DNS over Transport Layer Security announcements using DHCP or Router Advertisements
draft-peterson-dot-dhcp-00

Abstract

This specification describes a DHCP option and Router Advertisement (RA) extension to inform clients of the presence of DNS resolvers with Transport Layer Security (TLS).

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1. Introduction

DHCPv4 [RFC2131], DHCPv6 [RFC3646], and IPv6 Router Announcements [RFC8106] all provide means to inform clients of available resolvers using the incumbent DNS protocol for querying, however there is no means of specifying alternate protocols to perform DNS queries.

2. Conventions and Definitions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. The DNS over TLS Option

3.1. IPv4 DHCP Option

The format of the IPv4 DoT DHCP option is shown below.

```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Code     |      Len      |                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                               |
|                                                               |
|                          DNS Servers                          |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Code: The DoT DHCPv4 option (one octet)
Length: Length of the DNS Servers list in octects

DNS Servers: One or more IPv4 addresses of DNS servers

3.2. IPv6 DHCP Option

The format of the IPv6 Captive-Portal DHCP option is shown below.

```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          option-code          |           option-len          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
|                           DNS Servers                         |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

option-code: TODO (two octets)

option-len: Length of the list of DNS servers in octects, which MUST be a multiple of 16

DNS Servers: IPv6 addresses of DNS servers

3.3. The DoT IPv6 RA Option

The format of the DoT Router Advertisement option is shown below.

```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Type     |      Len      |                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                               |
|                                                               |
|                          DNS Servers                          |
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Type: TODO (one octet)

Length: 8-bit unsigned integer representing the entire length of all fields, in units of 8 bytes. The minimum value is 3 if one DNS server is contained in the option. Every additional DNS server increases the length by 2. This field is used by the receiver to determine the number of DNS server addresses in the option.
DNS Servers: One or more IPv6 addresses of DNS servers. The number of addresses is determined by the Length field. That is, the number of addresses is equal to \((\text{Length} - 1) / 2\).

4. Security Considerations

An attacker with the ability to inject DHCP messages could include this option and present a malicious resolver.

TODO: Further risk and threat assessments.

5. IANA Considerations

TODO: This section must be updated after assignments have been issued.

This document requires the assignment of an option code assigned under the "BOOTP Vendor Extensions and DHCP Options" [bootp-registry], in addition to an option code assigned under the "Option Codes" registry under DHCPv6 parameters [dhcpv6-registry].

Also, an assignment for an IPv6 RA Option Type from the "IPv6 Neighbor Discovery Option Formats" registry under ICMPv6 parameters [icmpv6-registry].

6. References

6.1. Normative References


6.2. Informative References

[bootp-registry]

[dhcpv6-registry]


Acknowledgments

TODO

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