Additional Methods for Generating Key Identifiers Values

Abstract

This document specifies additional example methods for generating Key Identifier values for use in the AKI (Authority Key Identifier) and SKI (Subject Key Identifier) certificate extensions.

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1. Introduction

[RFC5280] defines the AKI (Authority Key Identifier) and SKI (Subject Key Identifier) certificate extensions. [RFC5280] describes two example mechanisms for generating AKI and SKI values: a 160-bit SHA-1 (Secure Hash Algorithm) hash of the public key and a four-bit type field with the value 0100 followed by the least significant 60 bits of the SHA-1 hash. Both of these mechanisms were designed to not be critical to security. This document defines three additional mechanisms for generating Key Identifier values using SHA-256, SHA-384, and SHA-512 [SHS] that are similar to those examples defined in [RFC5280] as well as one based on hashing the certificate’s Subject Public Key Info field.

2. Additional Methods for Generating Key Identifiers

[RFC5280] specifies two examples for generating key identifiers from public keys. Four additional mechanisms are as follows:

1) The keyIdentifier is composed of the leftmost 160-bits of the SHA-256 hash of the value of the BIT STRING subjectPublicKey (excluding the tag, length, and number of unused bits).

2) The keyIdentifier is composed of the leftmost 160-bits of the SHA-384 hash of the value of the BIT STRING subjectPublicKey (excluding the tag, length, and number of unused bits).

3) The keyIdentifier is composed of the leftmost 160-bits of the SHA-512 hash of the value of the BIT STRING subjectPublicKey (excluding the tag, length, and number of unused bits).

4) The keyIdentifier is composed of the hash of the DER encoding of the SubjectPublicKeyInfo value.
3. Examples

This section provides some examples. The keys and SKIs are presented in hexadecimal (two hex digits per byte).

Given the following DER-encoded SubjectPublicKeyInfo value holding an P-256 ECDSA (Elliptic Curve Digital Signature Algorithm) key:

```
30 59  
30 13  
  06 07 2A8648CE3D0201 -- id-ecPublicKey  
  06 08 2A8648CE3D030107 -- secp256r1  
  03 42 00  
  04 7F7F35A79794C950060B8029FC8F363A  
  28F11159692D9D34E6AC948190434735  
  F833B1A6652DC514337AFF7F5C9C75D  
  670C019D95A5D639B72744C64A9128BB
```

The SHA-256 hash of the 65 bytes 047F7F...BB is:

```
BF37B3E5808FD46D54B28E846311BCCE1CAD2E1A62AA9092EF3EFB3F11451F44
```

The SHA-1 hash of these 65 bytes is:

```
6FEF9162C0A3F27608956D41C37DA0C8E87F0AE
```

The SHA-256 hash of the 91 bytes 305930...BB is:

```
6D20896AB8BD833B6B66554BD59B20225D8A75A296088148399D7BF763D57405
```

Using method 1 from Section 2, the subjectKeyIdentifier would be:

```
30 1D  
  06 03 551D0E -- id-ce-subjectKeyIdentifier  
  04 16  
  04 14 BF37B3E5808FD46D54B28E846311BCCE1CAD2E1A
```

Using method 4 from Section 2 with SHA-256 and no truncation, the subjectKeyIdentifier extensions would be:

```
30 29  
  06 03 551D0E -- id-ce-subjectKeyIdentifier  
  04 22  
  04 20 6D20896AB8BD833B6B66554BD59B2022  
  5D8A75A296088148399D7BF763D57405
```
4. Security Considerations

The security considerations of [RFC5280] apply to certificates. The security considerations of [RFC5758] apply to the hash algorithms.

While hash algorithms provide preimage resistance, second-preimage resistance, and collision resistance, none of these properties are needed for key identifiers.

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