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Container Option for Server Configuration
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Status of this Memo

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Abstract

In some DHCP service deployments, it is desirable for a DHCP server in one administrative domain to pass configuration options to a DHCP server in a different administrative domain. This DHCP option carries a set of DHCP options that can be used by another DHCP server.

1. Introduction

In some DHCP service deployments, it is desirable to pass configuration options from a DHCP server in one administrative domain to another DHCP server in a different administrative domain. In one example of such a deployment, an IPTV service provider (SP) may need to provide certain SP domain-specific information to IPTV device(s) located in the consumer domain. This information is sent from the IPTV SP DHCP server to the consumer DHCP server located in the Residential Gateway (RG), which can then be passed along to IPTV device(s) in the subscriber network.

Existing RGs may pass some configuration information received by the RG DHCP client to the RG server for configuration of devices attached to the consumer network. There are several motivations for this option:

- The devices attached to the consumer network may require different configuration information than the DHCP options provided to the RG
- Existing RG DHCP clients are typically not be coded to process new DHCP options and, therefore, will be unable to pass those new options to the RG DHCP server
- Existing RG DHCP clients are typically coded to pass only a fixed list of DHCP options to the RG DHCP server and, therefore, will be unable to pass newly defined options to the RG DHCP server.

The DHCP Container option defined in this document provides a mechanism through which the RG DHCP client can pass DHCP options to the RG DHCP server without explicit knowledge of the semantics of those options. With this option, the SP DHCP server can pass both current and future DHCP options to the RG DHCP server.

The DHCP Container option does not carry IP addresses, IPv6 prefixes or other information about leases. It carries other configuration information.

2. Terminology

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].

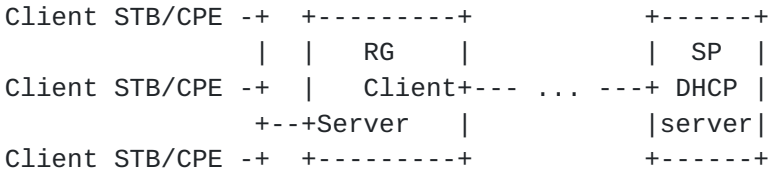
The following terms and acronyms are used in this document:

DHCPv4	"Dynamic Host Configuration Protocol" [RFC2131]
DHCPv6	"Dynamic Host Configuration Protocol for IPv6" [RFC3315]
DHCP	DHCPv4 and/or DHCPv6
RG	"home gateway"; the device through which the consumer network connects to the broadband WAN; typically a layer 3 forwarding device
RG DHCP client	(or "RG client") the DHCP client in the RG
RG DHCP server	(or "RG server") the DHCP server in the RG
SP DHCP server	(or "SP server") the DHCP server managed by the service provider (SP)

This document uses terminology for DHCPv4 and DHCPv6 as defined in RFCs 2131 and 2132, respectively.

3. Problem statement and requirements for RG DHCP server configuration

The following diagram shows the components in a network deployment using the DHCP Container option:



In this diagram, the RG client engages in DHCP message exchanges with the SP server to obtain its IP address and other configuration information.

The problem under consideration in this document is to transmit configuration information from the SP DHCP server to devices attached to the consumer network. The problem solution has the following requirements:

- The SP server MUST be able to transmit different configuration information to the consumer devices than the DHCP options provided

to the RG

- The SP server MUST be able to control which DHCP options are transmitted to the consumer device

- There MUST be a way for the SP server to pass DHCP options to be defined in the future to consumer devices

4. Design alternatives

The following three designs meet the solution requirements:

- SP server passes container option to RG client, which forwards contents to RG server; this alternative is the preferred solution

- RG server does direct DHCP info request to SP server; this alternative is not preferred:

  * requires that the RG server include a DHCP client

  * requires that the SP server be able to differentiate between RG client and server requests

  * does not scale well, as it at least doubles the load on the SP server

- RG server passes device requests to SP DHCP server; this alternative is not preferred:

  * requires that the RG also function as a DHCP relay

  * requires that the RG relay function be configured with the IP addresses of the SP DHCP server(s)

  * requires that the RG relay function differentiate between DHCP messages that are processed by the RG server and DHCP messages that are processes by the SP server

A variant on the preferred design would allow the inclusion of multiple sets of DHCP options intended for different classes of devices in the consumer network; e.g., the design would allow for one set of options for video set-top boxes and a second set of options for VoIP MTAs. The variant would require the specification of rules to be provided by the SP server through which the RG server would differentiate its clients and send the appropriate set of options to each device. At present, there is no requirement for differential configuration of consumer devices and this alternative is not defined

in this document.

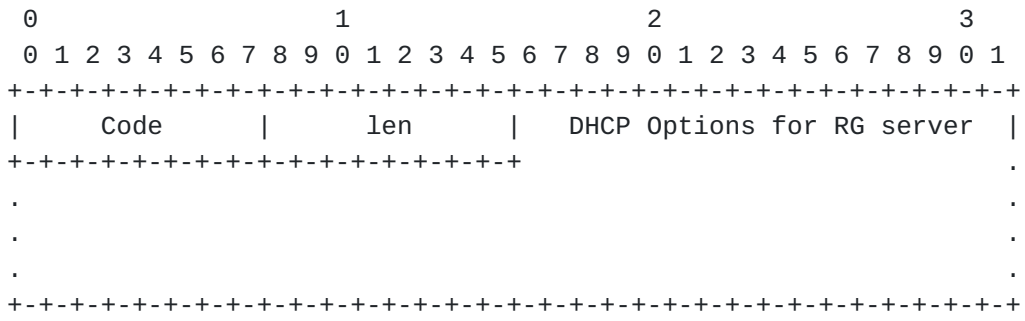
5. Semantics and syntax of the Container option

Along with configuration information intended for the RG, the SP server can include the DHCP Container option. When the RG client receives the DHCP Container option, it passes the contents of the option to the RG server. The means through which the information is passed between the RG client and the RG server is out of the scope of this document and left unspecified.

The DHCP options in this container are carried in DHCP message format (option-code/length/value). In this format, the contained options can be passed through a DHCP client to a co-located DHCP server without specific knowledge on the part of the client or the server of the semantics of the options.

5.1. DHCPv4 Container option

The DHCPv4 Container option has the following format:

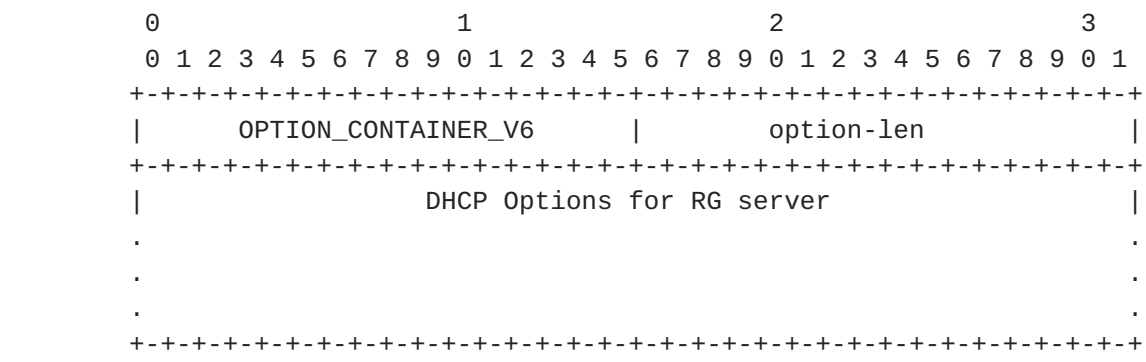


Code OPTION_CONTAINER_V4 (TBD)

len Length of options for RG server, in octets

5.2. DHCPv6 Container option

The DHCPv6 Container option has the following format:



option-code OPTION_CONTAINER_V6 (TBD).

option-len Length of options for RG server, in octets

5.3. SP server behavior

The SP server MAY include the Container option in any DHCP message sent to an RG client.

The policy through which the SP server is instructed to include a Container option for an RG client, and the policy determining the contents of the Container object are out of scope of this document and left unspecified.

5.4. RG client behavior

The RG client MUST pass the contents of the received Container option to the RG server without alteration. The details of the implementation through which the RG client parses the content of the Container option and passes the options to the RG server are out of scope for this document and left unspecified.

5.5. RG server behavior

The RG server MUST discard any options related to IP address assignment, IPv6 prefix delegation or operation of the DHCP protocol itself. Appendices TBD give a list of DHCPv4 and DHCPv6 options that the RG server MUST discard.

The Container option provides a mechanism through which the SP might be able to unilaterally control the configuration settings passed from a CPE DHCP server to a CPE device. This configuration channel must be handled with some care if the subscriber is to retain desired control over the CPE configurations. The following behaviors limit the degree to which the SP con control CPE configuration:

- The RG server MAY discard any undesired options, as determined by policy in the RG.

- The RG server MUST return to any DHCP client only those options requested by the DHCP client in a Parameter Request List option (DHCPv4 option code 55) or an Option Request option (DHCPv6 option code 6).

6. Security Considerations

A rogue server can use this option to pass invalid information to the RG client, which would then be passed to the Client STB/CPEs. This invalid information could be used to mount a denial of service attack or a man-in-the-middle attack against some applications.

Authentication of DHCP messages(RFC 3118 [RFC3118] for DHCPv4 or section 20 of RFC 3315 [RFC3315]) can be used to ensure that the contents of this option are not altered in transit between the DHCP server and client.

7. IANA Considerations

When this document is published, IANA is asked to assign an option tag from the "BOOTP Vendor Extensions and DHCP Options" registry for OPTION_CONTAINER_V4.

When this document is published, IANA is asked to assign an option code from the "DHCPv6 Option Codes" registry for OPTION_CONTAINER_V6.

8. Change Log

If this document is accepted for publication as an RFC, this change log is to be removed before publication.

- Corrected a cut-and-paste error in section "DHCPv6 Container option": The Time Protocol Servers option -> The DHCPv4 Container option

- Added text to section "RG Server Behavior" to address policy management concerns

9. Normative References

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

[RFC2131] Droms, R., "Dynamic Host Configuration Protocol", RFC 2131, March 1997.

[RFC2132] Alexander, S. and R. Droms, "DHCP Options and BOOTP Vendor Extensions", RFC 2132, 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.

[RFC3118] Droms, R. and W. Arbaugh, "Authentication for DHCP Messages", RFC 3118, June 2001.

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