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The IPv6 Loopback Address Prefix
draft-kumari-ipv6-loopback-01

Abstract

This document updates the IP Version 6 Address Architecture to define the IPv6 address prefix `::/96` as the Loopback address prefix.

About This Document

This note is to be removed before publishing as an RFC.

The latest revision of this draft can be found at <https://wkumari.github.io/draft-kumari-ipv6-loopback/draft-kumari-ipv6-loopback.html>. Status information for this document may be found at <https://datatracker.ietf.org/doc/draft-kumari-ipv6-loopback/>.

Source for this draft and an issue tracker can be found at <https://github.com/wkumari/draft-kumari-ipv6-loopback>.

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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1. Introduction

In the IP address architecture, a loopback address is a special IP address used by hosts to send data to itself. Packets directed to a loopback address are automatically routed back to the sending host's network software stack without ever reaching a physical network interface. This has use in some forms of testing and is used to support a non-network method to facilitate local inter-process communication within a host.

This document updates the IP Version 6 Address Architecture to define the IPv6 address prefix `::/96` as the Loopback address prefix.

2. Conventions and Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Loopback addresses

The IPv4 network 127.0.0.0/8 was reserved by the IANA in [RFC791] where the class-based address architecture was described. It is understood that it was the IANA's policy at the time to reserve the first and last network of each class, and the address prefixes 0.0.0.0/8 and 127.0.0.0/8 from the Class A space were reserved in accordance with this practice. [RFC990] listed the 127.0.0.0/8 address prefix as being used by the loopback function, and this function was listed as a requirement for all Internet hosts in [RFC1122].

The "loopback" function is defined such that an outbound packet whose destination address triggers this loopback function should loop the packet back to the packet ingress queue for processing by the same host. No packet that is addresses to a loopback address should ever to passed to any physical network.

[RFC1884], the original IPv6 Addressing Architecture document, allocates a single local loopback address, ::1. This single address allocation has been preserved in all subsequent revision to the IPv6 addressing specification ([RFC2373], [RFC3513], [RFC4291])

Loopback addresses enable localhost communication, network diagnostics, and inter-process connections, making them essential for various local functions.

Multiple loopback addresses can increase the number of distinct sockets that can be used for inter-process communication within a host. A larger local loopback prefix in IPv6 can permit large numbers of distinct concurrent loopback TCP connections within a single host, which is comparable to the functionality supported by the IPv4 loopback address prefix.

4. The IPv6 Loopback Prefix

The IANA IPv6 Address registry denotes the address prefix ::/8 as being reserved by the IETF in [RFC3513] [RFC4291]. This range has been partially allocated with the prefix ::FFFF:0:0/96 being used in the context of an IPv6 transition technology to map IPv4 addresses into IPv6 addresses.

The document expands the set of IPv6 loopback addresses to span the address prefix range ::0 through through ::FFFF:FFFF (or ::/96 in prefix notation).

This RFC replaces section 2.5.2 and 2.5.3 of [RFC4291] as follows:

The Loopback prefix

The unicast address prefix `::/96` is called the loopback address prefix.

The first address of this address prefix block, `0:0:0:0:0:0:0:0` (`::/128`), is also termed the "unspecified address". This address MUST NOT be assigned to any node, as it indicates the absence of an address. One example of the use of this address is in the Source Address field of any IPv6 packets sent by an initializing host before it has learned its own address.

All other loopback addresses drawn from this loopback address prefix may be used by a node as a destination address to send an IPv6 packet to itself. These addresses MUST NOT be assigned to any physical interface. These addresses are treated as having Link-Local scope, and may be thought of as the Link-Local unicast address prefix of a virtual interface (typically called the "loopback interface") to an imaginary link that goes nowhere.

All loopback addresses other than the unspecified address MUST NOT be used as the source address in IPv6 packets that are sent outside of a single node. An IPv6 packet with a destination address of loopback address MUST NOT be sent outside of a single node and must never be forwarded by an IPv6 router. A packet received on an interface with a destination loopback address MUST be dropped.

((Geoff: I have gone for proposing a simple prefix that sits below the IPv4-mapped address block of `0:0:0:0:0:FFFF::/96` - the complication is that the prefix then includes the "unspecified address" as well, so the RFC4291 text relating to the unspecified address is reproduced in this proposed amendment, as this text proposes replacing the entirety of sections 2.5.2 and 2.5.3 of RFC4291.))

((Geoff: David Farmer has proposed adding additional text noting that this proposed address designation clashes with the now deprecated IPv4-Compatible IPv6 Address designation in section 2.5.5.1. It is noted that this was deprecated in RFC4291 twenty years ago and I'm proposing no further mention of this deprecated historic address designation. David suggests that this old designation should be explicitly noted in this text.))

5. Security Considerations

IPv6 addressing documents do not have any direct impact on Internet infrastructure security.

```
((heas: ::1/32 remains the primary loopback address and MUST
(SHOULD?) be assigned to a loopback interface.))
```

```
((WK: I don't think that we need to add anything about the
"Unspecified Address", nor the behavior of "packets with source
address of ::" since this is already covered in RFC 4291, but figured
I'd mention it here for completeness.))
```

6. IANA Considerations

The IANA is requested to amend the IPv6 Address registry and the IPv6 Special Purpose Address registry to record the designation of the IPv6 address prefix `::/96` as denoting the IPV6 Loopback function.

The IANA is also requested to add an entry to the IPv6 Locally-Served DNS Zone Registry for the entry
0.IP6.ARPA

7. References

7.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/rfc/rfc2119>>.
- [RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, DOI 10.17487/RFC4291, February 2006, <<https://www.rfc-editor.org/rfc/rfc4291>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/rfc/rfc8174>>.

7.2. Informative References

- [RFC1122] Braden, R., Ed., "Requirements for Internet Hosts - Communication Layers", STD 3, RFC 1122, DOI 10.17487/RFC1122, October 1989, <<https://www.rfc-editor.org/rfc/rfc1122>>.
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- [RFC791] Postel, J., "Internet Protocol", STD 5, RFC 791, DOI 10.17487/RFC0791, September 1981, <<https://www.rfc-editor.org/rfc/rfc791>>.
- [RFC990] Reynolds, J. and J. Postel, "Assigned numbers", RFC 990, DOI 10.17487/RFC0990, November 1986, <<https://www.rfc-editor.org/rfc/rfc990>>.

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The need for a loopback address prefix has long been a topic of discussion in various forums, and we would like to acknowledge the contributions of many individuals who have participated in these discussions over the years. Unfortunately, at least one of the authors has a terrible memory, and has lost track of all those who have contributed to this topic over the years, and will be more than happy to acknowledge their input if reminded of this :-)

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