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RADIUS Delegated-IPv6-Prefix Attribute
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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.

```
  Requeting 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

TBD 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 Request	#	Attribute
0+	0+	0	0	0+	TBD	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 Delegate-IPv6-Prefix attribute are:

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

6. IANA Considerations

IANA is requested to assign a Type value, TBD, 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. Change Log

This section to be removed before publication as an RFC.

The following changes were made in revision -01 of this document:

- o Added additional details to Abstract; defined that this attribute can be used in both RADIUS and Diameter. (Issue 188)
- o Moved and clarified text describing which packets this attribute can appear in adjacent to table in section 3. (Issue 188)
- o Fixed RFC 2119 boilerplate in section 2. (Issue 185)
- o Fixed table in section 3 to clarify which packets this attribute cannot appear in. (Issue 188)
- o Added section 4, Diameter Considerations. (Issue 188)

- o Made some references in section 6, Security Considerations, Informative rather than Normative. (Issue 188)
- o Updated reference to RFC 2401 [9] to RFC 4301. (Issue 188)
- o Changed "IP SEC" to "IPsec" in section 6. (Issues 185 and 188)

The following changes were made in revision -02 of this document:

- o Added a second paragraph to the Introduction, referencing the Framed-IPv6-Prefix attribute
- o Improved description of attribute fields in section 3
- o Added border to table in section 3
- o Updated Section 4, Diameter Considerations, to describe how this attribute would be used in Diameter.
- o Added reference to RFC 3588 in Section 6, Security Considerations.

The following changes, based on Issues 201 and 204 on the RADEXT WG Issues list: http://www.drizzle.com/~aboba/RADEXT/, were made in revision -03 of this document:

- o Updated Section 5, Diameter Considerations, to describe the AVP flag rules for this attribute.
- o Edited Section 1, to clarify the relationship between the Delegated-IPv6-Prefix and Framed-IPv6-Prefix attributes.
- o Edited table of attributes and moved to a separate section.

Revision -04 includes the following changes:

- o Editorial changes in the AVP flag rules table
- o Editorial changes in the description of the relationship between the Delegated-IPv6-Prefix and Framed-IPv6-Prefix attributes (last paragraph of section 1)
- o Editorical changes in the first paragraph of section 1 to clarify that this document defines a new attribute not already defined in RFC 2865
- o Added a text and a diagram to section 1 to illustrate the use of the Delegated-IPv6-Prefix attribute

9. References

9.1. 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. Non-normative 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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