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**Deprecating MD5 and SHA-1 signature hashes in TLS 1.2  
draft-ietf-tls-md5-sha1-deprecate-02**

Abstract

The MD5 and SHA-1 hashing algorithms are steadily weakening in strength and their deprecation process should begin for their use in TLS 1.2 digital signatures. However, this document does not deprecate SHA-1 in HMAC for record protection.

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**[1.](#) Introduction**

The usage of MD5 and SHA-1 for signature hashing in TLS 1.2 is specified in [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. 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 SHA-1 MUST NOT be used for digital signatures. However, this document does not deprecate SHA-1 in HMAC for record protection.

**[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 the 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, except when digital signatures are not used (for example, when using PSK ciphers).

### **3. Certificate Request**

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 and it sent one in signature\_algorithms extensions it MUST abort the connection with handshake\_failure or insufficient\_security alert. If client did not send MD5 nor SHA-1 hash algorithm in signature\_algorithms extension and it receives a MD5 or SHA-1 signature in the ServerKeyExchange it MUST abort the connection with the illegal\_parameter alert.

### **5. Certificate Verify**

Clients MUST NOT include MD5 and SHA-1 in CertificateVerify message. If the server receives a CertificateVerify message with MD5 or SHA-1 it MUST abort the connection with handshake\_failure or insufficient\_security alert.

### **6. Updates to [RFC5246](#)**

[RFC5246](#) [[RFC5246](#)], The Transport Layer Security (TLS) Protocol Version 1.2, suggests that implementations can assume support for MD5 and SHA-1 by their peer. This update changes the suggestion to assume support for SHA-256 instead, due to MD5 and SHA-1 being deprecated.

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:

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 MUST 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. However, this document does not deprecate SHA-1 in HMAC for record protection.

## **9. Acknowledgement**

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## **10. References**

### **10.1. Normative References**

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