RADIUS attributes for Domain-specific Key Request and Delivery
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Abstract

This document specifies the Key-Request and Key-Response attributes in Remote Authentication and Dial-In User Service (RADIUS). These attributes can be used by a visited network entity to request a key from the home network and the home domain to deliver the key to the visited network entity; the request and response may be piggy-backed on the EAP authentication or EAP Re-authentication bootstrapping
exchange between the user and the user’s home RADIUS server or may be part of a separate exchange.

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1. Introduction

This document specifies two new RADIUS [1] attributes for the purpose of a user’s visited domain entity to request a cryptographic key from the home RADIUS server, and for the home RADIUS server to deliver the key to the visited domain entity that sent the request. The request and response may be piggy-backed on EAP authentication [5] or EAP Re-authentication bootstrapping exchanges [6] between the user and the user’s home RADIUS server or may be part of a separate exchange.

The Extended Master Session Key (EMSK) hierarchy specified in [2] contains Domain-Specific Root Keys (DSRK) specific to an administrative domain. It is plausible for a visited domain entity to request the home domain for a DSRK from the user’s home RADIUS server during EAP authentication or EAP Re-authentication bootstrapping protocol exchange. There is also proposed work on specifying a generic DSRK request protocol. When RADIUS is used as the AAA protocol, the Key-Request attribute specified in this document is used for requesting a key and the Key-Response attribute is used to deliver the key.

The key-request attribute contains the requesting entity’s identity and the type of the key being requested.

The key-response attribute contains the requesting entity’s identity, the type of the key, the key itself, its length, name and lifetime.

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. RADIUS Key-Request Attribute

Description

The RADIUS Key-Request attribute provides a means for a visited domain server to request a key from the home domain of the user. This attribute MAY be used in Access-Request messages by a visited domain server and MUST NOT be used in Access-Challenge, Access-Accept or Access-Reject messages.
Other than the 1-octet Type and Length fields, this attribute has a 1-octet field to indicate the type of the key being requested and a variable length field to carry the Requesting Entity’s Identity.

The Requesting Entity’s Identity is to be copied in the corresponding Key-Response attribute.

```
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      |     Length    |    Key Type   | Requesting    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        ~     Entity’s Identity (String)    ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 1: Key-Request Attribute

**Type**

IANA-TBD for Key-Request

**Length**

\[>= 4\]

**Key Type**

This 1-octet field indicates the type of the key being requested:

0 .......  Reserved

1 .......  Domain-Specific Root Key (DSRK)

**Requesting Entity’s Identity** The Requesting Entity’s Identity is a string, and typically takes the form of a fully qualified domain name (FQDN).

4. RADIUS Key-Response Attribute

**Description**
The RADIUS Key-Response attribute MAY be included in the Access-Accept message by the user’s home RADIUS server to send the requested key type, key, its name, length, and lifetime. In addition, the requesting entity’s identity MAY be included. This attribute MUST NOT be used in Access-Request, Access-Challenge or Access-Reject messages.

Other than the 1-octet Type and Length fields, this attribute has a 1-octet field to indicate the type of the key being included, a 1-octet key length field, a 4-octet key lifetime field, an 8-octet key name field, a variable length field to carry the key and optionally a variable length field to carry the Requesting Entity’s Identity.

The Requesting Entity’s Identity is to be copied from the corresponding Key-Request attribute.

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |     Length    |    Key Type   |  Key Length   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Key Lifetime (4 Octets)...                                  ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Key Name (8 Octets)...                                      ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Key (Variable)                                              ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Requesting Entity’s Identity (String, Variable) Optional ... ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 2: Key-Response Attribute

Type

IANA-TBD for Key-Response

Length

>= 80

Key Type
This 1-octet field indicates the type of the key being requested. This value is copied from the corresponding Key-Request attribute.

Key Length

This 1-octet field indicates the length of the key in octets. Since the length of the entire message is also included with a 1-octet field, key length cannot be larger than 240 octets. If the optional attribute "Requesting Entity’s Identity" is included in the message, the key length is smaller. Key length MUST be at least 64 octets.

Key Lifetime

The key lifetime in seconds is indicated within a 4-octet field.

Key Name

The key name field in 8 octets in size.

Key

The key of type Key Type is included in this field. This is a variable length field.

A stricter version of RFC 3756 requirements apply for RADIUS messages carrying Key-Response Attribute(s). Implementations of this specification MUST support IPsec along with IKEv2 for key management. IPsec ESP with a non-null transform MUST be supported, and IPsec ESP with a non-null encryption transform and authentication support is necessary to provide per-packet confidentiality, authentication, integrity and replay protection.

Requesting Entity’s Identity  The Requesting Entity’s Identity is a string, and typically takes the form of a fully qualified domain name (FQDN). This field is optional. Given that the Key Length must be at least 64 octets, this field can at most be 192 octets in length.

5. Security Considerations

A stricter version of RFC 3756 requirements apply for RADIUS messages carrying Key-Response Attribute(s). Implementations of this specification MUST support IPsec along with IKEv2 for key management. IPsec ESP with a non-null transform MUST be supported, and IPsec ESP with a non-null encryption transform and authentication support is necessary to provide per-packet confidentiality, authentication,
integrity and replay protection.

EAP Channel bindings may be necessary to ensure that the RADIUS user and the server are in synchronization regarding the key Requesting Entity’s Identity. Specifically, the Requesting Entity advertises its identity through the EAP lower layer and the user or the EAP peer communicates that identity to the EAP server (and the EAP server communicates that identity to the RADIUS server) via the EAP method for user/peer to server verification of the Requesting Entity’s Identity.

6. IANA Considerations

This document specifies the following IANA registrations in the RADIUS Attribute Types Registry at http://www.iana.org/assignments/radius-types

Key-Request

Key-Response

Within the attributes Key-Request and Key-Response, a Key Type field is being specified with the following assignments and rules:

0 ........ Reserved
1 ........ Domain-Specific Root Key (DSRK)
2-191 ..... IANA-managed (Expert Review)
192-223 ....... Experimental Use
224-255 ...... Private Use

7. Acknowledgments

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8. References
8.1. Normative References


8.2. Informative References


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