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DHCPv6 Option for Configuration of 6LoWPAN Compression Contexts
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Abstract

This document specifies a DHCPv6 option to configure hosts on a 6LoWPAN with IPv6 address compression information as required by stateful compression methods specified in RFC 6282. The option provides up to 16 prefixes that can be associated with specific instances of IPv6 address compression used in 6LoWPANs. Each prefix can be a variable length of bits, and includes a validity lifetime as well.

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 November 2, 2015.

1. Introduction

RFC 6282 describes a procedure for the compression of IPv6 addresses in IP headers, and this same technique can be used to compress arbitrary IPv6 addresses. The compression algorithms contain default, stateless methods, as well as "stateful" address compression based on a set of compression "contexts". However, the method by which 6LoWPAN nodes acquire these contexts is out of scope of RFC 6282. RFC 6775 introduced a method by which router advertisements can include "6LowPAN Context Options" that communicate context information to devices on the 6LoWPAN network. RFC 6775 also introduced a way to limit the rate of multicast router advertisements to make these router advertisements more friendly to constrained LoWPANs. These mechanisms allow a stateless auto-configuration option for LoWPANs. DHCPv6 is both a stateful method for address configuration, as well as stateless alternative for configuration of 6LoWPAN devices. DHCPv6 provides extensibility through the support of TLV options in the protocol. This document specifies such a DHCPv6 option for configuring 6LoWPAN compression contexts.

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 [RFC2119] [RFC2119].

2. Terminology

This document primarily uses the terminology described in [RFC6550], [RFC3315] and [RFC6282]. The terminology and concepts described in these documents will assist in the reading of this document.

3. DHCP Option format for 6LowPAN Compression Contexts

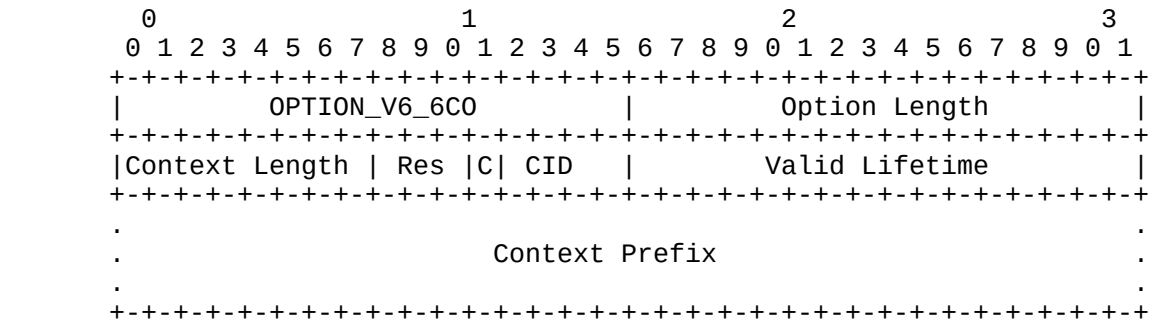

Figure 1: 6LoWPAN Context Option Format

Figure 1

The description of the option fields is provided below:

- OPTION_V6_6CO: The option-code per RFC 3315 (TBA by IANA)
- Option Length: 16-bit unsigned length (in bytes) of the entire option contents, including the type and length fields
- Context Length: 8-bit unsigned integer. The number (0 - 128) of valid leading bits in the "Context Prefix" field.
- Res: This field is currently unused. It MUST be initialized to zero by the server and MUST be ignored by the DHCPv6 client.
- CID: 4-bit Context Identifier for this prefix information. The CID is used by context-based header compression as specified in [RFC6282].
- Valid Lifetime: 16-bit unsigned integer. The length of time in units of 60 seconds (relative to the time the option is received) that the context is valid for the purpose of header compression or decompression. A value of zero indicates that no specific validity lifetime is specified (prefix validity does not expire).
- Context Prefix: The IPv6 prefix or address corresponding to the CID field. This field is padded with zeros in order to make the option a multiple of 8-bytes

There is one option per IPv6 context prefix, with each prefix option containing a "CID" that provides the context identifier (or index) in the range 0 to 15. This index is referred to by subsequent

compressed IPv6 addresses to indicate which stateful prefix should be used to either compress or decompress a particular IPv6 address.

4. DHCPv6 Client Behavior

Clients will utilize the OPTION_ORO (Option Request Option), specifying the OPTION_V6_6CO option to be returned by the server, in addition to any other required configuration parameters. Because of the constrained nature of 6LoWPAN networks, clients are advised to utilize the DHCPv6 Rapid Commit [RFC3315] option when requesting DHCPv6 configuration.

5. DHCPv6 Server Behavior

Servers that support OPTION_V6_6CO are expected to be aware of the existence of constrained networks that use the server during configuration. Therefore servers SHOULD support the abbreviated "Rapid Commit" packet exchange specified in [RFC3315].

6. Security Considerations

Any type of mis-configuration of the option described in this document may cause re-routing of packets on a 6LoWPAN network, due to the compression context being blindly trusted by DHCPv6 clients requesting this option. The trust relationship necessary to create a trusted binding of compression contexts and clients on the network should be established by means other than that specified in this document. This trust relationship should be binding for all such configuration information transmitted from a DHCPv6 server to clients requesting options. DHCPv6 traffic is traditionally communicated "in the clear" on most networks, and in these scenarios where traffic is neither encrypted nor integrity protected, man-in-the-middle attacks are possible. However, in many 6LoWPAN deployment scenarios, these networks include protection at layer-2 (for example, 802.15.4 encryption), including a "secure join" mechanism that protects these networks from introducing unauthorized traffic onto the network ("rougue nodes"). In these types of networks, man-in-the-middle attacks are less likely.

7. IANA Considerations

IANA is requested to assign one option code for OPTION_V6_6CO from the "DHCP Option Codes" table of the Dynamic Host Configuration Protocol for IPv6 (DHCPv6) Registry.

8. References

[RFC6550] Winter, T., "RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks", RFC 6550, March 2012.

[RFC3315] Bound, J., "DHCP for IPv6", RFC 3315, July 2003.

[RFC6282] Hui, J. and P. Thubert, "Compression Format for IPv6 Datagrams over 802.15.4-Based Networks", RFC 6282, September 2011.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", RFC 2119, March 1997.

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