                 Container Option for Server Configuration
                   draft-ietf-dhc-container-opt-06.txt

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.

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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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:

   o The devices attached to the consumer network may require different
      configuration information than the DHCP options provided to the
      RG.

   o Existing RG DHCP clients are typically not coded to process new
      DHCP options and, therefore, will be unable to pass those new
      options to the RG DHCP server.

   o 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].
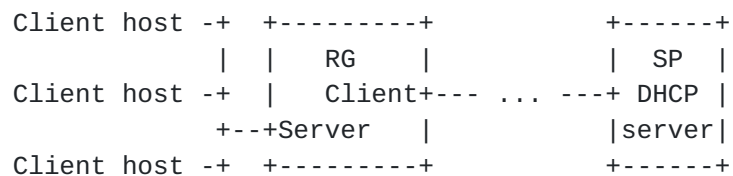
   The following terms and acronyms are used in this document:

DHCPv4   "Dynamic Host Configuration Protocol" [RFC2131]

DHCPv6   "Dynamic Host Configuration Protocol for IPv6"
                      [RFC3315]

DHCP   DHCPv4 and/or DHCPv6

RG   "residential 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 other terminology for DHCPv4 and DHCPv6 as defined
in RFC 2131 and RFC 3315, 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:


```
Client host -+  +---------+          +------+
             |  |   RG    |          |  SP  |
Client host -+  |   Client+--- ... ---+ DHCP |
             +--+Server   |          |server|
Client host -+  +---------+          +------+
```


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 hosts, such as
computers and set-top boxes, attached to the consumer network. The
problem solution has the following requirements:

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

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

o 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:

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

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

   * requires that the RG server include a DHCP client,

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

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

o RG server passes device requests to SP DHCP server; this
   alternative is not preferred because it:

   * 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), and it

   * 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, which does not scale well.

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:

```
     0                   1                   2                   3
     0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |     Code      |     len       |   DHCP Options for RG server  |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                             .
    .                                                              .
    .                                                              .
    .                                                              .
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
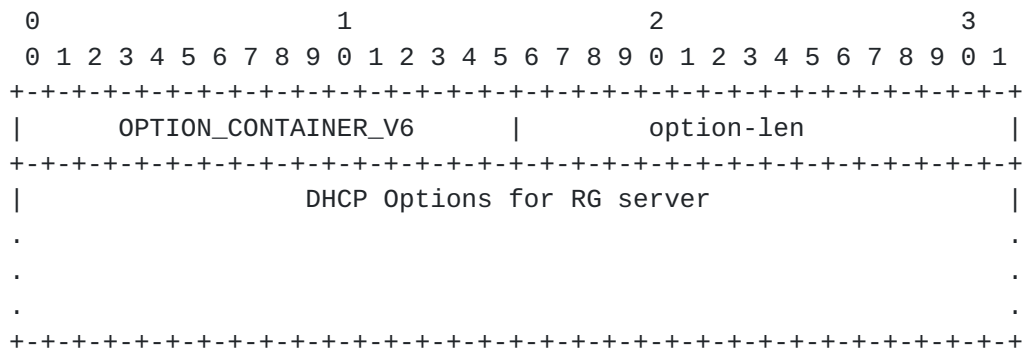
    Code   OPTION_CONTAINER_V4 (TBDv4)

    len   Length of options for RG server, in octets

5.2. DHCPv6 Container option

The DHCPv6 Container option has the following format:

```
   0                   1                   2                   3
   0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |        OPTION_CONTAINER_V6      |            option-len         |
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
  |                    DHCP Options for RG server                  |
  .                                                                .
  .                                                                .
  .                                                                .
  +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

option-code   OPTION_CONTAINER_V6 (TBDv6).

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.

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

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

   o 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 hosts. 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] and 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 (TBDv4).

   When this document is published, IANA is asked to assign an option
   code from the "DHCPv6 Option Codes" registry for OPTION_CONTAINER_V6
   (TBDv6).

8. Change Log

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

8.1. Revision -02

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

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

8.2. Revision -03

   Corrected several typos (thanks to Alfred Hoenes for his review).

8.3. Revision -04

   Corrected additional typos (again, thanks to Alfred Hoenes for his
   review).

   Added pointer to "CableLabs' DHCP Options Registry" as background for
   this option.

9. Related Work

   The Container option is based on the CableLabs eRouter DHCP Container
   vendor-identifying vendor-specific option, as defined in "CableLabs'
   DHCP Options Registry" [eRouter].

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.

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

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

   [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

   [eRouter] CableLabs, "CableLabs' DHCP Options Registry (CL-SP-CANN-
              DHCP-Reg-I02-080306)", March 2008.

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