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**Recommendation on Stable IPv6 Interface Identifiers
draft-ietf-6man-default-iids-01**

Abstract

The IPv6 addressing architecture defines Modified EUI-64 format Interface Identifiers, and the existing IPv6 over various link-layers specify how such identifiers are derived from the underlying link-layer address (e.g., an IEEE LAN MAC address) when employing IPv6 Stateless Address Autoconfiguration (SLAAC). The security and privacy implications of embedding hardware addresses in the Interface Identifier have been known and understood for some time now, and some popular IPv6 implementations have already deviated from such schemes to mitigate these issues. This document changes the recommended default Interface Identifier generation scheme to that specified in [RFC7217](#), and recommends against embedding hardware addresses in IPv6 Interface Identifiers. It formally updates [RFC2464](#), [RFC2467](#), [RFC2470](#), [RFC2491](#), [RFC2492](#), [RFC2497](#), [RFC2590](#), [RFC3146](#), [RFC3572](#), [RFC4291](#), [RFC4338](#), [RFC4391](#), [RFC5072](#), and [RFC5121](#), which require IPv6 Interface Identifiers to be derived from the underlying link-layer address.

Status of This Memo

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Table of Contents

- [1.](#) Introduction [2](#)
- [2.](#) Terminology [3](#)
- [3.](#) Generation of IPv6 Interface Identifiers [3](#)
- [4.](#) Future Work [4](#)
- [5.](#) IANA Considerations [4](#)
- [6.](#) Security Considerations [4](#)
- [7.](#) Acknowledgements [4](#)
- [8.](#) References [5](#)
 - [8.1.](#) Normative References [5](#)
 - [8.2.](#) Informative References [6](#)
- Authors' Addresses [7](#)

1. Introduction

[RFC4862] specifies Stateless Address Autoconfiguration (SLAAC) for IPv6 [[RFC2460](#)], which typically results in hosts configuring one or more "stable" addresses composed of a network prefix advertised by a local router, and an Interface Identifier (IID) [[RFC4291](#)] that typically embeds a hardware address (e.g., an IEEE LAN MAC address).

The security and privacy implications of embedding a hardware address in an IPv6 Interface ID have been known for some time now, and are discussed in great detail in [[I-D.ietf-6man-ipv6-address-generation-privacy](#)]; they include:

- o Network activity correlation
- o Location tracking

- o Address scanning
- o Device-specific vulnerability exploitation

Some popular IPv6 implementations have already deviated from the traditional stable IID generation scheme to mitigate the aforementioned security and privacy implications [[Microsoft](#)].

As a result of the aforementioned issues, this document recommends the implementation of an alternative scheme ([RFC7217](#)) as the default stable Interface-ID generation scheme, such that the aforementioned issues are mitigated.

NOTE: [RFC4291](#) defines the "Modified EUI-64 format" for Interface identifiers. [Appendix A of RFC4291](#) then describes how to transform an IEEE EUI-64 identifier, or an IEEE 802 48-bit MAC address from which an EUI-64 identifier is derived, into an interface identifier in the Modified EUI-64 format.

2. Terminology

Stable address:

An address that does not vary over time within the same network (as defined in [[I-D.ietf-6man-ipv6-address-generation-privacy](#)]).

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](#) [[RFC2119](#)].

3. Generation of IPv6 Interface Identifiers

Nodes SHOULD NOT employ IPv6 address generation schemes that embed the underlying hardware address in the Interface Identifier. Namely, nodes SHOULD NOT generate Interface Identifiers with the schemes specified in [[RFC2464](#)], [[RFC2467](#)], [[RFC2470](#)], [[RFC2491](#)], [[RFC2492](#)], [[RFC2497](#)], [[RFC2590](#)], [[RFC3146](#)], [[RFC3572](#)], [[RFC4338](#)], [[RFC4391](#)], [[RFC5121](#)], and [[RFC5072](#)].

Nodes SHOULD implement and employ [[RFC7217](#)] as the default scheme for generating stable IPv6 addresses with SLAAC.

Future specifications SHOULD NOT specify IPv6 address generation schemes that embed the underlying hardware address in the Interface Identifier.

4. Future Work

At the time of this writing, the mechanisms specified in the following documents are not compatible with the recommendations in this document:

- o [RFC 6282](#) [[RFC6282](#)]
- o [RFC 4944](#) [[RFC4944](#)]
- o [RFC 6755](#) [[RFC6775](#)]

It is expected that that future revisions or updates of these documents will address the aforementioned issues such that the requirements in this documents can be enforced.

5. IANA Considerations

There are no IANA registries within this document. The RFC-Editor can remove this section before publication of this document as an RFC.

6. Security Considerations

This document recommends [[RFC7217](#)] as the default scheme for generating IPv6 stable addresses with SLAAC, such that the security and privacy issues of Interface IDs that embed hardware addresses are mitigated.

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8. References

8.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", [RFC 2460](#), December 1998.
- [RFC2464] Crawford, M., "Transmission of IPv6 Packets over Ethernet Networks", [RFC 2464](#), December 1998.
- [RFC2467] Crawford, M., "Transmission of IPv6 Packets over FDDI Networks", [RFC 2467](#), December 1998.
- [RFC2470] Crawford, M., Narten, T., and S. Thomas, "Transmission of IPv6 Packets over Token Ring Networks", [RFC 2470](#), December 1998.
- [RFC2492] Armitage, G., Schuster, P., and M. Jork, "IPv6 over ATM Networks", [RFC 2492](#), January 1999.
- [RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", [RFC 4291](#), February 2006.
- [RFC4862] Thomson, S., Narten, T., and T. Jinmei, "IPv6 Stateless Address Autoconfiguration", [RFC 4862](#), September 2007.
- [RFC7217] Gont, F., "A Method for Generating Semantically Opaque Interface Identifiers with IPv6 Stateless Address Autoconfiguration (SLAAC)", [RFC 7217](#), April 2014.
- [RFC2491] Armitage, G., Schuster, P., Jork, M., and G. Harter, "IPv6 over Non-Broadcast Multiple Access (NBMA) networks", [RFC 2491](#), January 1999.
- [RFC2497] Souvatzis, I., "Transmission of IPv6 Packets over ARCnet Networks", [RFC 2497](#), January 1999.
- [RFC2590] Conta, A., Malis, A., and M. Mueller, "Transmission of IPv6 Packets over Frame Relay Networks Specification", [RFC 2590](#), May 1999.
- [RFC3146] Fujisawa, K. and A. Onoe, "Transmission of IPv6 Packets over IEEE 1394 Networks", [RFC 3146](#), October 2001.

- [RFC3572] Ogura, T., Maruyama, M., and T. Yoshida, "Internet Protocol Version 6 over MAPOS (Multiple Access Protocol Over SONET/SDH)", [RFC 3572](#), July 2003.
- [RFC4338] DeSanti, C., Carlson, C., and R. Nixon, "Transmission of IPv6, IPv4, and Address Resolution Protocol (ARP) Packets over Fibre Channel", [RFC 4338](#), January 2006.
- [RFC4391] Chu, J. and V. Kashyap, "Transmission of IP over InfiniBand (IPoIB)", [RFC 4391](#), April 2006.
- [RFC5121] Patil, B., Xia, F., Sarikaya, B., Choi, JH., and S. Madanapalli, "Transmission of IPv6 via the IPv6 Convergence Sublayer over IEEE 802.16 Networks", [RFC 5121](#), February 2008.
- [RFC5072] Varada, S., Haskins, D., and E. Allen, "IP Version 6 over PPP", [RFC 5072](#), September 2007.
- [RFC6282] Hui, J. and P. Thubert, "Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks", [RFC 6282](#), September 2011.
- [RFC4944] Montenegro, G., Kushalnagar, N., Hui, J., and D. Culler, "Transmission of IPv6 Packets over IEEE 802.15.4 Networks", [RFC 4944](#), September 2007.
- [RFC6775] Shelby, Z., Chakrabarti, S., Nordmark, E., and C. Bormann, "Neighbor Discovery Optimization for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)", [RFC 6775](#), November 2012.

8.2. Informative References

- [I-D.ietf-6man-ipv6-address-generation-privacy]
Cooper, A., Gont, F., and D. Thaler, "Privacy Considerations for IPv6 Address Generation Mechanisms", [draft-ietf-6man-ipv6-address-generation-privacy-01](#) (work in progress), February 2014.
- [Microsoft]
Davies, J., "Understanding IPv6, 3rd. ed", page 83, Microsoft Press, 2012, <<http://it-ebooks.info/book/1022/>>.

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