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The AERO Address
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Abstract

IPv6 interfaces are required to have a link-local address that is unique on the link. Nodes normally derive a link local address through the use of IPv6 Stateless Address Autoconfiguration (SLAAC) and employ Duplicate Address Detection (DAD) to ensure uniqueness. This document presents a method for a node that obtains a delegated prefix to statelessly construct a link-local address (known as the "AERO address") that is assured to be unique on the link.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on December 26, 2019.

Table of Contents

1. Introduction

IPv6 interfaces are required to have a link-local address that is unique on the link [RFC4291][RFC8200]. Nodes normally derive a link local address through the use of IPv6 StateLess Address Auto Configuration (SLAAC) and employ Duplicate Address Detection (DAD) to ensure uniqueness [RFC4861][RFC4862]. This document presents a method for a node that obtains a delegated prefix to statelessly construct one or more link-local addresses (known as "AERO addresses") that are assured to be unique on the link.

Nodes that construct AERO addresses must have assurance that all other nodes on the link employ the same address autoconfiguration method. This can be assured on links for which there is an "IPv6-over-(foo)" specification that mandates use of AERO addresses (e.g., see: [I-D.templin-intarea-6706bis]). Other link types can be administratively coordinated (e.g., via network management) to assure that only AERO addresses are used.

2. Terminology

The terminology in the normative references applies.

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 [RFC2119]. Lower case uses of these words are not to be interpreted as carrying RFC2119 significance.

3. The AERO Address

An AERO address is an IPv6 link-local address with an interface identifier based on a prefix that has been delegated to a node for its own exclusive use.

For IPv6, AERO addresses begin with the prefix fe80::/64 and include in the interface identifier (i.e., the lower 64 bits) a 64-bit prefix taken from the node's delegated IPv6 prefix. For example, if the node obtains the IPv6 delegated prefix 2001:db8:1000:2000::/56 it constructs its corresponding AERO addresses as:

fe80::2001:db8:1000:2000

fe80::2001:db8:1000:2001

fe80::2001:db8:1000:2002

... etc. ...

fe80::2001:db8:1000:20ff

For IPv4, AERO addresses are based on an IPv4-mapped IPv6 address [RFC4291] formed from the node's delegated IPv4 prefix. For example, for the IPv4 prefix 192.0.2.16/28 the IPv4-mapped AERO addresses are:

fe80::FFFF:192.0.2.16

fe80::FFFF:192.0.2.17

fe80::FFFF:192.0.2.18

... etc. ...

fe80:FFFF:192.0.2.31

Administratively-provisioned AERO addresses are allocated from the range fe80::/96, and MUST be managed for uniqueness by the administrative authority for the link. For interfaces that assign IPv4 addresses, the lower 32 bits of the AERO address includes the IPv4 address, e.g., for the IPv4 address 192.0.2.1 the corresponding AERO address is fe80::192.0.2.1. For other interfaces, the lower 32 bits of the AERO address includes a unique integer value, e.g., fe80::1, fe80::2, fe80::3, etc. (Note that the address fe80:: is reserved as the IPv6 link-local Subnet Router Anycast address [RFC4291], and the address fe80::ffff:ffff is reserved for special-purposes; hence, these values are not available for administrative assignment.)

AERO addresses that embed an IPv6 prefix can be statelessly transformed into an IPv6 Subnet Router Anycast address [RFC4291] and vice-versa. For example, for the AERO address fe80::2001:db8:2000:3000 the corresponding Subnet Router Anycast address is 2001:db8:2000:3000::, and for the IPv6 Subnet Router Anycast address 2001:db8:1:2:: the corresponding AERO address is fe80::2001:db8:1:2.

4. Applicability

The AERO address is useful for mobile networks that comprise a mobile router and a tethered network of "Internet of Things" devices that travel together with the router as a single unit. The mobile router assigns the AERO address to its upstream interface over which it receives a prefix delegation from a delegating router. The manner for receiving the delegated prefix could be through static configuration or some automated prefix delegation service.

Many other use case scenarios are possible (e.g., home networks) but the above case extends to multitudes of applications, e.g., a cell phone and its associated devices, an airplane and its on-board network, etc. A similar uses case exists for a mobile node that obtains a delegated prefix solely for its own internal multi-addressing purposes. These use cases are discussed in [I-D.templin-v6ops-pdhost].

5. Implementation Status

Public domain implementations exist that use the AERO address format as described in this document.

6. IANA Considerations

This document introduces no IANA considerations.

7. Security Considerations

TBD

8. Acknowledgements

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This work is aligned with the Boeing Information Technology (BIT) MobileNet program and the Boeing Research & Technology (BR&T) enterprise autonomy program.

9. References

9.1. Normative References

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[RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, DOI 10.17487/RFC4291, February 2006, <https://www.rfc-editor.org/info/rfc4291>.

[RFC4861] Narten, T., Nordmark, E., Simpson, W., and H. Soliman, "Neighbor Discovery for IP version 6 (IPv6)", RFC 4861, DOI 10.17487/RFC4861, September 2007, <https://www.rfc-editor.org/info/rfc4861>.

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9.2. Informative References

[I-D.templin-intarea-6706bis] Templin, F., "Asymmetric Extended Route Optimization (AERO)", draft-templin-intarea-6706bis-15 (work in progress), June 2019.

[I-D.templin-v6ops-pdhost] Templin, F., "IPv6 Prefix Delegation and Multi-Addressing Models", draft-templin-v6ops-pdhost-23 (work in progress), December 2018.

Appendix A. Change Log

<< RFC Editor - remove prior to publication >>

Changes from -04 to -05:

o Version and reference update

Changes from -03 to -04:

o Added this change log

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