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Route Information Options in Redirect Messages
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Abstract

The IPv6 Neighbor Discovery protocol provides a Redirect function allowing routers to inform hosts of a better next hop on the link toward the destination. This document specifies a backward-compatible extension to the Redirect function to allow routers to include forwarding information that the source can associate with the next hop.

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[1.](#) Introduction

The IPv6 Neighbor Discovery (ND) protocol [[RFC2460](#)][[RFC4861](#)] provides a Redirect function allowing routers to inform hosts of a better next hop on the link toward the destination. The Redirect message includes a target address identifying the next hop and a destination address taken from the IPv6 packet that triggered the Redirect.

"Default Router Preferences and More-Specific Routes" [[RFC4191](#)] specifies a Route Information Option (RIO) that routers can include in Router Advertisement (RA) messages to inform recipients of more-specific routes. This document specifies a backward-compatible extension to allow routers to include RIOs in Redirect messages. This method has precedence in a published experimental RFC [[RFC6706](#)].

[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. Route Information Options in Redirect Messages

The RIO is specified for inclusion in RA messages in [Section 2.3 of \[RFC4191\]](#). The IPv6 ND Redirect function is specified in [Section 8 of \[RFC4861\]](#), where the introductory paragraphs include the following:

"Redirect messages are sent by routers to redirect a host to a better first-hop router for a specific destination or to inform hosts that a destination is in fact a neighbor (i.e., on-link)."

This specification permits routers to include RIO options in Redirect messages so that hosts can direct future packets to a better first-hop for a **set of destinations** instead of just a singleton. This specification therefore updates [\[RFC4191\]](#) and [\[RFC4861\]](#) as discussed in the following sections.

3.1. Validation of Redirect Messages

The validation of Redirect messages follows [Section 8.1 of \[RFC4861\]](#) which states:

"The contents of the Reserved field, and of any unrecognized options, MUST be ignored. Future, backward-compatible changes to the protocol may specify the contents of the Reserved field or add new options; "

This specification permits routers to include RIOs in Redirect messages, and therefore represents a backward-compatible change to the protocol through the addition of a new option as described in this passage.

3.2. Router Specification

The Router Specification follows [Section 8.2 of \[RFC4861\]](#), except that RIOs are included in the list of permissible options. Routers therefore MAY send Redirect messages containing RIOs, where the RIOs are determined by a means outside the scope of this specification.

When the router includes RIOs, it MAY set the Destination Address field of the Redirect message to ':::' (i.e., the IPv6 unspecified address) if the destination of the packet that triggered the redirection event is covered by a prefix in one of the RIOs.

3.3. Host Specification

The Host Specification follows [Section 8.3 of \[RFC4861\]](#) and [Section 3 of \[RFC4191\]](#). According to [\[RFC4861\]](#), a host receiving a valid Redirect updates its destination cache and neighbor cache per the Destination and Target information included in the message, respectively. According to [\[RFC4191\]](#), a "Type C" host receiving a valid RA message updates its routing table per the RIOs included in the message.

In light of these considerations, a "Type C" host that receives a Redirect message containing RIOs adopts the combined behaviors of both of these specifications. Namely, the host updates its neighbor cache entry for the Target and updates its routing table per the included RIOs. If the Destination address is not the unspecified address, the host further updates its destination cache.

Note that "Type A" and "Type B" hosts ignore any RIOs and process the Redirect message according to [Section 8.3 of \[RFC4861\]](#).

4. Implementation Status

The Redirect function and RIOs are widely deployed in IPv6 implementations.

5. IANA Considerations

This document introduces no IANA considerations.

6. Security Considerations

Security considerations for Redirect messages that include RIOs are the same as for any IPv6 ND messages as specified in [Section 11 of \[RFC4861\]](#). Namely, the protocol must take measures to secure IPv6 ND messages on links where spoofing attacks are possible.

A spoofed Redirect message containing no RIOs could cause corruption in the host's destination cache while a spoofed Redirect message containing RIOs could corrupt the host's routing tables. While the latter would seem to be a more onerous result, the possibility for corruption is unacceptable in either case.

7. Acknowledgements

This document was motivated by discussions on the intarea list.

8. References

8.1. Normative References

- [RFC0791] Postel, J., "Internet Protocol", STD 5, [RFC 791](#), DOI 10.17487/RFC0791, September 1981, <<http://www.rfc-editor.org/info/rfc791>>.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.
- [RFC2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", [RFC 2460](#), DOI 10.17487/RFC2460, December 1998, <<http://www.rfc-editor.org/info/rfc2460>>.
- [RFC4191] Draves, R. and D. Thaler, "Default Router Preferences and More-Specific Routes", [RFC 4191](#), DOI 10.17487/RFC4191, November 2005, <<http://www.rfc-editor.org/info/rfc4191>>.
- [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, <<http://www.rfc-editor.org/info/rfc4861>>.

8.2. Informative References

- [RFC6706] Templin, F., Ed., "Asymmetric Extended Route Optimization (AERO)", [RFC 6706](#), DOI 10.17487/RFC6706, August 2012, <<http://www.rfc-editor.org/info/rfc6706>>.

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