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Diameter Attribute-Value Pairs for Cryptographic Key Transport

Abstract

Some Authentication, Authorization, and Accounting (AAA) applications require the transport of cryptographic keying material. This document specifies a set of Attribute-Value Pairs (AVPs) providing native Diameter support of cryptographic key delivery.

Status of This Memo

This is an Internet Standards Track document.

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1. Introduction

The Diameter Extensible Authentication Protocol (EAP) application [RFC4072] defines the EAP-Master-Session-Key and EAP-Key-Name AVPs for the purpose of transporting cryptographic keying material derived during the execution of certain Extensible Authentication Protocol (EAP) [RFC3748] methods (for example, EAP-TLS [RFC5216]). At most one instance of either of these AVPs is allowed in any Diameter message.

However, recent work (see, for example, [RFC5295]) has specified methods to derive other keys from the keying material created during EAP method execution that may require transport in addition to the Master Session Key (MSK). Also, the EAP Re-authentication Protocol (ERP) [RFC6696] specifies new keys that may need to be transported between Diameter nodes.

This document specifies a set of AVPs allowing the transport of multiple cryptographic keys in a single Diameter message.

2. Terminology

2.1. 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 RFC 2119 [RFC2119].

2.2. Technical Terms and Acronyms

DSRK

Domain-Specific Root Key [RFC5295].

MSK

Master Session Key [RFC3748].

rMSK

re-authentication MSK [RFC6696]. This is a per-authenticator key, derived from the rRK (below).

rRK

re-authentication Root Key, derived from the Extended Master Session Key (EMSK) [RFC3748] or DSRK [RFC6696].

3. Attribute-Value Pair Definitions

This section defines new AVPs for the transport of cryptographic keys in the Diameter EAP application [RFC4072], as well as other Diameter applications.

3.1. Key AVP

The Key AVP (AVP Code 581) is of type Grouped. It contains the type and keying material and, optionally, an indication of the usable lifetime of the key, the name of the key and a Security Parameter Index (SPI) with which the key is associated.

```
Key ::= < AVP Header: 581 >
      < Key-Type >
      { Keying-Material }
      [ Key-Lifetime ]
      [ Key-Name ]
      [ Key-SPI ]
      * [ AVP ]
```

3.1.1. Key-Type AVP

The Key-Type AVP (AVP Code 582) is of type Enumerated. This AVP identifies the type of the key being sent. The following decimal values are defined in this document:

DSRK (0)

A Domain-Specific Root Key [RFC5295].

rRK (1)

A re-authentication Root Key [RFC6696].

rMSK (2)

A re-authentication Master Session Key [RFC6696].

If additional values are needed, they are to be assigned by IANA according to the policy stated in Section 5.2.

3.1.2. Key-Name AVP

The Key-Name AVP (AVP Code 586) is of type OctetString. It contains an opaque key identifier. Exactly how this name is generated and used depends on the key type and usage in question and is beyond the scope of this document (see [RFC5247] and [RFC5295] for discussions of key name generation in the context of EAP).

3.1.3. Keying-Material AVP

The Keying-Material AVP (AVP Code 583) is of type OctetString. The exact usage of this keying material depends upon several factors, including the type of the key and the link layer in use and is beyond the scope of this document.

3.1.4. Key-Lifetime AVP

The Key-Lifetime AVP (AVP Code 584) is of type Unsigned32 and represents the period of time (in seconds) for which the contents of the Keying-Material AVP (Section 3.1.3) is valid.

NOTE:

Applications using this value SHOULD consider the beginning of the lifetime to be the point in time when the message containing the keying material is received. In addition, client implementations SHOULD check to ensure that the value is reasonable; for example, the lifetime of a key should not generally be longer than the session lifetime (see Section 8.13 of [RFC6733]).

3.1.5. Key-SPI

The Key-SPI AVP (AVP Code 585) is of type Unsigned32 and contains an SPI value that can be used with other parameters for identifying associated keying material.

4. Security Considerations

Transporting keys is a security-sensitive action. Some forms of keying material are already protected and can be sent safely over the open Internet. However, if a Key AVP contains a Keying-Material AVP that is not already protected, then the Diameter messages containing that Key AVP MUST only be sent protected via mutually authenticated TLS or IPsec.

The security considerations applicable to the Diameter base protocol [RFC6733] are also applicable to this document, as are those in Section 8.4 of RFC 4072 [RFC4072].

5. IANA Considerations

IANA has assigned values as described in the following sections.

5.1. AVP Codes

Codes have been assigned for the following AVPs using the policy specified in [RFC6733], Section 11.1.1:

- o Key (581, Section 3.1)
- o Key-Type (582, Section 3.1.1)
- o Keying-Material (583, Section 3.1.3)
- o Key-Lifetime (584, Section 3.1.4)
- o Key-SPI (585, Section 3.1.5)
- o Key-Name (586, Section 3.1.2)

5.2. AVP Values

IANA has created a new registry for values assigned to the Key-Type AVP and populated it with the decimal values defined in this document (Section 3.1.1). New values may be assigned for the Key-Type AVP using the "Specification Required" policy [RFC5226]; once values have been assigned, they MUST NOT be deleted, replaced, or modified.

6. Acknowledgements

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