

TLS Working Group
Internet Draft
Intended status: Informational
Expires: August 2008

Mohamad Badra
LIMOS Laboratory
February 4, 2008

ECDHE_PSK Ciphersuites for Transport Layer Security (TLS)
draft-ietf-tls-ecdh-psk-00.txt

Status of this Memo

By submitting this Internet-Draft, each author represents that any applicable patent or other IPR claims of which he or she is aware have been or will be disclosed, and any of which he or she becomes aware will be disclosed, in accordance with [Section 6 of BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/lid-abstracts.txt>

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>

This Internet-Draft will expire on August 4, 2008.

Copyright Notice

Copyright (C) The IETF Trust (2008).

Abstract

This document extends [RFC 4279](#), [RFC 4492](#) and [RFC 4785](#), and specifies a set of ciphersuites that use a pre-shared key (PSK) to authenticate an Elliptic Curve Diffie-Hellman exchange (ECDH). These ciphersuites provide Perfect Forward Secrecy (PFS).

The reader is expected to become familiar with [RFC 4279](#), [RFC 4492](#), and [RFC 4785](#) prior to studying this document.

1. Introduction

[RFC 4279](#) specifies ciphersuites for supporting TLS using pre-shared symmetric keys and they (a) use only symmetric key operations for authentication, (b) use a Diffie-Hellman exchange authenticated with a pre-shared key, or (c) combines public key authentication of the server with pre-shared key authentication of the client.

[RFC 4785](#) specifies authentication-only ciphersuites (with no encryption). These ciphersuites are useful when authentication and integrity protection is desired, but confidentiality is not needed or not permitted.

[RFC 4492](#) defines a set of ECC-based ciphersuites for TLS and describes the use of ECC certificates for client authentication. In particular, it specifies the use of Elliptic Curve Diffie-Hellman (ECDH) key agreement in a TLS handshake and the use of Elliptic Curve Digital Signature Algorithm (ECDSA) as a new authentication mechanism.

This document specifies a set of ciphersuites that use a PSK to authenticate an ECDH exchange. These ciphersuites provide Perfect Forward Secrecy. One of these ciphersuite provides authentication-only.

1.1. Conventions used in this document

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. ECDHE_PSK Key Exchange Algorithm

The ciphersuites in this section match the ciphersuites defined in [\[RFC4279\]](#), except that they use an Elliptic Curve Diffie-Hellman exchange [\[RFC4492\]](#) authenticated with a PSK. They are defined as follow:

CipherSuite	Key Exchange	Cipher	Hash
-------------	--------------	--------	------

TLS_ECDHE_PSK_WITH_RC4_128_SHA	ECDHE_PSK	RC4_128	SHA
TLS_ECDHE_PSK_WITH_3DES_EDE_CBC_SHA	ECDHE_PSK	3DES_EDE_CBC	SHA
TLS_ECDHE_PSK_WITH_AES_128_CBC_SHA	ECDHE_PSK	AES_128_CBC	SHA
TLS_ECDHE_PSK_WITH_AES_256_CBC_SHA	ECDHE_PSK	AES_256_CBC	SHA

Badra

Expires August 4, 2008

[Page 2]

Internet-Draft

ECDHE_PSK Ciphersuites for TLS

February 2008

When the ciphersuites defined in this document are used, the 'ec_diffie_hellman_psk' case inside the ServerKeyExchange and ClientKeyExchange structure MUST be used instead of the 'psk' case defined in [\[RFC4279\]](#) (i.e., the ServerKeyExchange and ClientKeyExchange messages include the Diffie-Hellman parameters). The PSK identity and identity hint fields have the same meaning specified in [\[RFC4279\]](#) (note that the ServerKeyExchange message is always sent, even if no PSK identity hint is provided).

The format of the ServerKeyExchange and ClientKeyExchange messages is shown below.

```

struct {
    select (KeyExchangeAlgorithm) {
        /* other cases for rsa, diffie_hellman, etc. */
        case ec_diffie_hellman_psk: /* NEW */
            opaque psk_identity_hint<0..2^16-1>;
            ServerECDHParams params;
    };
} ServerKeyExchange;

struct {
    select (KeyExchangeAlgorithm) {
        /* other cases for rsa, diffie_hellman, etc. */
        case ec_diffie_hellman_psk: /* NEW */
            opaque psk_identity<0..2^16-1>;
            ClientECDiffieHellmanPublic public;
    } exchange_keys;
} ClientKeyExchange;
```

The premaster secret is formed as follows. First, perform an ECDH operation (See [section 5.10 of \[RFC4492\]](#)) to compute the shared secret. Next, concatenate a uint16 containing the length of the shared secret (in octets), the shared secret itself, a uint16 containing the length of the PSK (in octets), and the PSK itself.

This corresponds to the general structure for the premaster secrets (see Note 1 in [Section 2 of \[RFC4279\]](#)), with "other_secret"

containing the shared secret:

```
struct {  
    opaque other_secret<0..2^16-1>;  
    opaque psk<0..2^16-1>;  
};
```

[3.](#) ECDHE_PSK Key Exchange Algorithm with NULL Encryption

The ciphersuite in this section matches the ciphersuites defined in [section 2](#), except that we define a suite with null encryption.

CipherSuite	Key Exchange	Cipher	Hash
TLS_ECDHE_PSK_WITH_NULL_SHA	ECDHE_PSK	NULL	SHA

[4.](#) Security Considerations

The security considerations described throughout [\[RFC4279\]](#), [\[RFC4346\]](#), [\[RFC4492\]](#), and [\[RFC4785\]](#) apply here as well.

[5.](#) IANA Considerations

This document defines the following new ciphersuites, whose values are to be assigned from the TLS Cipher Suite registry defined in [\[RFC4346\]](#).

```
CipherSuite TLS_ECDHE_PSK_WITH_RC4_128_SHA = { 0xXX, 0xXX };  
CipherSuite TLS_ECDHE_PSK_WITH_3DES_EDE_CBC_SHA = { 0xXX, 0xXX };  
CipherSuite TLS_ECDHE_PSK_WITH_AES_128_CBC_SHA = { 0xXX, 0xXX };  
CipherSuite TLS_ECDHE_PSK_WITH_AES_256_CBC_SHA = { 0xXX, 0xXX };  
CipherSuite TLS_ECDHE_PSK_WITH_NULL_SHA = { 0xXX, 0xXX };
```

[6.](#) Acknowledgments

The author would like to thank Bodo Moeller, Simon Josefsson, Uri Blumenthal, Pasi Eronen, Alfred Hoenes, and the TLS mailing list members for their comments on the document.

[7. References](#)

[7.1. Normative References](#)

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC4279] Eronen, P. and H. Tschofenig, "Pre-Shared Key Ciphersuites for Transport Layer Security (TLS)", [RFC 4279](#), December 2005.
- [RFC4346] Dierks, T., Rescorla, E., "The TLS Protocol Version 1.1", [RFC 4346](#), April 2006.

Badra

Expires August 4, 2008

[Page 4]

Internet-Draft

ECDHE_PSK Ciphersuites for TLS

February 2008

- [RFC4492] Blake-Wilson, S., Bolyard, N., Gupta, V., Hawk, C., Moeller, B., "Elliptic Curve Cryptography (ECC) Cipher Suites for Transport Layer Security (TLS)", [RFC 4492](#), May 2006.
- [RFC4785] Blumenthal, U., Goel, P., "Pre-Shared Key (PSK) Ciphersuites with NULL Encryption for Transport Layer Security (TLS)", [RFC 4785](#), January 2007.

Author's Addresses

Mohamad Badra
LIMOS Laboratory - UMR6158, CNRS
France

Email: badra@isima.fr

Intellectual Property Statement

The IETF takes no position regarding the validity or scope of any Intellectual Property Rights or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; nor does it represent that it has made any independent effort to identify any such rights. Information on the procedures with respect to rights in RFC documents can be found in [BCP 78](#) and [BCP 79](#).

Copies of IPR disclosures made to the IETF Secretariat and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF on-line IPR repository at <http://www.ietf.org/ipr>.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this standard. Please address the information to the IETF at ietf-ipr@ietf.org.

Disclaimer of Validity

This document and the information contained herein are provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY, THE IETF TRUST AND

Badra

Expires August 4, 2008

[Page 5]

Internet-Draft

ECDHE_PSK Ciphersuites for TLS

February 2008

THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Copyright Statement

Copyright (C) The IETF Trust (2008).

This document is subject to the rights, licenses and restrictions contained in [BCP 78](#), and except as set forth therein, the authors retain all their rights.

Acknowledgment

Funding for the RFC Editor function is currently provided by the Internet Society.

Badra

Expires August 4, 2008

[Page 6]