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DHCP Options for the Port Control Protocol (PCP)
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Abstract

This document specifies DHCP (IPv4 and IPv6) options to configure hosts with Port Control Protocol (PCP) Server IP addresses. The use of DHCPv4 or DHCPv6 depends on the PCP deployment scenario.

Requirements Language

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](#) [[RFC2119](#)].

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PCP DHCP Options

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Table of Contents

1.	Introduction	2
2.	Terminology	3
3.	DHCPv6 PCP Server Option	3
3.1.	Format	3
3.2.	Client Behavior	4
4.	DHCPv4 PCP Option	4
4.1.	Format	4
4.2.	Client Behavior	5
5.	DHCP Server Configuration Guidelines	5
6.	Dual-Stack Hosts	6
7.	Hosts with Multiple Interfaces	6
8.	Security Considerations	6
9.	IANA Considerations	6
9.1.	DHCPv6 Option	6
9.2.	DHCPv4 Option	6
10.	Acknowledgements	7
11.	References	7
11.1.	Normative References	7
11.2.	Informative References	7
	Authors' Addresses	8

[1.](#) Introduction

This document defines DHCPv4 [[RFC2131](#)] and DHCPv6 [[RFC3315](#)] options that can be used to provision PCP server [[RFC6887](#)] IP addresses.

This specification assumes a PCP server is reachable with one or multiple IP addresses. As such, a list of IP addresses can be returned in the PCP server DHCP option.

This specification allows returning one or multiple instances of the PCP server DHCP option. This is used as a hint to guide the PCP client when determining whether to send PCP requests to one or multiple PCP servers. For guidelines on how a PCP client can use

multiple IP addresses and multiple PCP servers, see [\[I-D.ietf-pcp-server-selection\]](#).

The use of DHCPv4 or DHCPv6 depends on the PCP deployment scenarios.

2. Terminology

This document makes use of the following terms:

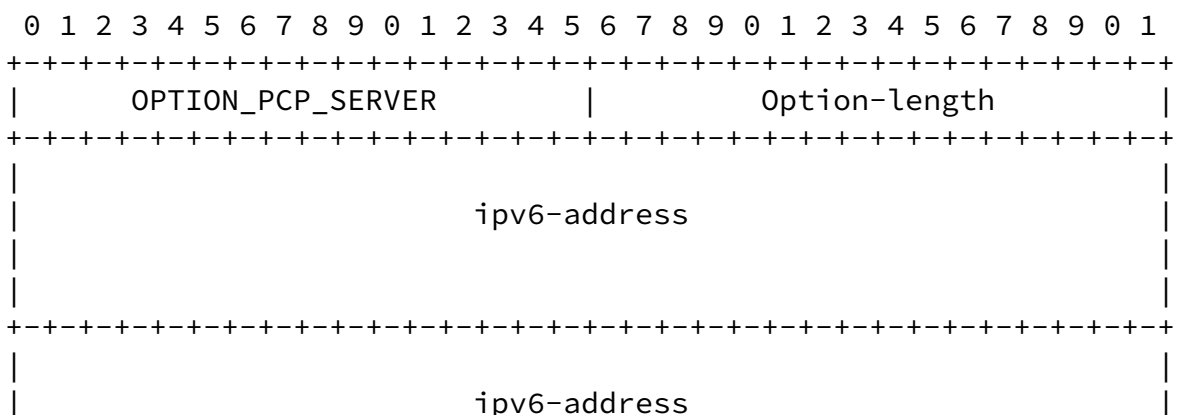
- o PCP server denotes a functional element that receives and processes PCP requests from a PCP client. A PCP server can be co-located with or be separated from the function (e.g., NAT, Firewall) it controls. Refer to [\[RFC6887\]](#).
- o PCP client denotes a PCP software instance responsible for issuing PCP requests to a PCP server. Refer to [\[RFC6887\]](#).
- o DHCP refers to both DHCPv4 [\[RFC2131\]](#) and DHCPv6 [\[RFC3315\]](#).
- o DHCP client (or client) denotes a node that initiates requests to obtain configuration parameters from one or more DHCP servers.
- o DHCP server (or server) refers to a node that responds to requests from DHCP clients.

3. DHCPv6 PCP Server Option

3.1. Format

The PCP server DHCPv6 option can be used to configure a list of IPv6 addresses of a PCP server.

The format of this option is shown in Figure 1.



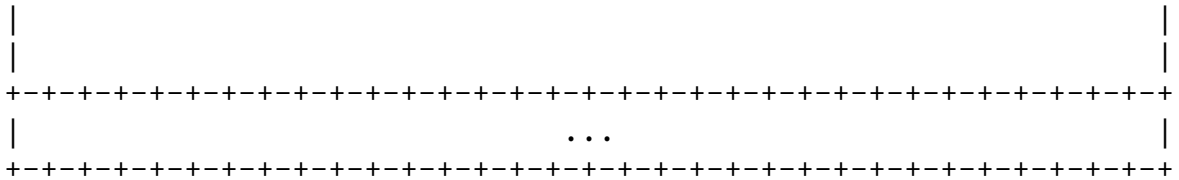


Figure 1: PCP Server DHCPv6 Option

The fields of the option shown in Figure 1 are as follows:

- o Option-code: OPTION_PCP_SERVER (TBA, see [Section 9.1](#))

- o Option-length: Length of the 'PCP server IP Address(es)' field in octets. MUST be a multiple of 16.
- o PCP server IPv6 Addresses: Includes one or more IPv6 addresses [[RFC4291](#)] of the PCP server to be used by the PCP client. Note, IPv4-mapped IPv6 addresses ([Section 2.5.5.2 of \[RFC4291\]](#)) are allowed to be included in this option.

[3.2.](#) Client Behavior

To discover a PCP server, the DHCPv6 client requests PCP server IP addresses by including OPTION_PCP_SERVER in an Option Request Option (ORO), as described in [Section 22.7 of \[RFC3315\]](#).

The client MUST be prepared to receive multiple instances of the DHCPv6 PCP server option; each instance is to be treated as a separate PCP server.

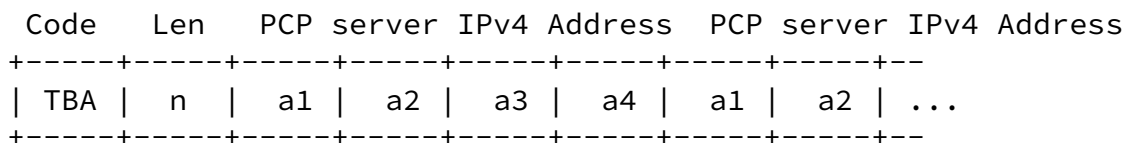
If an IPv4-mapped IPv6 address is received in an OPTION_PCP_SERVER option, it indicates that the PCP server has the corresponding IPv4 address.

When multiple instances of the PCP server DHCPv6 option or multiple IPv6 addresses are received from the DHCPv6 server, the PCP client follows the behavior specified in [[I-D.ietf-pcp-server-selection](#)].

[4.](#) DHCPv4 PCP Option

[4.1.](#) Format

The PCP server DHCPv4 option can be used to configure a list of IPv4 addresses of a PCP server. The format of this option is illustrated in Figure 2.



This format assumes that an IPv4 address is encoded as a1.a2.a3.a4.

Figure 2: PCP Server DHCPv4 Option

The description of the fields is as follows:

- o Code: OPTION_PCP_SERVER (TBA, see [Section 9.2](#));
- o Length: Includes the length of included IP address(es) in octets; MUST be a multiple of 4.

- o PCP server IPv4 Addresses: Contains one or more IPv4 addresses of the PCP server to be used by the PCP client.

[4.2.](#) Client Behavior

To discover a PCP server, the DHCPv4 client requests PCP server IP addresses by including OPTION_PCP_SERVER in a Parameter Request List Option [[RFC2132](#)].

The client MUST be prepared to receive multiple instances of the DHCPv4 PCP server option; each instance is to be treated as a separate PCP server.

[5.](#) DHCP Server Configuration Guidelines

DHCP servers supporting the DHCP PCP server option can be configured with a list of IP addresses of the PCP server(s). If multiple IP addresses are configured, the DHCP server MUST be explicitly configured whether all or some of these addresses refer to:

1. the same PCP server: the DHCP server returns multiple addresses in the same instance of the DHCP PCP server option.

2. distinct PCP servers: the DHCP server returns multiple instances of the DHCP PCP server option to the requesting client; each instance is referring to a distinct PCP server. For example, multiple OPTION_PCP_SERVER instances may be configured to a PCP client in some deployment contexts such as multi-homing. It is out of scope of this document to enumerate all deployment scenarios that require multiple OPTION_PCP_SERVER instances to be returned.

The DHCP server MAY be configurable with one or multiple FQDNs of the PCP server(s). In such case, the DHCP server MUST resolve these FQDNs into one or a list of IP addresses. If multiple FQDNs are configured to the DHCP server, the DHCP server MUST include multiple OPTION_PCP_SERVER instances; each of them carries one or a list of IP addresses that resulted from the FQDN resolution. DHCPv4 servers supporting PCP server option MUST resolve any configured FQDNs into IPv4 addresses while DHCPv6 servers may resolve any configured FQDNs into IPv6 and/or IPv4 addresses. If an IPv4 address is retrieved by the DHCPv6 server, the corresponding IPv4-mapped IPv6 address is included in the OPTION_PCP_SERVER DHCPv6 option. If both IPv4 and IPv6 addresses are retrieved by the DHCPv6 server, these addresses are included in the same OPTION_PCP_SERVER DHCPv6 option (IPv4 addresses are represented as IPv4-mapped IPv6 addresses).

Discussion: The motivation for this design is to accommodate deployment cases where an IPv4 connectivity service is provided while only DHCPv6 is in use (e.g., an IPv4-only PCP server in a DS-Lite context [[RFC6333](#)]).

For guidelines on providing context-specific configuration information (e.g., returning a regional-based configuration), and information on how a server might be configured with FQDNs that get resolved on demand, see [[I-D.ietf-dhc-topo-conf](#)].

[6.](#) Dual-Stack Hosts

A Dual-Stack host might receive OPTION_PCP_SERVER via both DHCPv4 and DHCPv6. For guidance on how a client can handle PCP server IP lists for the same network but obtained via different mechanisms, see

[\[I-D.ietf-pcp-server-selection\]](#).

7. Hosts with Multiple Interfaces

A host may have multiple network interfaces (e.g, 3G, IEEE 802.11, etc.); each configured differently. Each PCP server learned MUST be associated with the interface via which it was learned. Refer to [\[I-D.ietf-pcp-server-selection\]](#) and [Section 8.4 of \[RFC6887\]](#) for more discussion on multi-interface considerations.

8. Security Considerations

The security considerations in [\[RFC2131\]](#) and [\[RFC3315\]](#) are to be considered. PCP-related security considerations are discussed in [\[RFC6887\]](#).

9. IANA Considerations

9.1. DHCPv6 Option

IANA is requested to assign the following new DHCPv6 Option Code in the registry maintained in <http://www.iana.org/assignments/dhcpv6-parameters/>:

Option Name	Value
OPTION_PCP_SERVER	TBA

9.2. DHCPv4 Option

IANA is requested to assign the following new DHCPv4 Option Code in the registry maintained in <http://www.iana.org/assignments/bootp-dhcp-parameters/>:

Option Name	Value
OPTION_PCP_SERVER	TBA

10. Acknowledgements

Many thanks to B. Volz, C. Jacquenet, R. Maglione, D. Thaler, T. Mrugalski, T. Reddy, S. Cheshire and M. Wasserman for their review and comments.

Special thanks to T. Lemon for the review and his continuous effort to enhance this specification.

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