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G. Zorn
Network Zen
Q. Wu
Huawei
V. Cakulev
Alcatel Lucent
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Diameter Attribute-Value Pairs for Cryptographic Key Transport
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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.

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1. Introduction

The Diameter 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 MSK. In addition, the EAP Re-authentication Protocol (ERP) [RFC5296] specifies new keys that may need to be transported between Diameter nodes.

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

2. Terminology

2.1. Standards 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

reauthentication MSK [RFC5296]. This is a per-authenticator key, derived from the rRK (below).

rRK

reauthentication Root Key, derived from the EMSK Extended Master Session Key [RFC3748] or DSRK [RFC5296].

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 <AC1>) 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: AC1 >
      < Key-Type >
      { Keying-Material }
      [ Key-Lifetime ]
      [ Key-Name ]
      [ Key-SPI ]
      * [ AVP ]
```

3.1.1. Key-Type AVP

The Key-Type AVP (AVP Code <AC2>) 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 reauthentication Root Key [RFC5296].

rMSK (2)

A reauthentication Master Session Key [RFC5296].

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 <AC6>) 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 <AC3>) 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 <AC4>) 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 [I-D.ietf-dime-rfc3588bis]).

3.1.5. Key-SPI

The Key-SPI AVP (AVP Code <AC5>) is of type Unsigned32 and contains a 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 Keying-Material 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 [I-D.ietf-dime-rfc3588bis] are also applicable to this document, as are those in Section 8.4 of RFC 4072 [RFC4072].

5. IANA Considerations

Upon publication of this memo as an RFC, IANA is requested to assign values as described in the following sections.

5.1. AVP Codes

Codes must be assigned for the following AVPs using the policy specified in [I-D.ietf-dime-rfc3588bis], Section 11.1.1:

- o Key (<AC1>, Section 3.1)
- o Key-Type (<AC2>, Section 3.1.1)
- o Keying-Material (<AC3>, Section 3.1.3)
- o Key-Lifetime (<AC4>, Section 3.1.4)
- o Key-SPI (<AC5>, Section 3.1.5)
- o Key-Name (<AC6>, Section 3.1.2)

5.2. AVP Values

IANA is requested to create a new registry for values assigned to the Key-Type AVP and populated 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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Authors' Addresses

Glen Zorn
Network Zen
227/358 Thanon Sanphawut
Bang Na, Bangkok 10260
Thailand

Phone: +66 (0) 87-040-4617
Email: glenzorn@gmail.com

Qin Wu
Huawei Technologies Co., Ltd.
101 Software Avenue, Yuhua District
Nanjing, Jiangsu 21001
China

Phone: +86-25-56623633
Email: sunseawq@huawei.com

Violeta Cakulev
Alcatel Lucent
600 Mountain Ave.
3D-517
Murray Hill, NJ 07974
US

Phone: +1 908 582 3207
Email: violeta.cakulev@alcatel-lucent.com

