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**Prohibiting RC4 Cipher Suites**  
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Abstract

This document requires that Transport Layer Security (TLS) clients and servers never negotiate the use of RC4 cipher suites when they establish connections.

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## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">1.1.</a>	Requirements Language . . . . .	<a href="#">2</a>
<a href="#">2.</a>	Changes to TLS . . . . .	<a href="#">2</a>
<a href="#">3.</a>	Acknowledgements . . . . .	<a href="#">3</a>
<a href="#">4.</a>	IANA Considerations . . . . .	<a href="#">3</a>
<a href="#">5.</a>	Security Considerations . . . . .	<a href="#">3</a>
<a href="#">6.</a>	References . . . . .	<a href="#">3</a>
<a href="#">6.1.</a>	Normative References . . . . .	<a href="#">3</a>
<a href="#">6.2.</a>	Informative References . . . . .	<a href="#">3</a>
<a href="#">Appendix A.</a>	RC4 Cipher Suites . . . . .	<a href="#">4</a>
	Author's Address . . . . .	<a href="#">4</a>

## [1.](#) Introduction

RC4 is a stream cipher described in [\[SCH\]](#), which is widely supported, and often preferred, by TLS servers. However, RC4 has long been known to have a variety of cryptographic weaknesses, e.g. [\[PAU\]](#), [\[MAN\]](#), [\[FLU\]](#). Recent cryptanalysis results [\[ALF\]](#) exploit biases in the RC4 keystream to recover repeatedly encrypted plaintexts.

These recent results are on the verge of becoming practically exploitable; currently they require  $2^{26}$  sessions or  $13 \times 2^{30}$  encryptions. As a result, RC4 can no longer be seen as providing a sufficient level of security for TLS sessions.

This document requires that TLS ([\[RFC5246\]](#), [\[RFC4346\]](#), [\[RFC2246\]](#)) clients and servers never negotiate the use of RC4 cipher suites.

### [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 [\[RFC2119\]](#).

## [2.](#) Changes to TLS

Because of the deficiencies noted in [Section 1](#):

- o TLS clients MUST NOT include RC4 cipher suites in the ClientHello message.
- o TLS servers MUST NOT select an RC4 cipher suite when a TLS client sends such a cipher suite in the ClientHello message.



- o If the TLS client only offers RC4 cipher suites, the TLS server MUST terminate the handshake. The TLS server MAY send the `insufficient_security` fatal alert in this case.

[Appendix A](#) lists the RC4 cipher suites defined for TLS.

### **[3.](#) Acknowledgements**

This document was inspired by discussions with Magnus Nystrom, Eric Rescorla, Joseph Salowey, Yaron Sheffer, Nagendra Modadugu and others on the TLS mailing list.

### **[4.](#) IANA Considerations**

This memo includes no request to IANA.

### **[5.](#) Security Considerations**

This document helps maintain the security guarantees of the TLS protocol by prohibiting the use of the RC4-based cipher suites (listed in [Appendix A](#)), which do not provide a sufficiently high level of security.

### **[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.
- [RFC2246] Dierks, T. and C. Allen, "The TLS Protocol Version 1.0", [RFC 2246](#), January 1999.
- [RFC4346] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.1", [RFC 4346](#), April 2006.
- [RFC5246] Dierks, T. and E. Rescorla, "The Transport Layer Security (TLS) Protocol Version 1.2", [RFC 5246](#), August 2008.

#### **[6.2.](#) Informative References**

- [ALF] AlFardan, N., Bernstein, D., Paterson, K., Poettering, B., and J. Schuldt, "On the security of RC4 in TLS and WPA. USENIX Security Symposium.", 2013, <<https://www.usenix.org/conference/usenixsecurity13/security-rc4-tls>>.



- [FLU] Fluhrer, S., Mantin, I., and A. Shamir, "Weaknesses in the Key Scheduling Algorithm of RC4. Selected Areas in Cryptography, pp. 1-24", 2001.
- [MAN] Mantin, I. and A. Shamir, "A Practical Attack on Broadcast RC4. FSE, pp. 152-164.", 2001.
- [PAU] Paul, G. and S. Maitra, "Permutation after RC4 Key Scheduling Reveals the Secret Key. In Proceedings of the 14th Workshop on Selected Areas in Cryptography (SAC), pp. 360-377, vol. 4876, LNCS, Springer.", 2007.
- [SCH] Schneier, B., "Applied Cryptography: Protocols, Algorithms, and Source Code in C, 2nd ed.", 1996.

#### [Appendix A.](#) RC4 Cipher Suites

The following cipher suites defined for TLS use RC4:

- o TLS\_RSA\_WITH\_RC4\_128\_MD5
- o TLS\_RSA\_WITH\_RC4\_128\_SHA
- o TLS\_DH\_anon\_WITH\_RC4\_128\_MD5
- o TLS\_RSA\_EXPORT\_WITH\_RC4\_40\_MD5
- o TLS\_DH\_anon\_EXPORT\_WITH\_RC4\_40\_MD5

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