

## The IPv4 Subnet Selection Option for DHCP

### Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

### Copyright Notice

Copyright (C) The Internet Society (2000). All Rights Reserved.

### Abstract

This memo defines a new Dynamic Host Configuration Protocol (DHCP) option for selecting the subnet on which to allocate an address. This option would override a DHCP server's normal methods of selecting the subnet on which to allocate an address for a client.

### Table of Contents

1. Introduction.....	1
1.1. Motivational Example.....	2
2. Subnet Selection Option Definition.....	3
3. Intellectual Property.....	4
4. IANA Considerations.....	4
5. Acknowledgements.....	5
6. Security Considerations.....	5
7. References.....	5
8. Editor's Addresses.....	6
9. Full Copyright Statement.....	7

### 1. Introduction

The Dynamic Host Configuration Protocol (DHCP) [RFC2131] provides a framework for passing configuration information to hosts on a TCP/IP network. RFC 2132 [RFC2132] specifies DHCP option configuration information that may be carried in DHCP packets to/from the DHCP server and the DHCP client. This document specifies a new DHCP option.

To select the subnet on which to allocate an address, the DHCP server determines the subnet from which the request originated, and then selects an address on the originating subnet or on a subnet that is on the same network segment as the originating subnet. The subnet from which the request originates can be determined by:

- o Using the subnet address of the giaddr field in the DHCP packet header, or if the giaddr field is zero;
- o Using the subnet address of the local interface on which the DHCP server received the packet.

This memo defines a new DHCP option, the subnet selection option, which allows the DHCP client to specify the subnet on which to allocate an address. This option takes precedence over the methods that the DHCP server uses to determine the subnet on which to select an address.

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].

### 1.1. Motivational Example

An example of where this option could be useful is in a device (e.g.: a RAS device) that is allocating addresses on behalf of its clients. In this case the device would be allocating addresses through DHCP and then managing those addresses among its clients.

In this scenario, the device is connected to a private "internal" network on which the DHCP server would be located. The device is also connected to one or more service providing "external" networks (i.e.: the networks that the device's clients are connected to). Furthermore, the internal network is not IP connected to the external networks, although inside the device there is connectivity between the internal and external networks (e.g.: though the backplane).

Recall that the device is allocating addresses for its clients on the external networks and that there is no IP connectivity between the internal network and the external networks. The DHCP requests cannot originate from the external networks since packets cannot be routed between the external network and the internal network. Thus, the DHCP requests must originate from the internal network. The problem with originating the DHCP requests from the internal network is that the DHCP server will allocate addresses on the internal network's subnet, when what is required are addresses on the external subnets. The subnet selection option provides a solution to this problem.

The device would send its DHCP request on the internal subnet, but would include the subnet selection option containing the address of the external subnet on which it requires the address. The subnet selection option instructs the DHCP server to allocate the address on the requested subnet as opposed to the normal operation of allocating the address on the subnet from which the DHCP request originated.

## 2. Subnet Selection Option Definition

The subnet selection option is a DHCP option. The option contains a single IPv4 address that is the address of a subnet. The value for the subnet address is determined by taking any IPv4 address on the subnet and ANDing that address with the subnet mask (i.e.: the network and subnet bits are left alone and the remaining (address) bits are set to zero). When the DHCP server is configured to respond to this option, is allocating an address, and this option is present then the DHCP server MUST allocate the address on either:

- o the subnet specified in the subnet selection option, or;
- o a subnet on the same network segment as the subnet specified in the subnet selection option.

The format of the option is:

Code	Len	IPv4 Address			
118	4	A1	A2	A3	A4

Servers configured to support this option MUST return an identical copy of the option to any client that sends it, regardless of whether or not the client requests the option in a parameter request list. Clients using this option MUST discard DHCPOFFER or DHCPACK packets that do not contain this option.

This option does not require changes to operations or features of the DHCP server other than to select the subnet on which to allocate an address. For example, the handling of DHCPDISCOVER for an unknown subnet should continue to operate unchanged.

When this option is present and the server is configured to support this option, the server MUST NOT offer an address that is not on the requested subnet or network segment. Servers that do not understand this option will allocate an address using their normal algorithms and will not return this option in the DHCPOFFER or DHCPACK. In this case the client will discard the DHCPOFFER or DHCPACK. Servers that understand this option but are administratively configured to ignore

the option MUST ignore the option, use their normal algorithms to allocate an address, and MUST NOT return this option in the DHCP OFFER or DHCP ACK. In this case the client will discard the DHCP OFFER or DHCP ACK.

During an address renew, the DHCP server may send a DHCP ACK directly to the allocated address, however packets from the DHCP server may not be routable to the address. Thus, in all packets that the DHCP client sends that contain the subnet selection option, the giaddr field in the BOOTP header MUST be set to an IPv4 address on which the DHCP client will accept DHCP packets (e.g.: the address on the subnet connected to the internal network).

The IPv4 address to which a DHCP server sends a reply to MUST be the same as it would choose when this option is not present.

### 3. Intellectual Property

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11.

Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.

### 4. IANA Considerations

IANA has assigned a value of 118 for the DHCP option code described in this document.

## 5. Acknowledgements

This document is the result of work undertaken the by DHCP working group. Thanks to Ted Lemon, Tim Aston and Ralph Droms for their helpful comments in this work.

W. Mark Townsley and Pratik Gupta originally published a subnet selection option Internet Draft in July 1997. The work in this document was not based on the original work but it does achieve the same goals.

## 6. Security Considerations

DHCP currently provides no authentication or security mechanisms. Potential exposures to attack are discussed in section 7 of the protocol specification [RFC2131].

The subnet selection option allows for the DHCP client to specify the subnet on which to allocate an address. This would allow a client to perform a more complete address-pool exhaustion attack since the client would no longer be restricted to attacking address-pools on just its local subnet.

Servers that implement the subnet selection option MUST by default disable use of the feature; it must specifically be enabled through configuration. Moreover, a server SHOULD provide the ability to selectively enable use of the feature under restricted conditions, e.g., by enabling use of the option only from explicitly configured client-ids, enabling its use only by clients on a particular subnet, or restricting the subnets (as indicated in the subnet selection option) from which addresses may be requested.

## 7. 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.

## 8. Editor's Address

Glenn Waters  
Nortel Networks  
310-875 Carling Avenue,  
Ottawa, Ontario K1S 5P1  
Canada

Phone: +1 613-765-0249  
EMail: [gww@nortelnetworks.com](mailto:gww@nortelnetworks.com)

## 9. Full Copyright Statement

Copyright (C) The Internet Society (2000). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

## Acknowledgement

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

