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Internet-Draft   B. Senthil Kumar
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The Extended Remote Boot Option for DHCPv4
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Abstract

   Single TFTP [2] server for huge number of diskless clients is prone
   to single point of failure. So, Multiple TFTP servers are needed for
   high availability. Moreover, some of the clients need multiple
   bootfiles for boot up. This document provides a new DHCPv4 option
   for clients to obtain information about multiple TFTP [2] servers and
   bootfiles.

1. Introduction

   DHCPv4 (Dynamic Host Configuration Protocol Version for IPv4)
   provides a framework for passing configuration information to hosts
   on an IPv4 network. However, DHCPv4 does not provide a way to send
   more than one TFTP server address and bootfile names. This document
   defines a new option to provide more than one TFTP server and

bootfile names. This option is required for clients, which are
    booting over a network and require more than one file to be

   downloaded and executed. The multiple TFTP servers are needed for
   high availability. Network booting is widely used mechanism for
   booting up of the clients, because of their advantages; softwares
   will be in central server and requires maintenance at only one
   location rather than maintaining individual systems separately.
   Also, switching between different operating systems becomes easy when
   network booting is being used. The additional boot files may be used
   as supporting software for the boot image. Different Operating
   System vendors use different way of handling this.

2. Requirements

   The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD,
   SHOULD NOT, RECOMMENDED, MAY, and OPTIONAL, when they appear in this
   document, are to be interpreted as described in RFC 2119 [7]

3. Terminology

   This document uses terminology specific to DHCPv4 as defined in
   "Terminology" section of the DHCPv4 specification [1].

4. Extended Remote Boot Option

   The Extended Remote Boot Option is used to carry the parameters
   needed for remote boot of the DHCPv4 [1] clients. Using the
   information provided by this option, the clients will be able to
   bootp up.

   The format of the Remote Boot Option is as shown below:

```
     Code      Len   Extended Remote Boot Information Field
   +-------+------+------+------+------+------+--...-+------+
   |  TBD  |  N   | r1   | r2   | r3   | r4   |      | rN   |
   +-------+------+------+------+------+------+--...-+------+
```

   The length N gives the total number of octets in the Extended Remote
   Boot Information Field. The length N should be at least 4 bytes.

   r1, r2 .. rN are Remote Boot Information suboptions which contain
   information needed for boot up of the clients. They should be
   listed in the increasing order of preferences.

   The Remote Boot Information suboption is explained in the Section 5.

5. Remote Boot Information suboption

   The DHCP server uses the Remote Boot Information suboption to convey the
   client about the TFTP Server [3] names and list of boot files needed for
   booting of the clients. The clients are supposed to contact the TFTP
   Server, obtain the boot files one by one and boot up using these files.

The format of the Remote Boot Information suboption is as shown below:

```
    Code     Len       Remote Boot Information Field
   +-------+------+------+------+------+------+--...-+------+
   |   1   |  N   |  ts  |  f1  |  f2  |  f3  |      |  fN  |
   +-------+------+------+------+------+------+--...-+------+
```

The length N gives the total number of octets in the Remote
Boot Information Field. The length N should be at least 2 bytes.

'ts' field consists of either TFTP server name (option 66) [4]
or the TFTP Server Address suboption suboption represented in the
Opt/Length/Value tuples. The format of the TFTP Server Address
suboption is given below:

```
    Code   Len    TFTP Server address
   +-----+-----+-----+-----+-----+-----+
   |  1  |  n  | a1  | a2  | a3  | a4  |
   +-----+-----+-----+-----+-----+-----+
```

The TFTP Server Address suboption gives IPv4 address of the one of
the TFTP Server available for the client. a1, a2, a3 and a4 refer
the quadrants of the IPv4 address of TFTP Server address in the
network byte order. The length of the option will be 4 octets.

f1, f2 ... fN are sequence of Bootfile name (option 67) [4]
represented in the Opt/Length/Value tuples.

If Bootfile name option is not following the TFTP Server name/address
suboption, then, bootfiles corresponding to the TFTP server specified
in the 'ts' field defaults to the boot file names from the previous
Remote Boot Information suboption which has non empty 'fn' fields.

Thus, TFTP server name/address and Bootfile name are sent as
suboption to Remote Boot Information option here.

If multiple boot files are provided by the server, then, they should
appear in the order of their execution in the client. The first
appearing Bootfile name should be downloaded and executed first for
boot up, then the next and so on.

6. Precedence of the options

This specification recommends the following precedence for the
various remote boot options, including the ones specified in [4].

```
  Option name/Field name                Precedence
  ----------------------                ----------
 Extended Remote Boot Option            Highest
    options 66 and 67 [4]               Medium
```

'sname' and 'fname' [1]   Lowest

    Thus, if Extended Remote Boot Option is received by the client and
    'sname' and 'file' fields are not overloaded, the client MUST ignore
    the 'sname' and 'file' fields. If TFTP server name/address and/or

   Bootfile name are received in the reply the server, along with the
   Extended Remote Boot Option, then, the client MUST ignore TFTP server
   name/address and/or Bootfile name options.

7. Server behavior

   If the server receives the request for TFTP server name and/or
   Bootfile name along with the Extended Remote Boot Option, the server
   SHOULD ignore the TFTP server name and/or Bootfile name option and
   reply back with Extended Remote Boot Option.

   When the DHCP server is replying back with Extended Remote Boot
   Option, the 'sname' and 'file' field SHOULD be used to overload the
   options.

   If the length of any of these options exceed the maximum permissible
   within a single option (254 octets), then they MUST be represented in
   the DHCP message as specified in [2].

8. Client behavior

   The client MUST NOT request for TFTP server name and/or Bootfile name
   along with the Extended Remote Boot Option.

9. Security Considerations

   The Remote Boot Option may be used by an intruder DHCPv4 server to
   provide to cause DHCPv4 clients to contact rogue TFTP server (or) to
   send invalid file names. This will make booting up of DHCP clients
   to fail.

   To avoid attacks through this option, the DHCP client SHOULD use
   authentication mechanism for DHCP [5].

10. IANA Considerations

   IANA is requested to assign an option code to the following options
   from the option-code space defined for public DHCP Options in
   RFC 2939 [6].

         Option Name   Value   Described in
   Extended Remote Boot Option   tbd   Section 4

11. Normative References

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

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

[12](). Informative References

[3] K. Sollins, The TFTP Protocol (Revision 2), [RFC 1350](), July 1992.

[4] Alexander, S. and R. Droms, "DHCP options and BOOTP Vendor
    Extensions", [RFC 2132](), March 1997.

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

[6] R. Droms, Procedures and IANA Guidelines for Definition of New
    DHCP Options and Message Types, [RFC 2939](), September 2000.

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

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