      Stateless Dynamic Host Configuration Protocol (DHCP) Service for IPv6

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Abstract

   Stateless Dynamic Host Configuration Protocol service for IPv6
   (DHCPv6) is used by nodes to obtain configuration information, such
   as the addresses of DNS recursive name servers, that does not require
   the maintenance of any dynamic state for individual clients. A node
   that uses stateless DHCP must have obtained its IPv6 addresses
   through some other mechanism, typically stateless address
   autoconfiguration. This document explains which parts of RFC 3315
   must be implemented in each of the different kinds of DHCP agents so
   that agent can support stateless DHCP.

1. Introduction

   Nodes that have obtained IPv6 addresses through some other mechanism,
   such as stateless address autoconfiguration [6] or manual
   configuration, can use stateless DHCP to obtain other configuration
   information such as a list of DNS recursive name servers or SIP
   servers. A stateless DHCP server provides only configuration
   information to nodes and does not perform any address assignment.
   Such a server is called "stateless" because it need not maintain any
   dynamic state for individual clients.

   While the DHCP specification [1] defines more than 10 protocol
   messages and 20 options, only a subset of those messages and options
   are required for stateless DHCP service. This document explains
   which messages and options defined in RFC 3315 are required for
   stateless DHCP service. The intended use of the document is to guide

the interoperable implementation of clients and servers that use
stateless DHCP service.

The operation of relay agents is the same for stateless and stateful
DHCP service. The operation of relay agents is described in the DHCP
specification.

Section 4 of this document lists the sections of the DHCP document
that an implementor should read for an overview of the DHCP
specification and the basic requirements of a DHCP service. Section
5 lists the specific messages and options that are specifically
required for stateless DHCP service. Section 6 describes how
stateless and stateful DHCP servers interact to provide service to
clients that require address assignment and clients that require only
stateless service.

2. Terminology

   Throughout this document, "DHCP" refers to DHCP for IPv6.

   This document uses the terminology defined in RFC 2460 [2], the DHCP
   specification [1], and the DHCP DNS configuration options
   specification [3].

   "Stateless DHCP" refers to the use of DHCP to provide configuration
   information to clients that does not require the server to maintain
   dynamic state about the DHCP clients.

3. Overview

   This document assumes that a node using stateless DHCP configuration
   is not using DHCP for address assignment, and that a node has
   determined at least a link-local address as described in section 5.3
   of RFC 2461 [4].

   To obtain configuration parameters through stateless DHCP, a node
   uses the DHCP Information-request message. DHCP servers respond to
   the node's message with a Reply message that carries configuration
   parameters for the node. The Reply message from the server can carry
   configuration information, such as a list of DNS recursive name
   servers [3] and SIP servers [5].

   This document does not apply to the function of DHCP relay agents as
   described in RFC 3315. A network element can provide both DHCP
   server and DHCP relay service. For example, a network element can
   provide stateless DHCP service to hosts requesting stateless DHCP
   service, while relaying messages from hosts requesting address
   assignment through DHCP to another DHCP server.

4. Basic Requirements for Implementation of DHCP

   Several sections of the DHCP specification provide background
   information or define parts of the specification that are common to
   all implementations:

   1-4:   give an introduction to DHCP and an overview of DHCP message
           flows

   5:      defines constants used throughout the protocol specification

   6, 7:   illustrate the format of DHCP messages

   8:      describes the representation of Domain Names

   9:      defines the "DHCP unique identifier" (DUID)

   13-16: describe DHCP message transmission, retransmission, and
           validation

   21:     describes authentication for DHCP

5. Implementation of Stateless DHCP

   The client indicates that it is requesting configuration information
   by sending an Information-request message that includes an Option
   Request option specifying the options that it wishes to receive from
   the DHCP server. For example, if the client is attempting to obtain
   a list of DNS recursive name servers, it identifies the DNS Recursive
   Name Server option in the Information-request message. The server
   determines the appropriate configuration parameters for the client
   based on its configuration policies and responds with a Reply message
   containing the requested parameters. In this example, the server
   would respond with DNS configuration parameters.

   As described in section 18.1.5 of RFC 3315, a node may include a
   Client Identifier option in the Information-request message to
   identify itself to a server, because the server administrator may
   want to customize the server's response to each node, based on the
   node's identity.

   RFC 3315 does not define any mechanisms through which the time at
   which a host uses an Information-request message to obtain updated
   configuration parameters can be controlled. The DHC WG has
   undertaken the development of such a mechanism or mechanisms which
   will be published as Standards-track RFC(s).

RFC 3315 also does not provide any guidance about when a host might
use an Information-request message to obtain updated configuration
parameters when the host has moved to a new link. The DHC WG is
reviewing a related document, "Detection of Network Attachment (DNA)
in IPv4" [8], which describes how a host using IPv4 can determine
when to use DHCPv4. Either the DHC WG or a WG formed from the DNA
BOF will undertake development of a similar document for IPv6.

5.1. Messages Required for Stateless DHCP Service

   Clients and servers implement the following messages for stateless
   DHCP service; the section numbers in this list refer to the DHCP
   specification:

   Information-request: sent by a DHCP client to a server to request
                        configuration parameters (sections 18.1.5 and
                        18.2.5)

   Reply: sent by a DHCP server to a client containing
                        configuration parameters (sections 18.2.6 and
                        18.2.8)

   In addition, servers and relay agents implement the following
   messages for stateless DHCP service; the section numbers in this list
   refer to the DHCP specification:

   Relay-forward: sent by a DHCP relay agent to carry the client message
                  to a server (section 15.13)

   Relay-reply: sent by a DHCP server to carry a response message to
                  the relay agent (section 15.14)

5.2. Options Required for Stateless DHCP Service

   Clients and servers implement the following options for stateless
   DHCP service; the section numbers in this list refer to the DHCP
   specification:

   Option Request: specifies the configuration information that the
                       client is requesting from the server (section
                       22.7)

   Status Code: used to indicate completion status or other status
                       information (section 22.13)

   Server Identifier: used to identify the server responding to a client
                      request (section 22.3)

Servers and relay agents implement the following options for
stateless DHCP service; the section numbers in this list refer to the
DHCP specification:

Client message: sent by a DHCP relay agent in a Relay-forward message
                to carry the client message to a server (section 20)

Server message: sent by a DHCP server in a Relay-reply message to
                carry a response message to the relay agent (section
                20)

Interface-ID: sent by the DHCP relay agent and returned by the
                server to identify the interface to be used when
                forwarding a message to the client (section 22.18)

5.3. Options Used for Configuration Information

   Clients and servers use the following options to pass configuration
   information to clients; note that other options for configuration
   information may be specified in future Internet Standards:

   DNS Recursive Name Servers: specifies the DNS recursive name servers
                               [7] the client uses for name resolution;
                               see "DNS Configuration options for
                               DHCPv6" [3]

   DNS search list: specifies the domain names to be searched
                               during name resolution; see "DNS
                               Configuration options for DHCPv6" [3]

   SIP Servers: specifies the SIP servers the client uses
                               to obtain a list of domain names of IPv6
                               addresses that can be mapped to one or
                               more SIP outbound proxy servers [5]

5.4. Other Options Used in Stateless DHCP

   Clients and servers may implement the following options for stateless
   DHCP service; the section numbers in this list refer to the DHCP
   specification:

   Preference: sent by a DHCP server to indicate the preference
                 level for the server (section 22.8)

   Elapsed time: sent by a DHCP client to indicate the time since the
                 client began the DHCP configuration process (section
                 22.9)

    User Class: sent by a DHCP client to give additional information
                     to the server for selecting configuration parameters
                     for the client (section 22.15)

    Vendor Class: sent by a DHCP client to give additional information
                     about the client vendor and hardware to the server
                     for selecting configuration parameters for the client
                     (section 22.16)

    Vendor-specific Information: used to pass information to clients in
                              options defined by vendors (section
                              22.17)

    Client Identifier: sent by a DHCP client to identify itself (section
                     22.2). Clients are not required to send this
                     option; servers send the option back if included
                     in a message from a client

    Authentication: used to provide authentication of DHCP messages
                     (section 21)

6. Interaction with DHCP for Address Assignment

    In some networks, there may be both clients that are using stateless
    address autoconfiguration and DHCP for DNS configuration and clients
    that are using DHCP for stateful address configuration. Depending on
    the deployment and configuration of relay agents, DHCP servers that
    are intended only for stateless configuration may receive messages
    from clients that are performing stateful address configuration.

    A DHCP server that is only able to provide stateless configuration
    information through an Information-request/Reply message exchange
    discards any other DHCP messages it receives. Specifically, the
    server discards any messages other than Information-Request or
    Relay-forward it receives, and the server does not participate in any
    stateful address configuration message exchanges. If there are other
    DHCP servers that are configured to provide stateful address
    assignment, one of those servers will provide the address assignment.

7. Security Considerations

    Stateless DHCP service is a proper subset of the DHCP service
    described in the DHCP specification, RFC 3315 [1]. Therefore,
    stateless DHCP service introduces no additional security
    considerations beyond those discussed in sections 21, 22.11, and 23
    of the DHCP specification [1].

   Configuration information provided to a node through stateless DHCP
   service may be used to mount spoofing, man-in-the-middle, denial-of-
   service, and other attacks. These attacks are described in more
   detail in the specifications for each of the options that carry
   configuration information. Authenticated DHCP, as described in
   sections 21 and 22.11 of the DHCP specification [1], can be used to
   avoid attacks mounted through the stateless DHCP service.

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9.1. Normative References

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9.2. Informative References

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