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DHCPv6 Option for IPv4-Embedded Multicast and Unicast IPv6 Prefixes
draft-ietf-softwire-multicast-prefix-option-06

Abstract

   This document defines Dynamic Host Configuration Protocol version 6
   (DHCPv6) Option for multicast transition solutions, aiming to convey
   the IPv6 prefixes to be used to build unicast and multicast
   IPv4-embedded IPv6 addresses.

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   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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   time. It is inappropriate to use Internet-Drafts as reference
   material or to cite them other than as "work in progress."

   This Internet-Draft will expire on September 26, 2014.

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1. Introduction

Several solutions (e.g., [I-D.ietf-softwire-dslite-multicast]) are proposed for the delivery of multicast services in the context of transition to IPv6. Even if these solutions may have different applicable use cases, they all use specific IPv6 addresses to embed IPv4 addresses, for both multicast group, and multicast source addresses.

This document defines a DHCPv6 option [RFC3315] to convey the IPv6 prefixes to be used for constructing these IPv4-embedded IPv6 addresses.

This option can be in particular used in the context of DS-Lite [RFC6333], Stateless A+P [RFC6346] and other IPv4-IPv6 transition techniques.

1.1. 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].

2. Terminology

   This document makes use of the following terms:

   o IPv4-embedded IPv6 address: is an IPv6 address which embeds a 32
      bit-encoded IPv4 address [RFC6052]. An IPv4-embedded IPv6 address
      can be a unicast or a multicast address.
   o PREFIX64: is an IPv6 prefix used for synthesizing IPv4-embedded
      IPv6 addresses. A PREFIX64 can be of unicast or multicast.

         Note: "64" is used as an abbreviation for IPv6-IPv4
         interconnection.
   o ASM_PREFIX64: is a multicast PREFIX64 which belongs to the Any-
      Source Multicast (ASM) range.
   o SSM_PREFIX64: is a multicast PREFIX64 which belongs to the Source-
      Specific Multicast (SSM, [RFC4607]) range.
   o U_PREFIX64: is a unicast PREFIX64 for building the IPv4-embedded
      IPv6 addresses of multicast sources in SSM mode.

3. PREFIX64 DHCPv6 Option

   OPTION_V6_PREFIX64 (Figure 1) conveys the IPv6 prefix(es) to be used
   (e.g., by a mB4 [I-D.ietf-softwire-dslite-multicast]) to synthesize
   IPv4-embbedded IPv6 addresses.

```
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |       OPTION_V6_PREFIX64     |          option-length        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  asm-length   |                                              |
   +-+-+-+-+-+-+-+-+                                              :
   :                  ASM_PREFIX64 (Variable)                    :
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  ssm-length   |                                              |
   +-+-+-+-+-+-+-+-+                                              :
   :                  SSM_PREFIX64 (Variable)                    :
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   | unicast-length|                                              |
   +-+-+-+-+-+-+-+-+                                              :
   :                  U_PREFIX64 (Variable)                      :
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

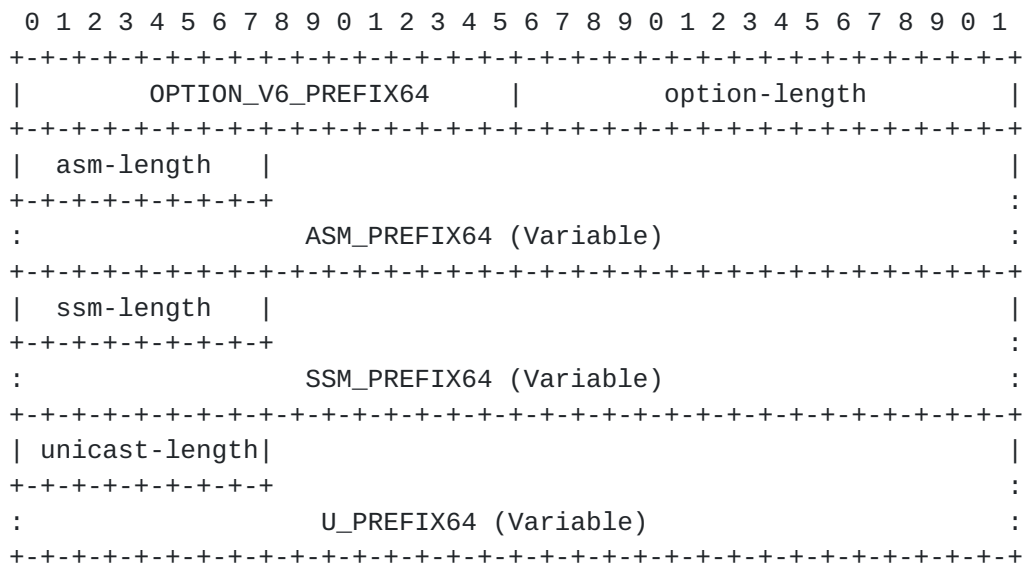   Figure 1: DHCPv6 Option Format for PREFIX64

   The fields of the option shown in Figure 1 are as follows:

   option-code: OPTION_V6_PREFIX64 (see Section 8).
   option-length: length of the PREFIX64 option.

asm-length: the prefix-length for the ASM IPv4-embedded prefix, as
    an 8-bit unsigned integer (0 to 128). This field represents the
    number of valid leading bits in the prefix.
ASM_PREFIX64: this field identifies the IPv6 multicast prefix to be
    used to synthesize the IPv4-embedded IPv6 addresses of the
    multicast groups in the ASM mode. It is a variable size field
    with the length of the field defined by the asm-length field and
    is rounded up to the nearest octet boundary. In such case any
    additional padding bits must be zeroed. The conveyed multicast
    IPv6 prefix MUST belong to the ASM range. This prefix is likely
    to be a /96.
ssm-length: the prefix-length for the SSM IPv4-embedded prefix, as
    an 8-bit unsigned integer (0 to 128). This field represents the
    number of valid leading bits in the prefix.
SSM_PREFIX64: this field identifies the IPv6 multicast prefix to be
    used to synthesize the IPv4-embedded IPv6 addresses of the
    multicast groups in the SSM mode. It is a variable size field
    with the length of the field defined by the ssm-length field and
    is rounded up to the nearest octet boundary. In such case any
    additional padding bits must be zeroed. The conveyed multicast
    IPv6 prefix MUST belong to the SSM range. This prefix is likely
    to be a /96.
unicast-length: the prefix-length for the IPv6 unicast prefix to be
    used to synthesize the IPv4-embedded IPv6 addresses of the
    multicast sources, as an 8-bit unsigned integer (0 to 128). This
    field represents the number of valid leading bits in the prefix.
U_PREFIX64: this field identifies the IPv6 unicast prefix to be used
    in SSM mode for constructing the IPv4-embedded IPv6 addresses
    representing the IPv4 multicast sources in the IPv6 domain.
    U_PREFIX64 may also be used to extract the IPv4 address from the
    received multicast data flows. It is a variable size field with
    the length of the field defined by the unicast-length field and is
    rounded up to the nearest octet boundary. In such case any
    additional padding bits must be zeroed. The address mapping MUST
    follow the guidelines documented in [RFC6052].

4. Configuration Guidelines for the Server

   DHCP servers supporting OPTION_V6_PREFIX64 should be configured with
   U_PREFIX64 and at least one ASM_PREFIX64 or one SSM_PREFIX64.

   When ASM_PREFIX64 and SSM_PREFIX64 are configured, the length of
   these prefixes must be /96.

   Both ASM_PREFIX64 and SSM_PREFIX64 may be configured and therefore be
   returned to a requesting DHCP client; it is deployment-specific. In
   particular, if both SSM and ASM modes are supported, ASM_PREFIX64 and

SSM_PREFIX64 prefixes must be configured. For SSM deployments, both
SSM_PREFIX64 and U_PREFIX64 should be configured.

5. DHCPv6 Client Behavior

To retrieve the IPv6 prefixes that will be used to synthesize unicast
and multicast IPv4-embedded IPv6 addresses, the DHCPv6 client MUST
include OPTION_V6_PREFIX64 in its OPTION_ORO. If the DHCPv6 client
receives more than one OPTION_V6_PREFIX64 option from the DHCPv6
server:

o If all the enclosed IPv4-embedded IPv6 multicast prefixes have the
   same scope, the first instance of the option MUST be used.
o If each enclosed IPv4-embedded IPv6 multicast prefix has a
   distinct scope, the client MUST select the appropriate
   IPv4-embedded IPv6 multicast prefix having a scope matching the
   IPv4 multicast address used to synthesize an IPv4-embedded IPv6
   multicast address.

If asm-length, ssm-length and unicast-length fields are all set to 0,
the DHCPv6 client MUST behave as if OPTION_V6_PREFIX64 had not been
received in the response received from the DHCPv6 server.

If the asm-length field is non-null, the IPv6 prefix identified by
ASM_PREFIX64 is used to synthesize IPv4-embedded IPv6 multicast
addresses in the ASM range. This is achieved by concatenating the
ASM_PREFIX64 and the IPv4 multicast address; the Pv4 multicast
address is inserted in the last 32 bits of the IPv4-embedded IPv6
multicast address.

If the ssm-length field is non-null, the IPv6 prefix identified by
SSM_PREFIX64 is used to synthesize IPv4-embedded IPv6 multicast
addresses in the SSM range. This is achieved by concatenating the
SSM_PREFIX64 and the IPv4 multicast address; the Pv4 multicast
address is inserted in the last 32 bits of the IPv4-embedded IPv6
multicast address.

If the unicast-length field is non-null, the IPv6 prefix identified
by U_PREFIX64 field is used to synthesize IPv4-embedded IPv6 unicast
addresses as specified in [RFC6052].

6. Security Considerations

The security considerations documented in [RFC3315] and [RFC6052] are
to be considered.

7. Acknowledgements

Particular thanks to C. Jacquenet, S. Venaas, B. Volz and T. Taylor
for their review.

8. IANA Considerations

Authors of this document request IANA to assign a new DHCPv6 option
in the registry maintained in http://www.iana.org/assignments/
dhcpv6-parameters:

```
                      Option Name    Value
                      ---------------- -----
                      OPTION_V6_PREFIX64 TBA
```

9. References

9.1. Normative References

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