Datagram Transport Layer Security for Stream Control Transmission Protocol
draft-tuexen-dtls-for-sctp-01.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 April 25, 2007.

Copyright Notice

Copyright (C) The Internet Society (2006).

Abstract

This document describes the usage of the Datagram Transport Layer Security (DTLS) protocol over the Stream Control Transmission Protocol (SCTP).
The user of DTLS over SCTP can take advantage of all features provided by SCTP and its extensions, especially support of

- multiple streams to avoid head of line blocking.
- multi-homing to provide network level fault tolerance.
- unordered delivery.
- partial reliable data transfer.

Table of Contents

1. Introduction ......................................................... 3
2. Conventions .............................................................. 4
3. DTLS considerations ..................................................... 4
4. SCTP considerations ..................................................... 5
5. IANA Considerations ................................................... 5
6. Security Considerations ............................................... 5
7. Normative References .................................................. 6
Authors' Addresses ....................................................... 6
Intellectual Property and Copyright Statements ....................... 8
1. Introduction

1.1. Overview

This document describes the usage of the Datagram Transport Layer Security (DTLS) protocol, as defined in RFC DTLS [8], over the Stream Control Transmission Protocol (SCTP), as defined in RFC2960 [4] and RFC3309 [5].

TLS is designed to run on top of a byte-stream oriented transport protocol providing a reliable, in-sequence delivery. Thus, TLS is currently mainly being used on top of the Transmission Control Protocol (TCP), as defined in RFC0793 [1].

TLS over SCTP as described in RFC3436 [6] has some serious limitations:

- It does not support the unordered delivery of SCTP user messages.
- It does not support partial reliability as defined in RFC3758 [7].
- It only supports the usage of the same number of streams in both directions.
- It uses a TLS connection for every bidirectional stream, which requires a substantial amount of resources and message exchanges if a large number of streams is used.

DTLS over SCTP as described in this document overcomes these limitations of TLS over SCTP. The user of DTLS over SCTP can use all services provided by SCTP and its partial reliability extension. The dynamic modification of the IP-addresses used by the SCTP endpoints is also supported.

The method described in this document requires that the SCTP implementation supports the optional feature of fragmentation of SCTP user messages and the SCTP authentication extension defined in SCTP-AUTH [9].

1.2. Terminology

This document uses the following terms:

Association: An SCTP association.
Connection: A TLS connection.

Session: A TLS session.

Stream: A unidirectional stream of an SCTP association. It is uniquely identified by a stream identifier.

1.3. Abbreviations

DTLS: Datagram Transport Layer Security

MTU: Maximum Transmission Unit

SCTP: Stream Control Transmission Protocol

TCP: Transmission Control Protocol

TLS: Transport Layer Security

2. Conventions

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, NOT RECOMMENDED, MAY, and OPTIONAL, when they appear in this document, are to be interpreted as described in RFC2119 [2].

3. DTLS considerations

3.1. Message fragmentation

The DTLS layer MUST NOT perform message fragmentation. The SCTP layer will perform this task. Thus the supported maximum length of SCTP user messages MUST be at least $2^{14} + 2048 + 5 = 18437$ bytes. Every DTLS message MUST be handled as one user message for SCTP.

3.2. Message sizes

DTLS imposes an limit in the user message size. This limit applies also to DTLS/SCTP.

3.3. Replay detection

Replay detection of DTLS MUST not be used.
3.4. Changing of Cipher Specs

Whenever Cipher Specs are changed a new shared secret MUST be derived from the master secret and used for SCTP-AUTH. The shared key identifier used by SCTP-AUTH MUST be incremented.

4. SCTP considerations

4.1. Stream usage

All DTLS control messages MUST be transported on stream 0 with unlimited reliability and with the ordered delivery feature.

User data messages MAY be transported over stream 0 but users SHOULD use other streams for better performance.

4.2. Chunk handling

The DATA, SACK and FORWARD-TSN chunks of SCTP MUST be sent in an authenticated way as described in SCTP-AUTH [9]. Other chunks MAY be sent in an authenticated way.

This makes sure that an attacker cannot modify the stream a message is sent in or affect the ordered/unordered delivery of the message. It is also not possible for an attacker to drop messages and use forged FORWARD-TSN and SACK chunks to hide this dropping.

4.3. Handling of endpoint-pair shared secrets

The endpoint-pair shared secret for Shared Key Identifier 0 is empty. After DTLS cipher specs are changed, a 64 byte shared secret is derived from the master secret and used as the new end-point pair shared secret. The shared Key identifier MUST be incremented by 1. If it is 65535, the next value MUST be 1. The next version of the ID will specify how the shared secret is derived from the master secret.

5. IANA Considerations

This document does not require any actions from IANA.

6. Security Considerations

This section is not complete yet.
7. Normative References


Authors’ Addresses

Michael Tuexen
Muenster Univ. of Applied Sciences
Stegerwaldstr. 39
48565 Steinfurt
Germany

Email: tuexen@fh-muenster.de

Carsten Hohendorf
University of Duisburg-Essen
Ellernstrasse 29
Essen, SC 45326
Germany

Email: hohend@iem.uni-due.de

Eric Rescorla
RTFM, Inc.
2064 Edgewood Drive
Palo Alto, CA 94303
USA

Phone: +1 650-320-8549
Email: ekr@rtfm.com