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IPv6 Prefix Length Recommendation for Forwarding
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Abstract

The length of IP prefixes is an information used by forwarding and routing processes is policy-based. As such, no maximum length must be assumed by design.

Discussions on the 64-bit boundary in IPv6 addressing revealed a need for a clear recommendation on which bits must be used by forwarding decision-making processes. This document sketches a recommendation to be followed by forwarding and routing designs with regards to the prefix length. The aim is to avoid hard-coded routing and forwarding designs that exclude some IP prefix lengths.

Requirements Language

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].

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1. Introduction

Recent discussions on the 64-bit boundary in IPv6 addressing ([I-D.ietf-6man-why64]) revealed a need for a clear recommendation on which bits must be used by forwarding decision-making processes.

A detailed analysis of the 64-bit boundary in IPv6 addressing, and the implication for end-site prefix assignment, is documented in [I-D.ietf-6man-why64]. No recommendation is included in [I-D.ietf-6man-why64].

It is fundamental to not link routing and forwarding to the IPv6 prefix/address semantics [RFC4291]. This document includes a recommendation for that aim.

Forwarding decisions made by routers primarily rely upon a longest prefix-match algorithm. Like in IPv4, the IPv6 prefix-match algorithms involve one critical operation which is the comparison of a destination address with a prefix present in a routing table (e.g., compare the 2001:db8::1 address with the 2001:db8::/64 prefix). The

recommendation of this document is to be followed by that critical operation.

It is important that the compare operation be a bit-wise comparison, and not a byte-wise comparison.

2. Recommendation

Forwarding decision-making processes MUST NOT restrict by design the length of IPv6 prefixes. In particular, forwarding processes MUST be designed to process prefixes of any length up to /128, by increments of 1.

Obviously, policies can be enforced to restrict the length of IP prefixes advertised within a given domain or in a given interconnection link. These policies are deployment-specific and/or driven by administrative (interconnection) considerations.

This recommendation does not conflict with the 64-bit boundary involved when IPv6 stateless address autoconfiguration (SLAAC, [RFC4862]) is used on links such as Ethernet [RFC2464].

Some lookup algorithm implementations (find the prefix matching a given destination address) may be affected by this recommendation, even more so for IPv6 than IPv4. The performance of some implementations may be degraded when prefix lengths are longer than /64.

3. IANA Considerations

This document does not require any action from IANA.

4. Security Considerations

This document does not introduce security issues in addition to what is discussed in [RFC4291].

5. Acknowledgements

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6. References

6.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, February 2006.

6.2. Informative References

- [I-D.ietf-6man-why64]
Carpenter, B., Chown, T., Gont, F., Jiang, S., Petrescu, A., and A. Yourtchenko, "Analysis of the 64-bit Boundary in IPv6 Addressing", draft-ietf-6man-why64-05 (work in progress), September 2014.
- [RFC2464] Crawford, M., "Transmission of IPv6 Packets over Ethernet Networks", RFC 2464, December 1998.
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