Network Working Group
Internet-Draft
Expires: December 2005

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July 2005

DHCP Option for Proxy Server Configuration
draft-ietf-dhc-proxyserver-opt-04.txt

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IPR Statement

Abstract

This document defines a new Dynamic Host Configuration Protocol

(DHCP) option, which can be used to configure Proxy Servers in TCP/IP for standard protocols like HTTP, FTP, NNTP, SOCKS, SNMP, SLL and etc. Proxy Servers provide controlled and efficient access to the Internet, include access control mechanisms for different types of user requests and cache frequently accessed information (Web pages and possibly files that might have been downloaded using FTP and other protocols).

1. Terminologies Used

DHCP Client: A DHCP [RFC-2131] client is an Internet host that uses DHCP to obtain configuration information such as a network address.

DHCP Server: A DHCP server [RFC-2131] is an Internet host that returns configuration parameters to DHCP clients.

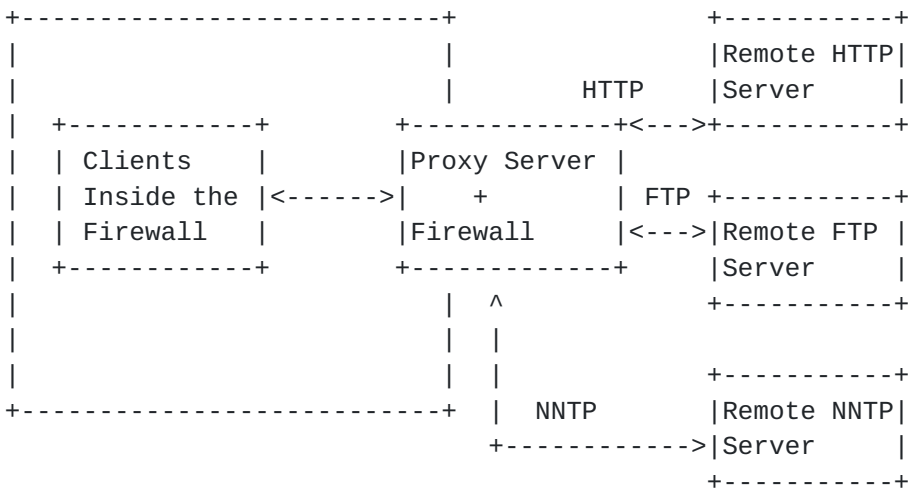
Proxy Server: In an enterprise network that connects to Internet, a proxy server is a server that acts as an intermediary between a workstation user and the Internet so that the enterprise can ensure security and administrative control. A Proxy server MAY provide caching services or be associated with or part of a gateway server that separates the enterprise network from the outside network (usually the Internet) and a firewall that protects the enterprise network from outside intrusion.

RDF:A language (Resource Description Framework [RDF-SYN]) for describing properties of web resources.

2. Introduction

The Dynamic Host Configuration Protocol [RFC-2131] provides a framework for passing configuration information to hosts on a TCP/IP network. This document describes a DHCP configuration option that can be used to inform a DHCP client of the IP addresses and properties of one or more proxy services that are either available to it or that must be used in order to access internet services, for example through a coporate firewall.

The following diagram depicts the typical setup of a proxy server providing proxy services to clients on a network that is protected by a firewall.



The primary use of proxies is to allow access to the World Wide Web from within a firewall. A proxy service typically runs on firewall machine. It waits for a request from inside the firewall, forwards

the request to the remote server outside the firewall, reads the response and then sends it back to the client. Usually, all the clients use the same proxy within a given network, which helps in efficient caching of documents that are requested by a number of clients. Similarly, proxies can provide document caching functions on the outside Internet.

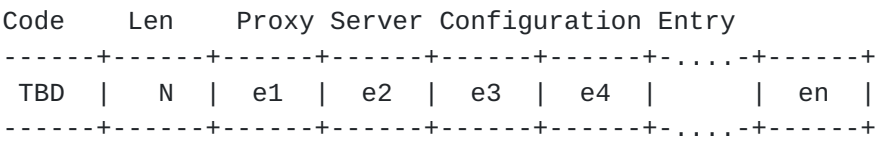
A proxy server can increase network security and user productivity by filtering content and controlling both internal and external access to information. Also, it provides several other functionalities that are not discussed here.

3. Requirements 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 [RFC 2119].

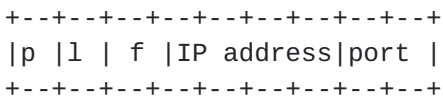
4. Proxy Server Configuration Option

This document defines a new DHCP Option called the Proxy Server Configuration Option. The format of the Proxy Server configuration option is:



Code is TBD and will be assigned by IANA according to [RFC-2939]. The length N gives the total number of octets in the Proxy Server Configuration entries.

The Proxy Server Configuration entry normally consists of a sequence of Protocol Type (p), len (l), flag (f), IP address and port. But it can also be a sequence of Protocol Type (p), Len and RDF[RDF-SYN] metadata.



The Protocol(p) is a two octet integer in network byte order, length (l) and flag (f) are one octet each; each IP address is four octets, and each port number is a two-octet integer encoded in network byte order.

The protocol type(p) specifies the type of protocol and MUST be one of the following assigned numbers.

protocol	Number
HTTP	80
FTP	21
NNTP	119
Gopher	70
SSL	TBD
SOCKS	1080
WAIS	210
IMAP	220
RDF	TBD

If the protocol type field is RDF[RDF-SYN], then it MUST be followed by len (length of RDF metadata) and the actual RDF metadata.

The length field (l) specifies the length of the Proxy Server Configuration entry. If some new protocol is introduced in the future, and if some version of a given dhcpclient doesn't support it, then that particular entry can be ignored. If it exists, the next following Proxy Server Configuration Entry can be processed.

The flag field (f) is by default 0. Otherwise, it can either have "-" or "#".

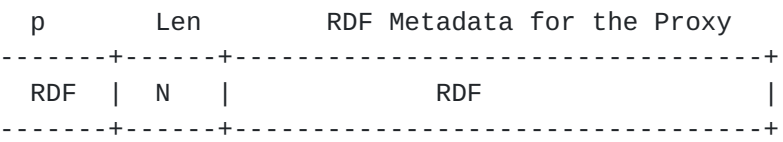
If it is "-", then the entry becomes a destination address for exclusion from forwarding to the proxy. If it is "#", then the proxy requires authentication.

In cases where it makes sense to specify more than one proxy server for a given protocol, these proxy servers MUST be specified as additional IP addresses and ports within the same entry. The list is ordered by precedence, with the most preferred proxy server appearing first in the list, and the least preferred proxy server appearing last in the list. The DHCP client SHOULD honor this ordering.

More than one Proxy Server Configuration Entries MAY be specified in the option. In that case, the list is ordered by precedence, with

the most preferred proxy server appearing first in the list, and the least preferred proxy server appearing last in the list. The DHCP client SHOULD honor this ordering.

The format of the Proxy Server Configuration using Metadata type is:



The RDF payload is freeform RDF metadata for describing proxy properties. The length N gives the number of octets in the RDF metadata field.

The following entry specifies the sample format of the RDF Meta data field

HTTP proxy:

```
<?xml version="1.0"?>
<!DOCTYPE rdf:RDF [<!ENTITY xsd "http://www.w3.org/2001/XMLSchema#">]>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
          xmlns:dc="http://purl.org/dc/elements/1.1/">
<rdf:Description rdf:about="http://http-proxy.example.com:8080">
     <dc:title>License Gate Proxy</dc:title>
     <dc:creator>John Doe</dc:creator>
     <dc:publisher>example.com IS</dc:publisher>
     <dc:subject>Offsite Resource Access Proxy</dc:subject>
     <dc:type>Service</dc:subject>
     <dc:rights>example.com employees</dc:rights>
     <dc:date>2005-07-11</dc:date>
</rdf:Description>
</rdf:RDF>
```

FTP proxy:

```
<?xml version="1.0"?>
<!DOCTYPE rdf:RDF [<!ENTITY xsd "http://www.w3.org/2001/XMLSchema#">]>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
          xmlns:dc="http://purl.org/dc/elements/1.1/">
<rdf:Description rdf:about="ftp://ftp-proxy.example.com:8080">
     <dc:title>License Gate FTP Proxy</dc:title>
     <dc:creator>John Doe</dc:creator>
     <dc:publisher>example.com IS</dc:publisher>
     <dc:subject>Offsite Resource Access Proxy</dc:subject>
     <dc:type>Service</dc:subject>
     <dc:rights>example.com employees</dc:rights>
     <dc:date>2005-07-11</dc:date>
</rdf:Description>
</rdf:RDF>
```

As such there is no minimum length to specify a proxy using RDF metadata. But the minimum sensible statement would be a literal description of the proxy (<dc:title>License Gate Proxy</dc:title>) giving a total of 418 characters including the overhead.

For example, with a description element of 60 characters, an URI of 80 characters plus a minimum XML/RDF syntax conformation/namespace declaration from below the minimum length would be 418 octes.

21 Octets <?xml version="1.0"?>
70 Octets <!DOCTYPE rdf:RDF [<!ENTITY xsd "http://www.w3.org/2001/XMLSchema#">]>
64 Octets <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
45 Octets xmlns:dc="http://purl.org/dc/elements/1.1/">
109 Octets <rdf:Description rdf:about="..80 characters..">
81 Octets <dc:title>..60 characters..</dc:title>
18 Octets </rdf:Description>
10 Octets </rdf:RDF>

5. Option Usage

The Proxy Server Configuration entries SHOULD not repeat the same type of proxy entries. The port MUST be a valid TCP/UDP port. If the length of the Proxy Server Configuration Option exceeds the maximum permissible within a single option (255 octets), then the option MUST be represented in the DHCP message as specified in [RFC-3396].

The following example shows how an RDF version of proxy server configuration entry of 400 octets is represented in the option.

```
 Code     Len   Proto   Len
+-------+------+------+------+------+------+-....-+------+
|  TBD  | 255  |  RDF |  253 | RDF Meta Data.............|
+-------+------+------+------+------+------+-....-+------+
 Code     Len   Proto   Len
+-------+------+------+------+------+------+-....-+------+
|  TBD  | 149  |  RDF |  147 | RDF Meta Data.............|
+-------+------+------+------+------+------+-....-+------+
```

The following example shows how a proxy server configuration entry of 400 octets is represented in RDF along with the normal (p|l|f|IP|port) format.

```
+---+---+----+-+-+-------------+----+---+---+...-+---+-----+
|TBD|255|HTTP|7|0|192.168.5.10 |8080|RDF|243| RDF Meta Data|
+---+---+----+-+-+-------------+----+---+---+...-+---+-----+

+-------+------+------+------+------+------+-....-+------+
|  TBD  | 159  |  RDF |  157 | RDF Meta Data.............|
+-------+------+------+------+------+------+-....-+------+
```

A Proxy Server Configuration Entry with more than one RDF type

of MUST not be sent in this option. This is because the RDF Meta Data is generally more than 255 octets and always requires more than one option of this type as per [RFC-3396]. However, more than one proxy server configuration (FTP, HTTP, SOCKS) can be specified with

the same RDF Meta Data as follows:

HTTP and FTP Proxy

```
<?xml version="1.0"?>
<!DOCTYPE rdf:RDF [<!ENTITY xsd "http://www.w3.org/2001/XMLSchema#">]>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
          xmlns:dc="http://purl.org/dc/elements/1.1/">
<rdf:Description rdf:about="http://http-proxy.example.com:8080">
     <dc:title>License Gate Proxy</dc:title>
     <dc:creator>John Doe</dc:creator>
     <dc:publisher>example.com IS</dc:publisher>
     <dc:subject>Offsite Resource Access Proxy</dc:subject>
     <dc:type>Service</dc:subject>
     <dc:rights>example.com employees</dc:rights>
     <dc:date>2005-07-11</dc:date>
</rdf:Description>
<rdf:Description rdf:about="ftp://ftp-proxy.example.com:8080">
     <dc:title>License Gate FTP Proxy</dc:title>
     <dc:creator>John Doe</dc:creator>
     <dc:publisher>example.com IS</dc:publisher>
     <dc:subject>Offsite Resource Access Proxy</dc:subject>
     <dc:type>Service</dc:subject>
     <dc:rights>example.com employees</dc:rights>
     <dc:date>2005-07-11</dc:date>
</rdf:Description>
</rdf:RDF>
```

6. Security Considerations

The DHCP Options defined here allow an intruder DHCP server to misdirect a client, causing it to access a nonexistent or malicious proxy server. This allows for a denial of service or man-in-the-middle attacks. The latter security consideration is a well known property of the DCHP protocol; this option does not create any additional risk of such attacks.

DHCP provides an authentication mechanism, as described in [RFC-3118], which may be used if authentication is required.

7. IANA Considerations

IANA is requested to assign an option code to the Proxy Server Configuration Option and protocol numbers for the SSL and RDF protocol.

8. Acknowledgements

Thanks to the DHC Working Group for their time and input into the specification. In particular, thanks to (in alphabetical order) Bernie Volz, Ralph Droms, Robert Elz, and Ted Lemon for their thorough review.

9. Normative References

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

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

[RFC-3396] Lemon, T. and S. Cheshire, "Encoding Long DHCP Options", RFC 3396, November 2002.

10. Informative References

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

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

[RFC-2616] Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P. and T. Berners-Lee, "Hypertext Transfer Protocol -- HTTP/1.1" RFC 2616, June 1999.

[RFC-959] Postel, J. and J. Reynolds, "File Transfer Protocol (FTP)", STD 9, RFC 959, October 1985.

[RFC-1436] F. Anklesaria, M. McCahill, P. Lindner, D. Johnson, D. Torrey and B. Albert, "The Internet Gopher Protocol (a distributed document search and retrieval protocol)", RFC 1436, March 1993.

[RFC-977] Kantor, B and P. Lapsley, "Network News Transfer Protocol", RFC 977, February 1986.

[RFC-1928] Leech, M., Ganis, M., Lee, Y., Kuris, R., Koblas, D., and L. Jones, "SOCKS Protocol V5", RFC 1928, April 1996.

[SSL2] Hickman, Kipp, "The SSL Protocol", Netscape Communications Corp., Feb 9, 1995.

[SSL3] A. Frier, P. Karlton, and P. Kocher, "The SSL 3.0 Protocol", Netscape Communications Corp., Nov 18, 1996.

[RFC-1625] M. St. Pierre, J. Fullton, K. Gamiel, J. Goldman, B. Kahle, J. Kunze, H. Morris, F. Schiettecatte, "WAIS over Z39.50-1988", RFC 1625, June 1994.

[RDF-SYN] Becket, D. and B. McBride, Ed., "RDF/XML Syntax Specification", W3C REC-rdf-syntax, February 2004, <http://www.w3.org/TR/rdf-syntax-grammar/>.

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Funding for the RFC Editor function is currently provided by the Internet Society.