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IPv6 Router Advertisement Flags Option

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Abstract

The IPv6 Neighbor Discovery's Router Advertisement message contains an 8-bit field reserved for single-bit flags. Several protocols have reserved flags in this field and others are preparing to reserve a sufficient number of flags to exhaust the field. This document defines an option to the Router Advertisement message that expands the number of flag bits available.

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1. Introduction

The IPv6 Neighbor Discovery Protocol's (NDP) [RFC4861] Router Advertisement message contains an 8-bit field reserved for single-bit flags. Several protocols have reserved flags in this field and others are preparing to reserve a sufficient number of flags to exhaust the field.

This document defines an option for the Router Advertisement message that expands the available number of flag bits by adding an additional 48 flag bits to NDP messages.

2. Terminology

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].

3. Current Router Advertisement Flags

Currently, the NDP Router Advertisement message contains the following one-bit flags defined in published RFCs:

```

  0 1 2 3 4 5 6 7
+---+---+---+---+
|M|O|H|Prf|P|R|R|
+---+---+---+---+

```

Figure 1: Router Advertisement Flags

- o M - Managed Address Configuration Flag [RFC4861]
- o O - Other Configuration Flag [RFC4861]
- o H - Mobile IPv6 Home Agent Flag [RFC3775]
- o Prf - Router Selection Preferences [RFC4191]
- o P - Neighbor Discovery Proxy Flag [RFC4389]
- o R - Reserved

With other protocols in the works (e.g., Detecting Network Attachment) that want to use flags in the NDP messages, it is necessary to define an expansion capability to support new features.

4. Flags Expansion Option

The Neighbor Discovery specification [RFC4861] contains the capability to define NDP options. The following (Figure 2) is the definition of the Expanded Flags Option (EFO) for NDP Router Advertisement messages.

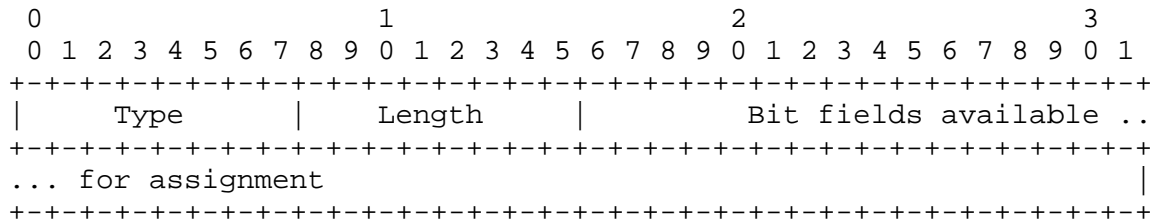


Figure 2: Router Advertisement Expanded Flags Option

- o Type - 26
- o Length - The length MUST be checked when processing the option in order to allow for future expansion of this option. An implementation of this specification MUST set the Length to 1, MUST ignore any unrecognized data, and MUST be able to recognize the specific length in order to skip over unrecognized bits.
- o Bits - allocated by IANA

The definition and usage of these bits is to be found in the document requesting their allocation.

During the construction/transmission, this option:

- o MUST only occur in Router Advertisement messages.
- o MUST occur prior to any additional options associated with any flags set in this option.
- o MUST only occur once in the Router Advertisement message.
- o MUST NOT be added to a Router Advertisement message if no flags in the option are set.
- o MUST set all unused flags to zero.

Upon reception, a receiver processing NDP messages containing this option:

- o MUST ignore the option if it occurs in a message other than a Router Advertisement.
- o MUST ignore all instances of the option except the first one encountered in the Router Advertisement message.
- o MUST ignore the option if the Length is less than 1.
- o MUST ignore any unknown flag bits.

The bit fields within the option are numbered from left to right, from 8 to 55 (starting as bit offset 16 in the option) and follow the numbering of the flag bits in the RA option described in Figure 1. Flag bits 0 to 7 are found in the Router Advertisement message header defined in [RFC4861].

5. IANA Considerations

IANA has defined a new IPv6 Neighbor Discovery option for the option defined in this document of the form:

| Type | Description | Reference |
|------|---------------------------|-----------|
| 26 | RA Flags Extension Option | [RFC5175] |

The registry for these options can be found at:
<http://www.iana.org/assignments/icmpv6-parameters>

IANA has created a new registry for IPv6 ND Router Advertisement flags. This should include the current flags in the RA option and in the extension option defined in this document. The new registry has been added to the icmpv6-parameters as shown above. The format for the registry is:

| RA Option Bit | Description | Reference |
|---------------|--|-----------|
| 0 | M - Managed Address Configuration Flag | [RFC4861] |
| 1 | O - Other Configuration Flag | [RFC4861] |
| 2 | H - Mobile IPv6 Home Agent Flag | [RFC3775] |
| 3 | Prf - Router Selection Preferences | [RFC4191] |
| 4 | Prf - Router Selection Preferences | [RFC4191] |
| 5 | P - Neighbor Discovery Proxy Flag | [RFC4389] |
| 6-53 | R - Reserved; Available for assignment | |
| 54-55 | Private Experimentation | |

The assignment of new RA flags in the RA option header and the bits defined in the RA extension option defined in this document require standards action or IESG approval [RFC2434].

6. Security Considerations

This protocol shares the security issues of NDP that are documented in the "Security Considerations" section of [RFC4861].

The inclusion of additional optional bit fields provides a potential covert channel that is useful for passing information.

7. References

7.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
- [RFC2434] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", BCP 26, RFC 2434, October 1998.
- [RFC4861] Narten, T., Nordmark, E., Simpson, W., and H. Soliman, "Neighbor Discovery for IP version 6 (IPv6)", RFC 4861, September 2007.

7.2. Informative References

- [RFC3775] Johnson, D., Perkins, C., and J. Arkko, "Mobility Support in IPv6", RFC 3775, June 2004.
- [RFC4191] Draves, R. and D. Thaler, "Default Router Preferences and More-Specific Routes", RFC 4191, November 2005.
- [RFC4389] Thaler, D., Talwar, M., and C. Patel, "Neighbor Discovery Proxies (ND Proxy)", RFC 4389, April 2006.

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