

DHC Working Group
Internet-Draft
Intended status: Standards Track
Expires: January 7, 2016

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July 6, 2015

DHCPv6 Prefix Length Hint Issues
draft-cui-dhc-dhcpv6-prefix-length-hint-issue-00

Abstract

DHCPv6 Prefix Delegation [[RFC3633](#)] allows a client to set a hint value in the prefix-length field of the IA_PD option to indicate a preference for the size of the prefix to be delegated, but is unclear about how the client and server should act in different situations involving the prefix length hint. This document provides a summary of the existing problems with the prefix length hint and guidance on what the client and server could do in the different situation involving the the prefix length hint.

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[1.](#) Introduction

The DHCPv6 specification [[RFC3315](#)] allows a client to include data values in the requested options, as hints to the server about parameter values the client would like to have returned. The servers are free to ignore the hint values depending on server policy. This would not cause problems for some hint values such as T1 and T2 lifetimes, but it would be an issue for the prefix length hint. Some clients can't function normally when they're provided with a prefix which length is different from what they requested. E.g. if the client is asking for a /56 and the server returns a /64, the functionality of the client might be limited because it might not be able to split the prefix for all its interfaces. The clients usually have higher preference on the prefix length hint than the other option hints, and it should be treated differently.

The current specification is unclear about how the client and server should act in different situations involving the prefix length hint.

From the client perspective, it should be able to use the prefix length hint to signal to the server its real time need and it should be able to handle the prefixes which lengths are different from the prefix length hint. This document provides guidance on what a client should do in different situations, to prevent it from failing. From the server perspective, the server is free to ignore the prefix length hints depending on server policy, but in cases where the server has a policy for considering the hint, this document provides guidance on how the prefix length hint should be handled by the server in different situations.

2. 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 [[RFC2119](#)].

3. Problem Description

3.1. Creation of Solicit Message by the Client

The Solicit message allows a client to ask servers for addresses and configuration parameters. When the client's configuration changes, it might require a prefix length different from what it is currently using. Sometimes the client might want to switch to a new prefix right away. The current specification is unclear about what the client should do if it wants to switch to a different prefix length. There is also the problem of what the client should do if the server is not able to provide the requested prefix length.

Additionally, if the server is able to provide the new prefix length that the client wants, what the client should do with the prefix it is currently using. The client could either deprecate the old prefix right away by sending a Release message or the client could use the two prefixes at the same time and deprecate the old prefix after some time interval.

3.2. Receipt of Solicit message by the Server

Some servers will keep a record about prefixes it gave to the client during previous interactions, and give the client with the same prefix if the same client requested a prefix from the server. If the server has prefix record from previous interactions with the client, and the client is now requesting a different prefix length in the Solicit message, the server has to decide whether to honor the newly requested prefix length hint or give the client the recorded prefix. The current specification is unclear about what a server should do in this situation, and it is dependent on the server policy. Normally

the server just gives the client the prefix the client had gotten before, during previous interactions with the server, but that might not be what the client prefers. The client might want a different prefix length due to configuration changes or it might just want the same prefix again after reboot. The server should interpret these cases differently, because giving the client a prefix different from what it needs might cause functional problems for the client.

Many servers are configured to provide prefixes of specific lengths to the client. E.g. Some servers will only provide /48 and /56. The question is how should these servers decide which prefix to give to the client based on the client's prefix length hint. If the client requested for a /54, and the server could only provide /30, /48, and /56, the server has to decide which prefix to give to the client.

3.3. Receipt of Advertise Message by the Client

The server might not be able to honor the prefix length hint due to server policy. If the prefix length provided by the server in the Advertise message is different from what the client requested in the Solicit message, the question would be whether the client should use the provided prefix or continue to ask for its preferred prefix. There are certain situations where the client would fail if it used a prefix which length is different from what it requested in the prefix length hint. However, if the client ignores the Advertise messages, and continue to solicit for the desired prefix length, the client might be stuck in the DHCP process.

3.4. Creation of Renew/Rebind Message by the Client

Servers might not be able to provide a prefix matching the prefix length hint requested by the client. If the client decided to use the prefix provided by the server which doesn't match the prefix length hint, but would still prefer the prefix length hint it originally requested in the Solicit message, there should be some way for the client to express this preference during Renew/Rebind. E.g. If the client requested for a /60 but got a /64, there should be some way for the client to signal to the server during Renew/Rebind that it would still prefer a /60. This is to see whether the server has the prefix preferred by the client available in its prefix pool during Renew/Rebind.

[RFC3315] does not allow a client to include in the Renew/Rebind message hint values different from what it already has, so the client cannot directly include a different prefix length hint value in the Renew/Rebind message. The current specification is also unclear about whether the client can include both the prefix it is currently

using as well as a different prefix length value as hint in the Renew/Rebind message.

This would raise the same question as to what the client should do with the prefix it is currently using, if the server is able to provide the new prefix that the client wants.

3.5. Receipt of Renew Message by the Server

Upon the receipt of the Renew message, the question is whether the server should remember the prefix length hint the client originally included in the Solicit message and check to see if it now has the prefix length the client originally desired. The prefix desired by the client might become available in the prefix pool during Renew but was unavailable during Solicit. This might be due to server configuration change or because some other client stopped using the prefix. This would require the server to keep extra information about the client. There is also the possibility that the client's preference for the prefix length might have changed during this time interval, so the prefix length remembered by the server might not be what the client wants during the Renew process.

Another question is what the server should do if the client also included in the Renew message a prefix length value different from what the client is currently using. The current specification does not specify how this should be handled and whether the server could also provide a different prefix to the client during the Renew process.

3.6. Receipt of Rebind Message by the Server

[RFC3315] specifies that when the server receives a Rebind message that contains an IA option from a client, it locates the client's binding and verifies that information in the IA from the client matches the information stored for that client. So the current specification requires the client to include in the Rebind message the prefix it is currently using. The question is what the server should do if the client also included in the Rebind message a prefix length value different from what the client is currently using. The Rebind message is sent to any available servers the client can find, so the servers might have the prefix length the client wanted, but the current specification does not specify whether the server could also provide a different prefix to the client during the Rebind process.

4. Proposed Solution

4.1. Creation of Solicit Message by the Client

When the client's configuration changes and suddenly requires a prefix length different from what it already has, the client should send a Solicit message with a different IAID, including the desired prefix length in the prefix-length field of the IA_PD option as the hint.

If the client is able to get the new prefix right away, it could do one of the following things depending on client's need:

1. Deprecate the old prefix right away by sending a Release message to the server, and switch over to the new prefix.

2. Use the two prefixes at the same time and deprecate the old prefix after some time interval. The client could wait for the old prefix to expire or it could extend the lifetime of the old prefix with some specific value.

If the client is unable to get the new prefix right away, it should continue using the old prefix, while soliciting for the new prefix. If the client is unable to use the old prefix anymore, it should deprecate the old prefix by sending a Release message to the server and keep sending Solicit messages asking for the new prefix. The client should send the Solicit messages at defined time intervals to avoid traffic congestion.

4.2. Receipt of Solicit message by the Server

When the prefix length hint in the Solicit message sent by the client is different from the prefix record the server has from previous interactions with the client, the server should try to honor the prefix length hint the client included in the Solicit message. Because it is what the client prefers to have at the time being. If the client wanted the same prefix back it would just include the old prefix as the hint in the Solicit message. If the server has a policy for considering the client's hint it should regard the prefix length hint in the Solicit message as the prefix length most preferred by the client at the time being.

Many servers are configured to provide prefixes of specific lengths to the client. In this situation, the server should provide a prefix which length is shorter than the prefix length hint and which length is closest to the prefix length hint. E.g. If the server could only provide prefixes with lengths /30, /48, and /56, and the client is requesting for a /50 in the prefix length hint, then the server

should provide the /48 to the client.

4.3. Receipt of Advertise Message by the Client

If none of the prefixes provided by the server in the Advertise messages match the prefix length hint the client included in the Solicit message, the client could choose to either accept or ignore the prefixes provided by the servers depending on functional need.

If the client could use the prefixes provided by the servers despite being different from the prefix length hint, the client should choose a prefix length closest to the prefix length hint.

There are certain situations where the client will fail if it used a prefix which length does not meet its requirement. If the client cannot use the prefixes provided by the servers, it should ignore the Advertise messages and continue to send Solicit messages until it gets the desired prefix. To prevent the client from not functioning, the client should not ignore other configuration parameters provided by the server such as available IA_NA addresses.

4.4. Creation of Renew Message by the Client

During the Renew process, if the client prefers a prefix length different from the prefix it is currently using, then the client should two IA_PD options in the Renew message, one with the currently delegated prefix as the hint and the other with the preferred prefix length as the hint. This is to extend the lifetime of the prefix the client is currently using and also get the prefix the client prefers, and go through a graceful switch over.

If the server is unable to provide the client with the newly requested prefix, the client should continue using the prefix it currently has.

4.5. Receipt of Renew Message by the Server

Upon the receipt of Renew message, if the client included an IA_PD option with a prefix length hint different from the prefix that has been delegated to the client, the server should check to see whether it has a prefix matching the prefix length hint.

If the server is able to provide a prefix matching the prefix length hint, then it should provide the new prefix to the client, while giving the old prefix a shorter lifetime. This way, the client wouldn't have to deprecate the old prefix right away.

If the server is unable to provide a prefix matching the newly

requested prefix length hint during Renew then it should just extend the lifetime of the old prefix.

It's unnecessary for the server to remember what the client requested before. The prefix length hint is reflecting what the client prefers at the time being. There is also the possibility that the client's preference for the prefix length might have changed during this time interval, so the prefix length hint in the Renew message might not be the same as the prefix length hint the client originally sent in the Solicit message.

4.6. Creation of Rebind Message by the Client

During the Rebind process, if the client prefers a prefix length different from the prefix it is currently using, then the client should check to see if any of the available servers have the prefix length preferred by the client. The client should include two IA_PD options in the Rebind message, one with the currently delegated prefix as the hint, and the other with the preferred prefix length as the hint. This is to extend lifetime of the prefix the client is currently using and also get the prefix the client prefers, and go through a graceful switch over.

4.7. Receipt of Rebind Message by the Server

Upon the receipt of Rebind message, if the client included an IA_PD option with a prefix length hint different from the prefix that has been delegated to the client, the server should check to see whether it has a prefix in its prefix pool that match the prefix length in the hint.

If the server is able to provide a prefix matching the prefix length hint, then it should provide the new prefix to the client, while giving the old prefix a shorter lifetime. This way, the client wouldn't have to deprecate the old prefix right away.

If the server is unable to provide the client with the newly requested prefix during Rebind then it should just extend the lifetime of the old prefix.

5. Security Considerations

TBD.

6. IANA Considerations

This document does not include an IANA request.

7. Contributors List

Many thanks to Qi Sun, Bernie Volz, Ole Troan.

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