64 bits.

7. LINK-LOCAL ADDRESSES

The IPv6 link-local address [[AARCH](#)] for an IEEE1394 interface is formed by appending the Interface Identifier, as defined above, to the prefix FE80::/64.

10 bits	54 bits	64 bits
+-----+	+-----+	+-----+
1111111010	(zeros)	Interface Identifier
+-----+	+-----+	+-----+

8. ADDRESS MAPPING FOR UNICAST

The procedure for mapping IPv6 unicast addresses into IEEE1394 link-layer addresses uses the Neighbor Discovery [[DISC](#)]. Since 1394 link address (node_ID) will not be constant across a 1394 bridge, we have chosen not to put it in the Link-layer Address option. The recipient of the Neighbor Discovery SHOULD use the source_ID (obtained from either the asynchronous packet header or the GASP header) in conjunction with the content of the Source link-layer address. The recipient of an Neighbor Discovery packet SHOULD ignore it unless the most significant ten bits of the source_ID are equal to either 0x3FF or the most significant ten bits of the recipient's NODE_IDS register.

The Source/Target Link-layer Address option has the following form when the link layer is IEEE1394.

```

      1      2      3
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|      Type      | Length = 3 |                                     |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     node_unique_ID                                     |
+---+                                     +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     |      max_rec      |      spd      |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     unicast_FIFO                                     |
+---+                                     +--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     |      reserved      |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
|                                     reserved                                     |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+

```

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

Length 3 (in units of 8 octets).

The meaning of 'node_unique_ID', 'unicast_FIFO', 'max_rec' and 'spd'

sub-fields are specified in [[IP1394](#)].

Note that node_ID may change when 1394 bus-reset occurs. The mapping cache held in the node SHOULD be cleared on 1394 bus-reset.

9. IPV6 MULTICAST

By default, all best-effort IPv6 multicast SHALL use asynchronous stream packets whose channel number is equal to the channel field from the BROADCAST_CHANNEL register.

Best-effort IPv6 multicast for particular multicast group addresses may utilize a different channel number if such a channel number is allocated and advertised prior to use, by a multicast channel allocation protocol (MCAP), as described in [[IP1394](#)]. The implementors are encouraged to support this protocol when transmitting high-rate multicast streams. The MCAP 'type' value for IPv6 group address descriptor is TBD.

10. OPEN ISSUES

- a) The mechanism to extend MTU size between particular two nodes.
- b) The mechanism to allocate and distribute a 1394 isochronous channel number for isochronous transmission of IPv6 packets, for an unicast or multicast flow.

Security Considerations

Security issues are not discussed in this document.

Acknowledgment

The editor would like to acknowledge the author of [[ETHER](#)] since some part of this document has been derived from [[ETHER](#)].

References

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- [IPV6] S. Deering, R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", [RFC2460](#), Dec 1998.
- [AARCH] R. Hinden, S. Deering "IP Version 6 Addressing Architecture", [RFC2373](#).
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- [DISC] T. Narten, E. Nordmark, W. A. Simpson, "Neighbor Discovery for IP Version 6 (IPv6)", [RFC2461](#), Dec 1998.
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