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L. Velvindron
cyberstorm.mu
K. Moriarty
Dell EMC
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Deprecating MD5 and SHA1 in TLS 1.2
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Abstract

The MD5 and SHA1 hashing algorithms are steadily weakening in strength and their deprecation process should begin for their use in TLS 1.2 digital signatures.

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[1.](#) Introduction

The usage of MD5 and SHA1 for TLS 1.2 is specified [RFC 5246](#) [[RFC5246](#)]. MD5 and SHA-1 have been proven to be insecure, subject to collision attacks. [RFC 6151](#) [[RFC6151](#)] details the security considerations, including collision attacks for MD5, published in 2011. MD5 has been deprecated by NIST and is no longer mentioned in publications such as [[NISTSP800-131A-R2](#)]. NIST formally deprecated use of SHA-1 in 2011 [[NISTSP800-131A-R2](#)] and disallowed its use for digital signatures at the end of 2013, based on both the Wang, et. al, attack and the potential for brute-force attack. Further, in 2017, researchers from Google and CWI Amsterdam [[SHA-1-Collision](#)] proved SHA-1 collision attacks were practical. This document updates [RFC 5246](#) [[RFC5246](#)] and [RFC7525](#) [[RFC7525](#)] in such a way that MD5 and SHA1 MUST NOT be used for digital signatures.

[1.1.](#) 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.](#) Signature Algorithms

Clients SHOULD NOT include md5 and SHA-1 in signature_algorithms extension. If a client does not send a signature_algorithms extension, then the server MUST abort the handshake and send a handshake_failure alert.

3. Certificate Requests

Servers SHOULD NOT include md5 and SHA-1 in CertificateRequest message.

4. Server Key Exchange

Servers MUST NOT include md5 and SHA-1 in ServerKeyExchange message. If client does receive a MD5 or SHA-1 signature in the ServerKeyExchange message it MUST abort the connection with handshake_failure or insufficient_security alert.

5. Certificate Verify

Clients MUST NOT include md5 and SHA-1 in CertificateVerify message.

6. Updates to [RFC5246](#)

OLD:

In [Section 7.4.1.4.1](#): the text should be revised from " enum { none(0), md5(1), sha1(2), sha224(3), sha256(4), sha384(5), sha512(6), (255) } HashAlgorithm;"

NEW:

enum { none(0), sha224(3), sha256(4), sha384(5), sha512(6), (255) } HashAlgorithm;

OLD:

In [Section 7.4.1.4.1](#): the text should be revised from " Note: this is a change from TLS 1.1 where there are no explicit rules, but as a practical matter one can assume that the peer supports MD5 and SHA-1."

NEW:

"Note: This is a change from TLS 1.1 where there are no explicit rules, but as a practical matter one can assume that the peer supports SHA-256."

7. Updates to [RFC7525](#)

[RFC7525](#) [[RFC7525](#)], Recommendations for Secure Use of Transport Layer Security (TLS) and Datagram Transport Layer Security (DTLS) recommends use of SHA-256 as a minimum requirement. This update moves the minimum recommendation to use stronger language deprecating

use of both SHA-1 and MD5. The prior text did not explicitly include MD5 and this text adds it to ensure it is understood as having been deprecated.

[Section 4.3](#):

OLD:

When using RSA, servers SHOULD authenticate using certificates with at least a 2048-bit modulus for the public key. In addition, the use of the SHA-256 hash algorithm is RECOMMENDED (see [\[CAB-Baseline\]](#) for more details). Clients SHOULD indicate to servers that they request SHA-256, by using the "Signature Algorithms" extension defined in TLS 1.2.

NEW:

When using RSA, servers SHOULD authenticate using certificates with at least a 2048-bit modulus for the public key. In addition, the use of the SHA-256 hash algorithm is RECOMMENDED, SHA-1 or MD5 MUST not be used (see [\[CAB-Baseline\]](#) for more details). Clients SHOULD indicate to servers that they request SHA-256, by using the "Signature Algorithms" extension defined in TLS 1.2.

[8. Security Considerations](#)

Concerns with TLS 1.2 implementations falling back to SHA-1 is an issue. This draft updates the TLS 1.2 specification to deprecate support for MD5 and SHA-1 for digital signatures.

[9. Acknowledgement](#)

The authors would like to thank Hubert Kario for his help in writing the initial draft.

[10. References](#)

[10.1. Normative References](#)

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10.2. Informative References

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Authors' Addresses

Loganaden Velvindron
cyberstorm.mu
Rose Hill
MU

Phone: +230 59762817
Email: logan@cyberstorm.mu

Kathleen Moriarty
Dell EMC

