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Requesting Suboptions in DHCPv6
draft-mrugalski-dhc-dhcpv6-suboptions-02

Abstract

DHCPv6 clients may use Option Request Option (ORO) defined in RFC3315 [RFC3315] to specify, which options they would like to have configured by DHCPv6 servers. Clients may also be interested in specific options that do not appear in DHCPv6 message directly (top-level options), but rather as nested options or sub-options (i.e. options conveyed within other options). This document clarifies how to use already defined ORO to request specific options within scopes other than top-level. This document updates RFC3315.

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].

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 April 25, 2012.

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1. Introduction

There are 2 ways DHCPv6 client can inform a server about its intent to have an option configured. The first (mandatory) way is to send Option Request Option (ORO), defined in [RFC3315]. The second way (optional, can be used as an addition to the first method) is to send the actual requested option to provide hints to a server.

Clients may also be interested in receiving specific sub-options (i.e. options that do not appear in DHCPv6 messages directly, but rather within other options). Unfortunately, there is no clear way for clients to request such sub-options. [RFC3315] does not provide any guidance regarding such problem. This document clarifies how clients should request sub-options.

2. Terminology

This section defines terms used in this document.

Option - Any DHCPv6 Option, defined according to format specified in [RFC3315]. Option may appear in DHCPv6 message directly or within other options.

Top-Level Option - an option that appears in DHCPv6 directly. Most existing options are top-level options.

Sub-Option - An option that appears not as top-level option, but rather within other option. An example of such option is IAADDR that may only appear within IA_NA or IA_TA options. Sub-options are sometimes referred to as nested options.

Scope - Any place (message or option) that is allowed to convey DHCPv6 options. Examples of scope are top-level (options conveyed directly within DHCPv6 message), IA_NA (options conveyed within specific instance of IA_NA option), or IA_PD (options conveyed within specific instance of IA_PD option).

3. Suboption Request Procedure

Clients that want specific option provided by the server, SHOULD include ORO within requested scope. This ORO MUST include requested option type. For example, if client expects to have suboption FOO configured in IA_NA, it should transmit IA_NA option that contains ORO. This ORO should convey a FOO option code and possibly other options requested within that scope.

Client MAY include several instances of ORO, one for each scope. Client MUST NOT include more than one ORO in each scope.

Discussion: Aforementioned simple procedure is easy to implement, but it does not cover all cases. Therefore following extension may be taken into consideration.

There are cases, when client does not transmit options for each scope it expects to receive. Therefore client may not be able to follow procedure defined in previous section. In such case client SHOULD include ORO option in the inner-most scope that is closest to the location of desired option. For example, [I-D.ietf-dhc-pd-exclude] defines PD_EXCLUDE option that may be placed within IAPREFIX option, that in turn may be placed within IA_PD option that finally is placed in a DHCPv6 message. Client would like to receive PD_EXCLUDE option, but it in certain cases may choose to not send IAPREFIX within IA_PD, just empty IA_PD (e.g. in SOLICIT message). In such cases, client should include ORO within IA_PD, even though requested PD_EXCLUDE option will not be coveyed directly within IA_PD, but rather indirectly - within IAPREFIX that will be included in IA_PD.

Example: TODO (provide example of client requesting top-level and nested option, e.g. DNS_SERVER and PD_EXCLUDE).

4. Justification

As DHCPv6 protocol continues to be used to configure increasingly complex features, number of nested options will increase. To avoid each new document repeating the same sub-option request procedure, it seems reasonable to define such uniform procedure now. Even worse, such documents may propose different ways of requesting different options. This would considerably complicate server implementations.

Another alternative possible approach would be to simply use ORO as it is already defined. Client could include single instance of ORO to express desire to receive specific suboptions. Several existing server implementations deal with all options in an uniform way. Using top-level ORO to request suboptions would cause server to misplace requested options (i.e. to place them as top-level option rather than suboption). Avoiding such pitfalls, would complicate server implementation significantly, as servers would have to be configured with extra information regarding each option (where does specific option is supposed to appear - top level or as suboption). For example, in case when client requested PD_EXCLUDE and DNS_SERVERS options, server would have to handle each requested option differently and put one option inside an IAPREFIX option, while the other option directly in a message.

Discussion: (The following section should probably be removed if this draft is published). Currently there are several existing drafts that could benefit from this proposal:

1. [I-D.ietf-dhc-pd-exclude] defines PD_EXCLUDE option that is conveyed within IAPREFIX (that in turn is conveyed in IA_PD). Currently this draft calls for requesting PD_EXCLUDE in top-level ORO.

2. [I-D.ietf-mif-dhcpv6-route-option] defines a way to convey basic information about routers and prefixes available via those routers. It defines NEXT_HOP option that contains RT_PREFIX options. Each of those defined options may possibly convey additional, not yet defined routing related options, e.g. MTU, flow label, QoS parameters or many others.

3. There is at least one existing DHCPv6 implementation (Dibbler) that currently requests extra sub-options using top-level ORO.

4. A draft about configuring 4rd rules over DHCPv6 [I-D.mrugalski-dhc-dhcpv6-4rd] defines nested DHCPv6 options. Although this is early phase of the work and its layout will likely change (there is ongoing work within Softwires group on MAP that will likely include this work), the generic high level approach will remain similar. 4rd and MAP architectures require configuring one or more mapping rules. Each mapping rule consists of several mandatory (Domain IPv6 Prefix, Domain 4rd/MAP Prefix, Length of CE IPv6 Prefix) and one optional (Domain IPv6 suffix) parameters. As all those options are dedicated to configuration of different aspects of the same feature (4rd or MAP), there’s distinct possibility that it will be defined as several options nested within a single grouping option. Although this architecture is a new proposal, there may be new extensions proposed, similar to extensions to DS-Lite architecture. This may result in potential new options related to 4rd/MAP.

5. DHCPv6 Client Behavior

In addition to standard behavior defined in [RFC3315] client SHOULD include ORO in each option that it would like to receive suboptions in. For example, if client wants to receive suboption FOO in IA_NA option, it SHOULD transmit IA_NA option that contains a single ORO with FOO option code.

6. DHCPv6 Server Behavior

Server processes the message received from client in a regular way, as explained in [RFC3315]. For each option that is allowed to have suboptions (i.e. for each scope), server checks if there is ORO present. For each ORO present, server appends requested options if it is configured to do so.

7. IANA Considerations

IANA is not requested to take any actions regarding this document.

8. Security Considerations

TBD

9. Acknowledgements

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10. References

10.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[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.

10.2. Informative References

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