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DHCPv6 Option for IPv4-Embedded Multicast and Unicast IPv6 Prefixes draft-ietf-softwire-multicast-prefix-option-13

Abstract

This document defines a Dynamic Host Configuration Protocol version 6 (DHCPv6) Option for multicast IPv4 service continuity solutions, which is used to carry the IPv6 prefixes to be used to build unicast and multicast IPv4-embedded IPv6 addresses.

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 August 5, 2017.

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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 that embed IPv4 addresses, for both multicast group and source addresses.

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

In particular, this option can be 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:

IPv4-embedded IPv6 address: 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.

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.

ASM_mPrefix64: a multicast Prefix64 which belongs to the Any-Source Multicast (ASM) range.

SSM_mPrefix64: a multicast Prefix64 which belongs to the Source-Specific Multicast (SSM) [RFC4607] range.

uPrefix64: a unicast Prefix64 for building the IPv4-embedded IPv6 addresses of multicast sources in SSM mode.

3. OPTION_V6_PREFIX64 DHCPv6 Option

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

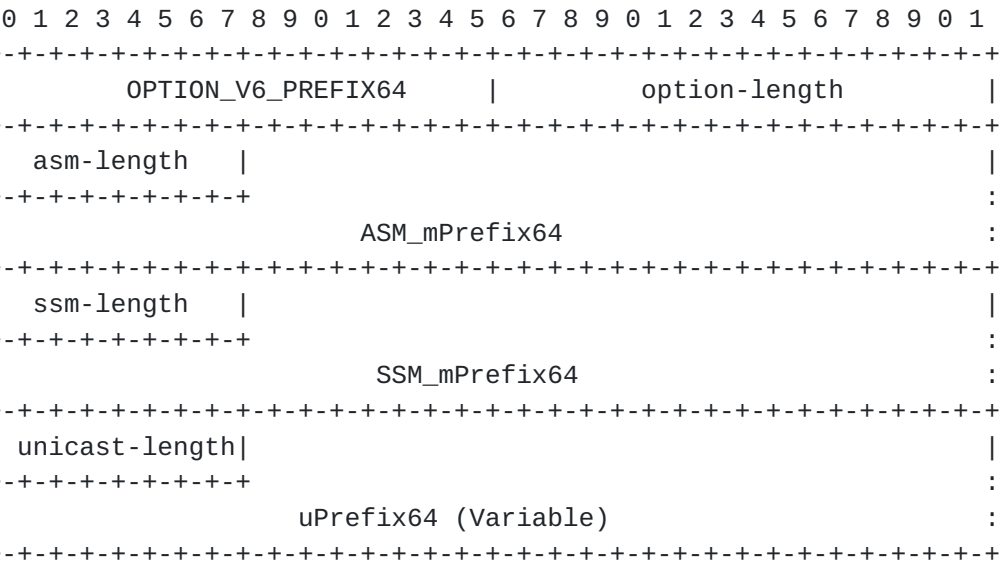

Figure 1: OPTION_V6_PREFIX64: Option Format

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 option, in octets.

asm-length: the prefix-length for the ASM IPv4-embedded prefix, as an 8-bit unsigned integer. This field represents the number of valid leading bits in the prefix. This field MUST be set to 96.

ASM_mPrefix64: 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. The conveyed multicast IPv6 prefix MUST belong to the ASM range.

ssm-length: the prefix-length for the SSM IPv4-embedded prefix, as an 8-bit unsigned integer. This field represents the number of valid leading bits in the prefix. This field MUST be set to 96.

SSM_mPrefix64: 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. The conveyed multicast IPv6 prefix MUST belong to the SSM range.

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. As specified in [RFC6052], the unicast-length MUST be one of 32, 48, 56, 64, or 96. This field represents the number of valid leading bits in the prefix.

uPrefix64: 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. uPrefix64 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 this case, any additional padding bits must be zeroed. The address mapping MUST follow the guidelines documented in [RFC6052].

Multiple instances of OPTION_V6_PREFIX64 may be returned to a DHCPv6 client.

Note that it was tempting to define three distinct DHCPv6 options, but that approach was not adopted because it has a side effect: the specification of a DHCPv6 option that could be used to discover unicast Prefix64s in environments where multicast is not enabled. Such side effect conflicts with the recommendation to support the Well-Known DNS Name heuristic discovery-based method for unicast-only environments (Section 6 of [RFC7051]).

4. Configuration Guidelines for the Server

This section is not normative but specifies a set of configuration guidelines.

DHCP servers supporting OPTION_V6_PREFIX64 must be configured with ASM_mPrefix64 or SSM_mPrefix64, and may be configured with both. uPrefix64 must also be configured when SSM_mPrefix64 is provided. uPrefix64 may be configured when ASM_mPrefix64 is provided. Note that uPrefix64 is not mandatory for the ASM case if, for example, a local address mapping algorithm is supported or the Well-Know Prefix (64:ff9b::/96) is used.

When a multicast Prefix64 (ASM_mPrefix64 or SSM_mPrefix64) is configured, the length of the prefix must be /96.

Both ASM_mPrefix64 and SSM_mPrefix64 may be configured and therefore be returned to a requesting DHCP client in the same OPTION_V6_PREFIX64. In particular, if both SSM and ASM modes are supported, ASM_mPrefix64 and SSM_mPrefix64 prefixes must be configured. For SSM deployments, both SSM_mPrefix64 and uPrefix64 must be configured.

When distinct IPv6 multicast address scopes [RFC7346] are required to preserve the scope when translating IPv4 multicast addresses (Section 8 of [RFC2365]), each scope is configured as a separate OPTION_V6_PREFIX64. How DHCP servers are configured to separate multicast Prefix64 per scope is implementation-specific and not covered by this document.

When scope preservation is not required, only one instance of OPTION_V6_PREFIX64 is 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 code in its OPTION_ORO. If the DHCPv6 client receives more than one OPTION_V6_PREFIX64 option from the DHCPv6 server:

- If each enclosed IPv6 multicast prefix has a distinct scope [RFC7346], the client MUST select the appropriate IPv6 multicast prefix whose scope matches the IPv4 multicast address used to synthesize an IPv4-embedded IPv6 multicast address.

- o If at least two of the received options convey IPv6 multicast prefixes that have the same scope, the said options MUST be discarded.

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_mPrefix64 is used to synthesize IPv4-embedded IPv6 multicast addresses in the ASM range. This is achieved by concatenating the ASM_mPrefix64 and the IPv4 multicast address; the IPv4 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_mPrefix64 is used to synthesize IPv4-embedded IPv6 multicast addresses in the SSM range. This is achieved by concatenating the SSM_mPrefix64 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 uPrefix64 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. Acknowledgments

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8. IANA Considerations

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

Option Name	Value
OPTION_V6_PREFIX64	TBA

9. References

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