

**Transport Layer Security (TLS) Partial Encryption Mode**  
**draft-rescorla-tls-partial-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/1id-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 29, 2006.

Copyright Notice

Copyright (C) The Internet Society (2006).

Abstract

This document describes an extension to TLS to allow partial encryption of record bodies. This allows the beginning of the record body to be in the clear, thus facilitating debugging and header compression.

## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">3</a>
<a href="#">2.</a>	Conventions Used In This Document . . . . .	<a href="#">3</a>
<a href="#">3.</a>	Negotiating the Partial Encryption Extension . . . . .	<a href="#">3</a>
<a href="#">4.</a>	Record Processing . . . . .	<a href="#">3</a>
<a href="#">4.1.</a>	Record Transmission . . . . .	<a href="#">4</a>
<a href="#">4.2.</a>	Record Reception . . . . .	<a href="#">4</a>
<a href="#">5.</a>	Security Considerations . . . . .	<a href="#">4</a>
<a href="#">6.</a>	IANA Considerations . . . . .	<a href="#">5</a>
<a href="#">7.</a>	Normative References . . . . .	<a href="#">5</a>
	Author's Address . . . . .	<a href="#">6</a>
	Intellectual Property and Copyright Statements . . . . .	<a href="#">7</a>



## **1. Introduction**

Encryption in Transport Layer Security (TLS) [[2](#)] is currently an all-or-nothing proposition. The choices are a cipher suite that has encryption or one of the NULL cipher suites which offer no encryption. This has disadvantages in settings where the application layer itself has some data (such as a header) that it wishes to have in the clear (e.g., for debugging purposes) and some data (such as a payload) that it wishes to have encrypted. This document describes an extension to TLS that allows for the initial portion of the record to remain uncompressed and unencrypted.

## **2. 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 [[1](#)].

## **3. Negotiating the Partial Encryption Extension**

The client requests support for the partial encryption feature by sending the "partial\_encryption" extension in its ClientHello. The "extension\_data" field contains a PartialEncryption field:

```
struct {  
    uint16 InitialClearBytes;  
} PartialEncryption
```

The InitialClearBytes value contains the number of bytes which will be in the clear for each application\_data record. This value will obtain for the entire life of this association.

The server indicates support for the partial encryption feature sending a "partial\_encryption" extension with an empty "extension\_data" field. This indicates its acceptance of the extension and of the the number of bytes to be sent in the clear. If the server does not support the extension or does not accept the InitialClearBytes value, it MUST ignore the extension. The first application\_data record in the new association (after the change\_cipher\_spec message) MUST use the new encryption mode as described below.

## **4. Record Processing**

The partial encryption extension only matters for records of type



"application\_data". All other records should be processed via the usual TLS/DTLS rules.

#### **4.1. Record Transmission**

When the partial encryption extension is in effect, the `TLSCiphertext.fragment` struct becomes:

```
select (CipherSpec.cipher_type) {
    opaque plaintext_bytes[InitialClearBytes]; // New field

    case stream: GenericStreamCipher;
    case block:  GenericBlockCipher;
} fragment;
```

The first `InitialClearBytes` bytes of the `TLSPplaintext.fragment` are inserted in the `TLSCiphertext.plaintext_bytes` value. The rest are passed through compression and encryption to form the `GenericStreamCipher` or `GenericBlockCipher` values. If the `TLSPplaintext.fragment` is less than `InitialClearBytes` then the entire plaintext is left un-encrypted. The same processing applies to DTLS [4].

The TLS MAC remains unchanged and is applied to both the `plaintext_bytes` and the `TLSCiphertext.fragment`. Where length is computed as `InitialClearBytes + TLSCiphertext.length`.

#### **4.2. Record Reception**

Record reception is relatively simple. The receiver knows whether the `partial_plaintext` extension is in effect and simply treats the first `InitialClearBytes` of what would otherwise be the ciphertext as plaintext. After those bytes are removed, the rest of the record can be processed as usual.

### **5. Security Considerations**

There are two security concerns introduced by these extensions. The first involves the security of the negotiation and the second the security of the transport protocol. Because the negotiation is protected by the TLS/DTLS handshake, attackers can neither force the use of these extensions nor block them while allowing the negotiation to succeed.

The second concern is the security of the data. Obviously, no confidentiality is provided for any data in the initial plaintext. However, because the length of the initial plaintext is fixed in the



negotiation and the MAC covers the total length, an active attacker cannot convince the receiver to accept values which are encrypted as if they were plaintext or vice versa.

One concern that applies solely to DTLS is that an active attacker might manipulate MTU values to attempt to force the sender to split data across multiple records and thus have some application layer data which would otherwise be encrypted sent in the clear. DTLS itself does not do any fragmentation and applications which use this extension MUST NOT fragment the data that they send to DTLS in such a way that sensitive data could be transmitted unencrypted.

## **6. IANA Considerations**

This document defines an extension to TLS, in accordance with [3]:

```
enum { partial_encryption (??) } ExtensionType;
```

[[ NOTE: These values need to be assigned by IANA ]]

## **7. Normative References**

- [1] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [2] Dierks, T. and E. Rescorla, "The TLS Protocol Version 1.1", [draft-ietf-tls-rfc2246-bis-13](#) (work in progress), June 2005.
- [3] Blake-Wilson, S., "Transport Layer Security (TLS) Extensions", [draft-ietf-tls-rfc3546bis-02](#) (work in progress), October 2005.
- [4] Rescorla, E. and N. Modadugu, "Datagram Transport Layer Security", [draft-rescorla-dtls-05](#) (work in progress), June 2005.



Author's Address

Eric Rescorla  
Network Resonance  
2483 E. Bayshore Rd., #212  
Palo Alto, CA 94303  
USA

Email: [ekr@networkresonance.com](mailto:ekr@networkresonance.com)

## 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](mailto: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 AND 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 Internet Society (2006). 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.

