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Distributing Address Selection Policy using DHCPv6
draft-fujisaki-6man-addr-select-opt-00.txt

Abstract

This document describes a new DHCPv6 option for distributing address selection policy information defined in RFC3484 to a client. With this option, site administrators can distribute address selection policy to control the node's address selection behavior.

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 January 29, 2011.

1. Introduction

RFC3484 [RFC3484] (Draves, R., “Default Address Selection for Internet Protocol version 6 (IPv6),” February 2003.) describes algorithms for selecting a default address when a node has multiple destination and/or source addresses by using an address selection policy. However, there are some problems with the default address selection policy in RFC3484 [RFC5220] (Matsumoto, A., Fujisaki, T., Hiromi, R., and K. Kanayama, “Problem Statement for Default Address Selection in Multi-Prefix Environments: Operational Issues of RFC 3484 Default Rules,” July 2008.), and mechanisms to control a proper source address selection will be necessary. Requiremets for those mechanisms are described in [RFC5221] (Matsumoto, A., Fujisaki, T., Hiromi, R., and K. Kanayama, “Requirements for Address Selection Mechanisms,” July 2008.). Solutions are discussed in [I-D.ietf-6man-addr-select-sol] (Matsumoto, A., Fujisaki, T., and R. Hiromi, “Solution approaches for address-selection problems,” March 2010.) and [I-D.ietf-6man-addr-select-considerations] (Chown, T., “Considerations for IPv6 Address Selection Policy Changes,” July 2010.). This document describes an option for distributing address selection policy information using DHCPv6, which is refered as `most proactive approach' in the solution document, and `perferable protocol to deliver RFC3848 policies' in consideration document.

1.1. Conventions Used in This Document

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 [RFC2119] (Bradner, S., “Key words for use in RFCs to Indicate Requirement Levels,” March 1997.).

1.2. Terminology

This document uses the terminology defined in [RFC2460] (Deering, S. and R. Hinden, “Internet Protocol, Version 6 (IPv6) Specification,” December 1998.) and the DHCP specification defined in [RFC3315] (Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, “Dynamic Host Configuration Protocol for IPv6 (DHCPv6),” July 2003.)

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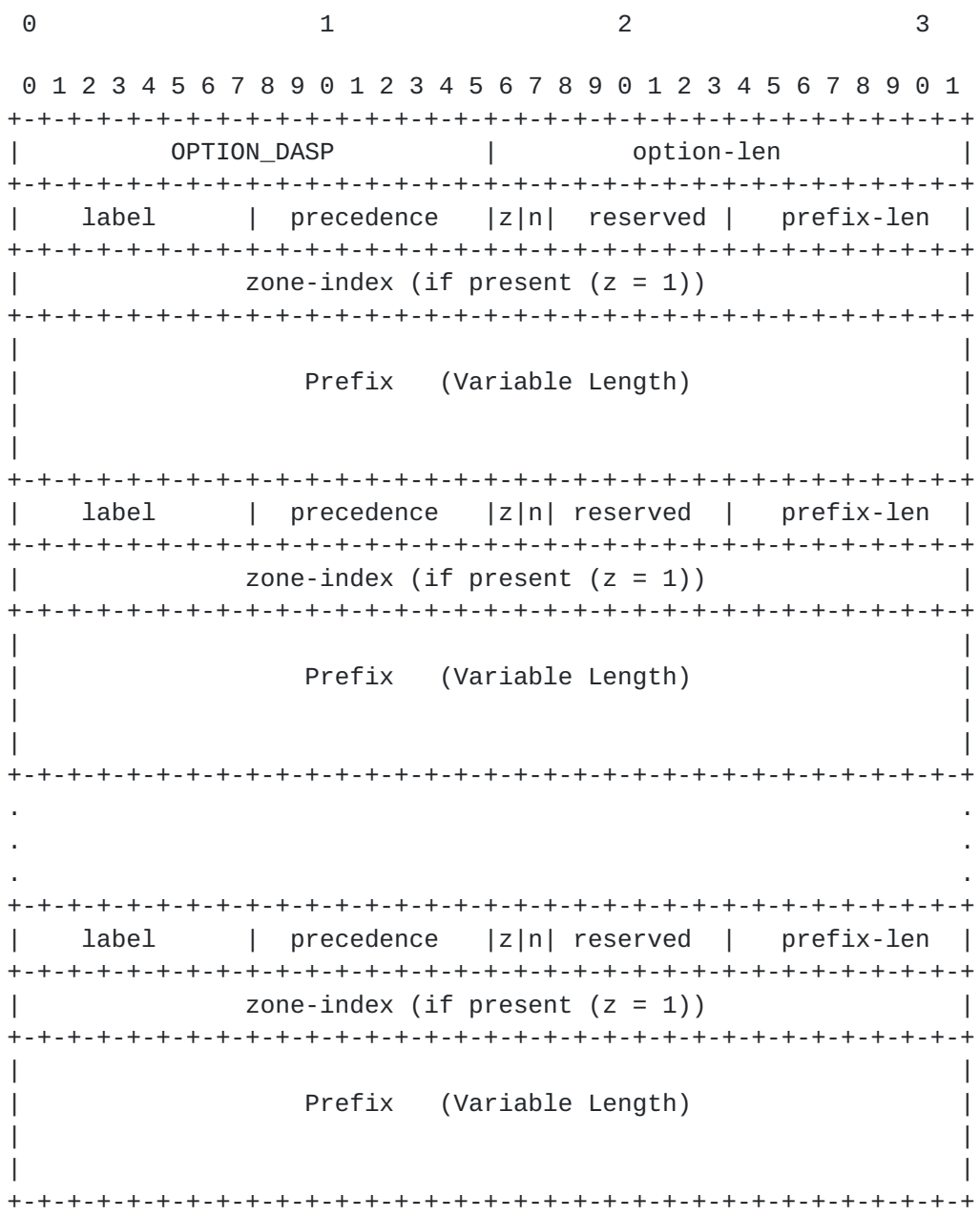
2. Address Selection Policy Option

The Address Selection Policy Option provides policy information for address selection rules. Specifically, it transmits a set of IPv6

source and destination address prefixes and some parameters that are used to control address selection as described in RFC 3484.
Each end node is expected to configure its policy table, as described in RFC 3484, using the Address Selection Policy option information as an reference.
The format of the Address Selection Policy option is given below:



[Fig. 1]

Fields:

option-code: OPTION_DASP (TBD)

option-len: The total length of the label fields, precedence fields, zone-index fields, prefix-len fields, and prefix fields in octets.

label: An 8-bit unsigned integer; this value is used to make a combination of source address prefixes and destination address prefixes.

precedence: An 8-bit unsigned integer; this value is used for sorting destination addresses.

z bit: 'zone-index' bit. If z bit is set to 1, 32 bit zone-index value is included right after the "prefix-len" field, and "Prefix" value continues after the "zone-index" field. If z bit is 0, "Prefix" value contitunes right after the "prefix-len" value.

n bit: 'no privacy iid' bit. If n bit is set to 1, RFC 4941 [RFC4941] (Narten, T., Draves, R., and S. Krishnan, “Privacy Extensions for Stateless Address Autoconfiguration in IPv6,” September 2007.) privacy extensions MUST NOT be used for this prefix. If n bit is 0, interface ID may use RFC4941.

reserved: 6-bit reservied field. Initialized to zero by sender, and ignored by receiver.

zone-index: If z-bit is set to 1, this field is inserted between "prefix-len" field and "Prefix" field. Zone-index field is an 32-bit unsigned integer and used to specify zones for scoped addresses. This bit length is defined in RFC3493 [RFC3493] (Gilligan, R., Thomson, S., Bound, J., McCann, J., and W. Stevens, “Basic Socket Interface Extensions for IPv6,” February 2003.) as 'scope ID'.

prefix-len: An 8-bit unsigned integer; the number of leading bits in the prefix that are valid. The value ranges from 0 to 128. The Prefix field is 0, 4, 8, 12, or 16 octets, depending on the length.

Prefix: A variable-length field containing an IP address or the prefix of an IP address. IPv4-mapped address [mapped] must be used to represent an IPv4 address as a prefix value.

3. Appearance of this Option

The Address Selection Policy option MUST NOT appear in any messages other than the following ones : Solicit, Advertise, Request, Renew, Rebind, Information-Request, and Reply.

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4. Implementation Considerations

*The value 'label' is passed as an unsigned integer, but there is no special meaning for the value, that is whether it is a large or small number. It is used to select a preferred source address prefix corresponding to a destination address prefix by matching the same label value within this DHCP message. DHCPv6 clients need to convert this label to a representation specified by each implementation (e.g., string).

*Currently, the value label, precedence are defined as 8-bit unsigned integers. In almost all cases, this value will be enough.

*The maximum number of address selection rules in one DHCPv6 message depend on the prefix length of each rules and maximum DHCPv6 message size defined in RFC3315. It is possible to carry over 3,000 rules (e.g. default policy table defined in RFC3484 contains 5 rules) in one DHCPv6 message (maximum UDP message size).

*Since the number of selection rules would be large, policy distributer should be care about the DHCPv6 message size.

*If there are multiple DHCPv6 servers (e.g. a node with multiple interface), a node may have multiple address selection policies. Since RFC3484 policy table is one and global for a node, the node have to decide how to process multiple policies. This policy conflict is discussed in [I-D.ietf-6man-addr-select-considerations] (Chown, T., “Considerations for IPv6 Address Selection Policy Changes,” July 2010.).

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5. Discussion

*The 'zone index' value is used to specify a particular zone for scoped addresses. This can be used effectively to control address selection in the site scope (e.g., to tell a node to use a specified source address corresponding to a site-scoped multicast address). However, in some cases such as a link-local scope address, the value specifying one zone is only meaningful locally within that node. There might be some cases where the administrator knows which clients are on the network and wants specific interfaces to be used though. However, in general case, it is hard to use this value.

*Since we got a comment that some implementations use 32-bit integers for zone index value, we extended the bit lenght of the 'zone index' field. However, as described above, there might be few cases to specify 'zone index' in policy distribution, we defined this field as optional, controled by a flag.

*There may be some demands to control the use of special address types such as the temporary addresses described in RFC4941 [RFC4941] (Narten, T., Draves, R., and S. Krishnan, “Privacy Extensions for Stateless Address Autoconfiguration in IPv6,” September 2007.), address assigned by DHCPv6 and so on. (e.g., informing not to use a temporary address when it communicate within the an organization's network). It is possible to indicate the type of addresses using reserved field value.

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6. Security Considerations

A rogue DHCPv6 server could issue bogus address selection policies to a client. This might lead to incorrect address selection by the client, and the affected packets might be blocked at an outgoing ISP because of ingress filtering.
To guard against such attacks, both DCHP clients and servers SHOULD use DHCP authentication, as described in section 21 of RFC 3315, "Authentication of DHCP messages."

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7. IANA Considerations

IANA is requested to assign option codes to OPTION_DASP from the option-code space as defined in section "DHCPv6 Options" of RFC 3315.

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8. References

8.1. Normative References

[RFC2119]	Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels," BCP 14, RFC 2119, March 1997 (TXT, HTML, XML).
[RFC3315]	Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)," RFC 3315, July 2003 (TXT).
[RFC3484]	Draves, R., "Default Address Selection for Internet Protocol version 6 (IPv6)," RFC 3484, February 2003 (TXT).

8.2. Informative References

[I-D.ietf-6man-addr-select-considerations]	Chown, T., "Considerations for IPv6 Address Selection Policy Changes," draft-ietf-6man-addr-select-considerations-02 (work in progress), July 2010 (TXT).
[I-D.ietf-6man-addr-select-sol]	Matsumoto, A., Fujisaki, T., and R. Hiromi, "Solution approaches for address-selection problems," draft-ietf-6man-addr-select-sol-03 (work in progress), March 2010 (TXT).
[RFC2460]	Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification," RFC 2460, December 1998 (TXT, HTML, XML).
[RFC3493]	Gilligan, R., Thomson, S., Bound, J., McCann, J., and W. Stevens, "Basic Socket Interface Extensions for IPv6," RFC 3493, February 2003 (TXT).
[RFC4941]	Narten, T., Draves, R., and S. Krishnan, "Privacy Extensions for Stateless Address Autoconfiguration in IPv6," RFC 4941, September 2007 (TXT).
[RFC5220]	Matsumoto, A., Fujisaki, T., Hiromi, R., and K. Kanayama, "Problem Statement for Default Address Selection in Multi-Prefix Environments: Operational Issues of RFC 3484 Default Rules," RFC 5220, July 2008 (TXT).
[RFC5221]	Matsumoto, A., Fujisaki, T., Hiromi, R., and K. Kanayama, "Requirements for Address Selection Mechanisms," RFC 5221, July 2008 (TXT).

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