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Vendor-Identifying Vendor Options for Dynamic Host Configuration Protocol version 4 (DHCPv4)

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Abstract

The Dynamic Host Configuration Protocol (DHCP) options for Vendor Class and Vendor-Specific Information can be limiting or ambiguous when a DHCP client represents multiple vendors. This document defines two new options, modeled on the IPv6 options for vendor class and vendor-specific information, that contain Enterprise Numbers to remove ambiguity.

Table of Contents

1. Introduction

The DHCP protocol for IPv4, RFC 2131 [2], defines options that allow a client to indicate its vendor type (option 60), and the DHCP client and server to exchange vendor-specific information (option 43) [5]. Although there is no prohibition against passing multiple copies of these options in a single packet, doing so would introduce ambiguity of interpretation, particularly if conveying vendor-specific information for multiple vendors. The vendor identified by option 60 defines the interpretation of option 43, which itself carries no vendor identifier. Furthermore, the concatenation of multiple instances of the same option, required by RFC 2131 and specified by RFC 3396 [4], means that multiple copies of options 60 or 43 would not remain independent.

In some circumstances, an implementation may need to support multiple, independently defined forms of vendor-specific information. For example, implementations that must conform to an industry-standard use of DHCPv4, to allow interoperability in a particular technology space, may be required to support the vendor-specific options of that industry group. But the same implementation may also require support for vendor-specific options defined by the manufacturer. In particular, this is an issue for vendors of devices supporting CableLabs [9] standards, such as DOCSIS, CableHome, and PacketCable, as those standards define an industry-specific use for options 60 and 43.

This document defines two new options, modeled on the IPv6 options for vendor class and vendor-specific information defined in RFC 3315 [6], that contain IANA-assigned Enterprise Numbers [3] to remove ambiguity about the interpretation of their contents. If desired, these new options can be used in addition to the current vendor class and vendor information options, whose definition is unaffected by this 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 BCP 14, RFC 2119 [1].

2. Supporting Multiple Vendor Instances

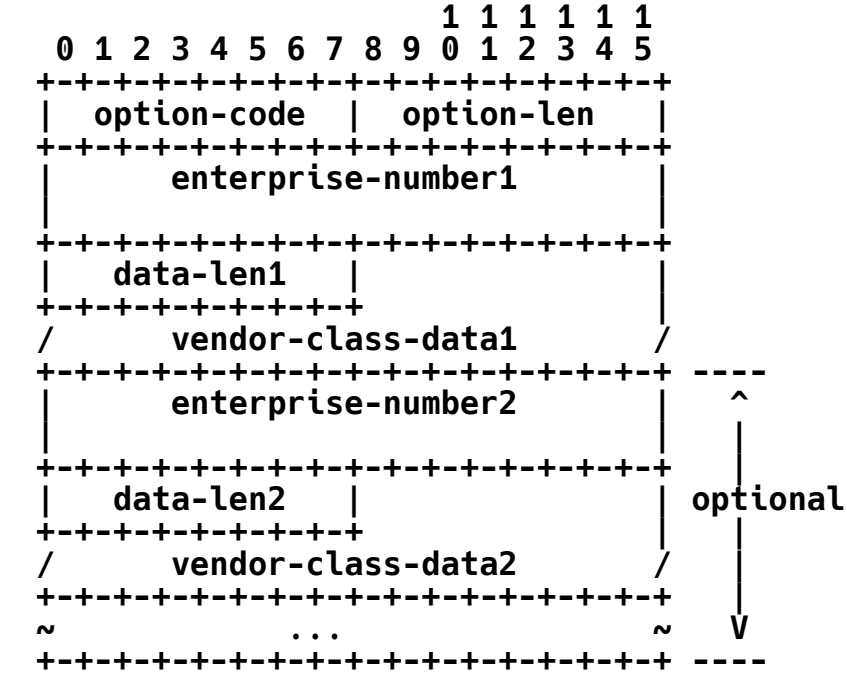
The options defined in this document may each contain data corresponding to more than one vendor. The data portion of each option defined here contains an enterprise number (assigned by IANA [3]), followed by an internal data length, followed by vendor-specific data. This sequence may be repeated multiple times within each option. Because the aggregate of the vendor-specific data for either option may exceed 255 octets, these options are hereby declared to be "concatenation-requiring", as defined by RFC 3396 [4]. As such, for each of the two options defined here, the aggregate of all instances of vendor-specific data is to be considered one long option. These long options can be divided into smaller options for packet encoding in conformance with RFC 3396, on whatever octet boundaries are convenient to the implementation. Dividing on the boundaries between vendor instances is not required but may be convenient for encoding or packet tracing.

3. Vendor-Identifying Vendor Class Option

A DHCP client may use this option to unambiguously identify the vendor that manufactured the hardware on which the client is running, the software in use, or an industry consortium to which the vendor belongs. The information contained in the per-vendor data area of this option is contained in one or more opaque fields that may identify details of the hardware configuration.

This option may be used wherever Vendor Class Identifier (option 60) may be used, as described in RFC 2131 [2], except for DHCPNAK messages, where other options are not permitted. It is most meaningful in messages from DHCP client to DHCP server (DHCPDISCOVER, DHCPREQUEST, DHCPINFORM).

The format of the V-I Vendor Class option is as follows:



option-code OPTION_V-I_VENDOR_CLASS (124)

option-len total length of all following option data in octets

enterprise-numberN The vendor's 32-bit Enterprise Number as registered with IANA [3]

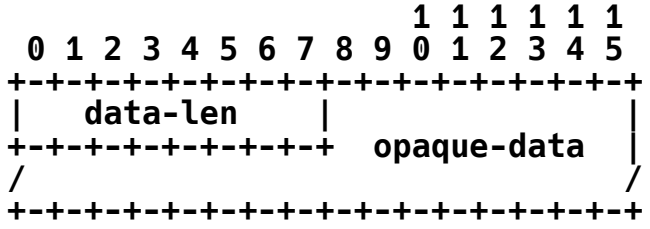
data-lenN Length of vendor-class-data field

vendor-class-dataN Details of the hardware configuration of the host on which the client is running, or of industry consortium compliance

This option contains information corresponding to one or more Enterprise Numbers. Multiple instances of this option may be present and MUST be concatenated in accordance with RFC 3396 [4]. An Enterprise Number SHOULD only occur once among all instances of this option. Behavior is undefined if an Enterprise Number occurs multiple times. The information for each Enterprise Number is treated independently, regardless or whether it occurs in an option with other Enterprise Numbers or in a separate option.

The vendor-class-data comprises a series of separate items, each of which describes some characteristic of the client's hardware configuration or capabilities. Examples of vendor-class-data instances might include the version of the operating system the client is running or the amount of memory installed on the client.

Each instance of the vendor-class-data is formatted as follows:



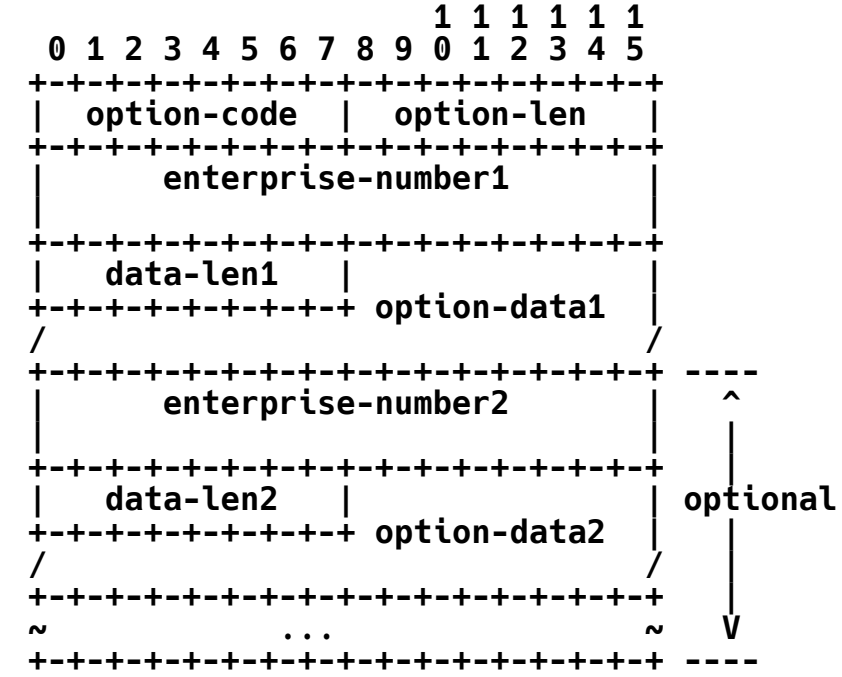
The data-len is one octet long and specifies the length of the opaque vendor class data in network byte order.

4. Vendor-Identifying Vendor-Specific Information Option

DHCP clients and servers may use this option to exchange vendor-specific information. Either party may send this option, as needed. Although a typical case might be for a client to send the Vendor-Identifying Vendor Class option, to elicit a useful Vendor-Identifying Vendor-Specific Information Option, there is no requirement for such a flow.

This option may be used in any packets where "other" options are allowed by RFC 2131 [2], specifically DHCPDISCOVER, DHCPOFFER, DHCPREQUEST, DHCPACK, and DHCPINFORM.

The format of the V-I Vendor-specific Information option is as follows:



option-code OPTION_V-I_VENDOR_OPTS (125)

option-len total length of all following option data in octets

enterprise-numberN The vendor's registered 32-bit Enterprise Number as registered with IANA [3]

data-lenN Length of option-data field

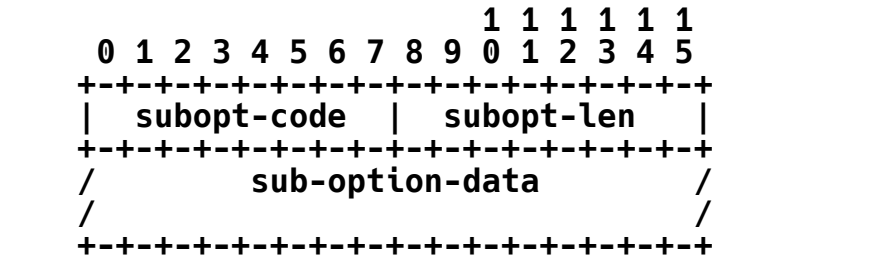
option-dataN Vendor-specific options, described below

The definition of the information carried in this option is vendor specific. The vendor is indicated in the enterprise-number field. This option contains information corresponding to one or more Enterprise Numbers. Multiple instances of this option may be present and MUST be concatenated in accordance with RFC 3396 [4].

An Enterprise Number SHOULD only occur once among all instances of this option. Behavior is undefined if an Enterprise Number occurs multiple times. The information for each Enterprise Number is treated independently, regardless or whether it occurs in an option with other Enterprise Numbers, or in a separate option.

Use of vendor-specific information allows enhanced operation, utilizing additional features in a vendor's DHCP implementation. Servers not equipped to interpret the vendor-specific information sent by a client MUST ignore it. Clients that do not receive desired vendor-specific information SHOULD make an attempt to operate without it.

The encapsulated vendor-specific option-data field MUST be encoded as a sequence of code/length/value fields of identical format to the DHCP options field. The option codes are defined by the vendor identified in the enterprise-number field and are not managed by IANA. Option codes 0 and 255 have no pre-defined interpretation or format. Each of the encapsulated options is formatted as follows:



subopt-code	The code for the encapsulated option
subopt-len	An unsigned integer giving the length of the option-data field in this encapsulated option in octets
sub-option-data	Data area for the encapsulated option

5. IANA Considerations

The values for the OPTION_V-I_VENDOR_CLASS and OPTION_V-I_VENDOR_OPTS option codes have been assigned from the numbering space defined for public DHCP Options in RFC 2939 [7].

6. Security Considerations

This document in and by itself provides no security, nor does it impact existing security. DHCP provides an authentication and message integrity mechanism, as described in RFC 3118 [8], which may be used if authenticity is required for data carried by the options defined in this document.

7. References

7.1. Normative References

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

[2] Droms, R., "Dynamic Host Configuration Protocol", RFC 2131, March 1997.

[3] IANA, "Private Enterprise Numbers", <http://www.iana.org/assignments/enterprise-numbers>.

[4] Lemon, T. and S. Cheshire, "Encoding Long Options in the Dynamic Host Configuration Protocol (DHCPv4)", RFC 3396, November 2002.

7.2. Informative References

[5] Alexander, S. and R. Droms, "DHCP Options and BOOTP Vendor Extensions", RFC 2132, March 1997.

[6] Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", RFC 3315, July 2003.

[7] Droms, R., "Procedures and IANA Guidelines for Definition of New DHCP Options and Message Types", BCP 43, RFC 2939, September 2000.

[8] Droms, R. and W. Arbaugh, "Authentication for DHCP Messages", RFC 3118, June 2001.

URIs

[9] <http://www.cablelabs.com/>

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9. Full Copyright Statement

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