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## Prohibiting Secure Sockets Layer (SSL) Version 2.0

### Abstract

This document requires that when Transport Layer Security (TLS) clients and servers establish connections, they never negotiate the use of Secure Sockets Layer (SSL) version 2.0. This document updates the backward compatibility sections found in the Transport Layer Security (TLS).

### Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in [Section 2 of RFC 5741](#).

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <http://www.rfc-editor.org/info/rfc6176>.

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## 1. Introduction

Many protocols specified in the IETF rely on Transport Layer Security (TLS) [TLS1.0][TLS1.1][TLS1.2] for security services. This is a good thing, but some TLS clients and servers also support negotiating the use of Secure Sockets Layer (SSL) version 2.0 [SSL2]; however, this version does not provide a sufficiently high level of security. SSL version 2.0 has known deficiencies. This document describes those deficiencies, and it requires that TLS clients and servers never negotiate the use of SSL version 2.0.

RFC 4346 [TLS1.1], and later RFC 5246 [TLS1.2], explicitly warned implementers that the "ability to send version 2.0 CLIENT-HELLO messages will be phased out with all due haste". This document accomplishes this by updating the backward compatibility sections found in TLS [TLS1.0][TLS1.1][TLS1.2].

### 1.1. Requirements Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

## 2. SSL 2.0 Deficiencies

SSL version 2.0 [SSL2] deficiencies include the following:

- o Message authentication uses MD5 [MD5]. Most security-aware users have already moved away from any use of MD5 [RFC6151].
- o Handshake messages are not protected. This permits a man-in-the-middle to trick the client into picking a weaker cipher suite than it would normally choose.
- o Message integrity and message encryption use the same key, which is a problem if the client and server negotiate a weak encryption algorithm.
- o Sessions can be easily terminated. A man-in-the-middle can easily insert a TCP FIN to close the session, and the peer is unable to determine whether or not it was a legitimate end of the session.

### 3. Changes to TLS

Because of the deficiencies noted in the previous section:

- o TLS clients MUST NOT send the SSL version 2.0 compatible CLIENT-HELLO message format. Clients MUST NOT send any ClientHello message that specifies a protocol version less than { 0x03, 0x00 }. As previously stated by the definitions of all previous versions of TLS, the client SHOULD specify the highest protocol version it supports.
- o TLS servers MAY continue to accept ClientHello messages in the version 2 CLIENT-HELLO format as specified in [RFC 5246 \[TLS1.2\]](#), [Appendix E.2](#). Note that this does not contradict the prohibition against actually negotiating the use of SSL 2.0.
- o TLS servers MUST NOT reply with an SSL 2.0 SERVER-HELLO with a protocol version that is less than { 0x03, 0x00 } and instead MUST abort the connection, i.e., when the highest protocol version offered by the client is { 0x02, 0x00 }, the TLS connection will be refused.

Note that the number of servers that support this above-mentioned "MAY accept" implementation option is declining, and the SSL 2.0 CLIENT-HELLO precludes the use of TLS protocol enhancements that require TLS extensions. TLS extensions can only be sent as part of an (Extended) ClientHello handshake message.

### 4. Security Considerations

This entire document is about security considerations.

### 5. Acknowledgements

The idea for this document was inspired by discussions between Peter Saint Andre, Simon Josefsson, and others on the Extensible Messaging and Presence Protocol (XMPP) mailing list.

We would also like to thank Michael D'Errico, Paul Hoffman, Nikos Mavrogiannopoulos, Tom Petch, Yngve Pettersen, Marsh Ray, Martin Rex, Yaron Sheffer, and Glen Zorn for their reviews and comments.

## 6. References

### 6.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [TLS1.0] Dierks, T. and C. Allen, "The TLS Protocol Version 1.0", [RFC 2246](#), January 1999.
- [TLS1.1] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.1", [RFC 4346](#), April 2006.
- [TLS1.2] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.2", [RFC 5246](#), August 2008.

### 6.2. Informative References

- [MD5] Rivest, R., "The MD5 Message-Digest Algorithm", [RFC 1321](#), April 1992.
- [SSL2] Hickman, Kipp, "The SSL Protocol", Netscape Communications Corp., Feb 9, 1995.
- [RFC6151] Turner, S. and L. Chen, "Updated Security Considerations for the MD5 Message-Digest and the HMAC-MD5 Algorithms", [RFC 6151](#), March 2011.

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