                RADIUS Delegated-IPv6-Prefix Attribute

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.

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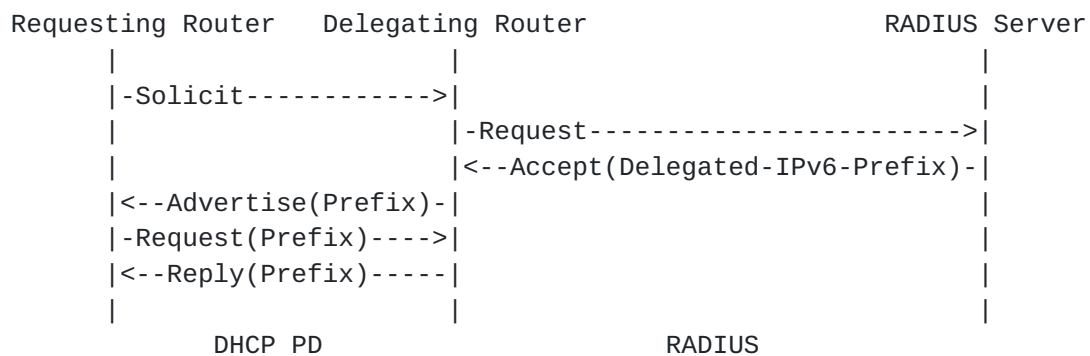
Abstract

   This document defines a RADIUS (Remote Authentication Dial In User
   Service) attribute that carries an IPv6 prefix that is to be
   delegated to the user. This attribute is usable within either RADIUS
   or Diameter.

1. Introduction

   This document defines the Delegated-IPv6-Prefix attribute as a RADIUS
   [1] attribute that carries an IPv6 prefix to be delegated to the
   user, for use in the user's network. For example, the prefix in a
   Delegated-IPv6-Prefix attribute can be delegated to another node
   through DHCP Prefix Delegation [2].

   The Delegated-IPv6-Prefix attribute can be used in DHCP Prefix
   Delegation between the delegating router and a RADIUS server, as
   illustrated in the following message sequence.

   Requesting Router   Delegating Router   RADIUS Server
         | | |
         |-Solicit------------>| |
         | |-Request----------------------->|
         | |<--Accept(Delegated-IPv6-Prefix)-|
         |<--Advertise(Prefix)-| |
         |-Request(Prefix)---->| |
         |<--Reply(Prefix)-----| |
         | | |
                DHCP PD   RADIUS

   The Framed-IPv6-Prefix attribute [4] is not designed to support
   delegation of IPv6 prefixes to be used in the user's network, and
   therefore Framed-IPv6-Prefix and Delegated-IPv6-Prefix attributes may
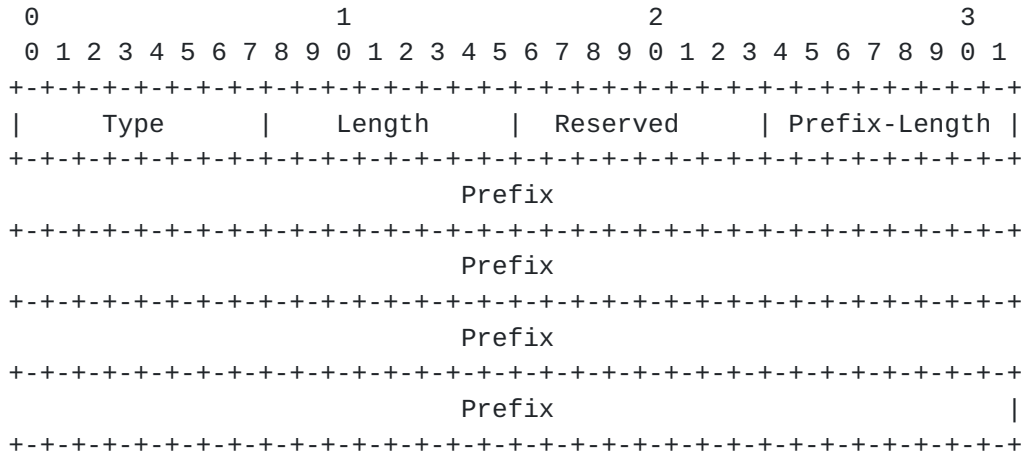   be included in the same RADIUS packet.

2. Terminology

   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 [3].

3. Attribute Format

The format of the Delegated-IPv6-Prefix is:

```
 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 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |    Length     |   Reserved    | Prefix-Length |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                             Prefix
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                             Prefix
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                             Prefix
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                             Prefix                             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Type

    123 for Delegated-IPv6-Prefix

Length

    The length of the entire attribute, in bytes. At least 4 (to
    hold Type/Length/Reserved/Prefix-Length for a 0-bit prefix),
    and no larger than 20 (to hold Type/Length/ Reserved/Prefix-
    Length for a 128-bit prefix)

Reserved

    Always set to zero by sender; ignored by receiver

Prefix-Length

    The length of the prefix being delegated, in bits. At least
    0 and no larger than 128 bits (identifying a single IPv6
    address)

Note that the prefix field is only required to be long enough to hold
the prefix bits and can be shorter than 16 bytes. Any bits in the
prefix field that are not part of the prefix MUST be zero.

The Delegated-IPv6-Prefix MAY appear in an Access-Accept packet, and
can appear multiple times. It MAY appear in an Access-Request packet
as a hint by the NAS to the server that it would prefer these
prefix(es), but the server is not required to honor the hint.

The Delegated-IPv6-Prefix attribute MAY appear in an Accounting-
Request packet.

The Delegated-IPv6-Prefix MUST NOT appear in any other RADIUS
packets.

4. Table of Attributes

The following table provides a guide to which attributes may be found
in which kinds of packets, and in what quantity.

```
+--------------------------------------------------------------------+
| Request Accept Reject Challenge Accounting  #   Attribute          |
|                                 Request                            |
| 0+      0+     0      0         0+          123 Delegated-IPv6-     |
|                                                 Prefix             |
+--------------------------------------------------------------------+
```

The meaning of the above table entries is as follows:
   0   This attribute MUST NOT be present.
   0+ Zero or more instances of this attribute MAY be present.
   0-1 Zero or one instance of this attribute MAY be present.
   1   Exactly one instance of this attribute MUST be present.
   1+ One or more of these attributes MUST be present.

5. Diameter Considerations

When used in Diameter, the attribute defined in this specification
can be used as a Diameter AVP from the Code space 1-255, i.e., RADIUS
attribute compatibility space. No additional Diameter Code values
are therefore allocated. The data types of the attributes are as
follows:

    Delegated-IPv6-Prefix   OctetString

The attribute in this specification has no special translation
requirements for Diameter to RADIUS or RADIUS to Diameter gateways,
i.e., the attribute is copied as is, except for changes relating to
headers, alignment, and padding. See also RFC 3588 [5], Section 4.1,
and RFC 4005 [6], Section 9.

The text in this specification describing the applicability of the
Delegated-IPv6-Prefix attribute for RADIUS Access-Request applies in
Diameter to AA-Request [6] or Diameter-EAP-Request [7].

The text in this specification describing the applicability of the
Delegated-IPv6-Prefix attribute for RADIUS Access-Accept applies in
Diameter to AA-Answer or Diameter-EAP-Answer that indicates success.

The text in this specification describing the applicability of the
Delegated-IPv6-Prefix attribute for RADIUS Accounting-Request applies
to Diameter Accounting-Request [6] as well.

The AVP flag rules [5] for the Delegated-IPv6-Prefix attribute are:

```
                             +--------------------+
                             |   AVP Flag rules   |
                             |----+-----+----+-----|----+
                 AVP         |    |     |SHLD| MUST|    |
   Attribute Name  Code  Value Type |MUST| MAY | NOT| NOT|Encr|
   -------------------------------|----+-----+----+-----|----|
   Delegated-IPv6- 123   OctetString| M  | P   |    | V  | Y  |
     Prefix                    |    |     |    |     |    |
   -------------------------------|----+-----+----+-----|----|
```

6. IANA Considerations

IANA assigned a Type value, 123, for this attribute from the RADIUS
Attribute Types registry.

7. Security Considerations

Known security vulnerabilities of the RADIUS protocol are discussed
in RFC 2607 [8], RFC 2865 [1], and RFC 2869 [9]. Use of IPsec [10]
for providing security when RADIUS is carried in IPv6 is discussed in
RFC 3162.

Security considerations for the Diameter protocol are discussed in
RFC 3588 [5].

8. References

8.1. Normative References

[1]   Rigney, C., Willens, S., Rubens, A., and W. Simpson, "Remote
      Authentication Dial In User Service (RADIUS)", RFC 2865, June
      2000.

[2]   Troan, O. and R. Droms, "IPv6 Prefix Options for Dynamic Host
      Configuration Protocol (DHCP) version 6", RFC 3633, December
      2003.

[3]   Bradner, S., "Key words for use in RFCs to Indicate Requirement
      Levels", BCP 14, RFC 2119, March 1997.

9.2. Informative References

   [4]   Aboba, B., Zorn, G., and D. Mitton, "RADIUS and IPv6", RFC 3162,
         August 2001.

   [5]   Calhoun, P., Loughney, J., Guttman, E., Zorn, G., and J. Arkko,
         "Diameter Base Protocol", RFC 3588, September 2003.

   [6]   Calhoun, P., Zorn, G., Spence, D., and D. Mitton, "Diameter
         Network Access Server Application", RFC 4005, August 2005.

   [7]   Eronen, P., Hiller, T., and G. Zorn, "Diameter Extensible
         Authentication Protocol (EAP) Application", RFC 4072, August
         2005.

   [8]   Aboba, B. and J. Vollbrecht, "Proxy Chaining and Policy
         Implementation in Roaming", RFC 2607, June 1999.

   [9]   Rigney, C., Willats, W., and P. Calhoun, "RADIUS Extensions",
         RFC 2869, June 2000.

   [10] Kent, S. and K. Seo, "Security Architecture for the Internet
         Protocol", RFC 4301, December 2005.

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