

June 2019

Expires: December 2019

Identity Modules for CoAP
draft-urien-core-identity-module-coap-06.txt

Abstract

This document defines identity modules based on Secure Elements processing DTLS/TLS stacks for CoAP devices. The expected benefits of these secure microcontrollers are the following :

- Secure storage of pre-share keys or private keys
- Trusted simple or mutual authentication between CoAP devices and CoAP clients.
- The device identity is enforced by a non cloneable chip.
- Trusted cryptographic support.
- Low power consumption for DTLS/TLS processing.

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 [RFC 2119](#).

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

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."

This Internet-Draft will expire on December 2019.

.

Copyright Notice

Copyright (c) 2019 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the [Trust Legal Provisions](#) and are provided without warranty as described in the Simplified BSD License.

Table of Contents

| | |
|---|-------------------|
| Abstract..... | 1 |
| Requirements Language..... | 1 |
| Status of this Memo..... | 1 |
| Copyright Notice..... | 2 |
| 1 Overview..... | 4 |
| 2 What is a Secure Element..... | 4 |
| 3 Identity Module for CoAP..... | 6 |
| 4 DTLS/TLS profile for CoAP security modules..... | 6 |
| 5 IANA Considerations..... | 6 |
| 6 References..... | 7 |
| 6.1 Normative References..... | 7 |
| 6.2 Informative References..... | 7 |
| 7 Authors' Addresses..... | 7 |

1 Overview

The CoAP [[RFC7252](#)] protocol MAY be secured by the DTLS protocol [[DTLS](#)] over an UDP/IP stack; the TLS support [[TLS](#)] is defined by [[RFC8323](#)] over a TCP/IP stack.

According to [[RFC7252](#)] four security modes are available, NoSec, PreSharedKey, RawPublicKey, and Certificate. When DTLS is used with the PreShareKey or Certificate modes there is a need to store secrets such as symmetric or asymmetric keys, which authenticate the CoAP device.

In that case a Secure Element (SE) MAY be used in order to fully run the DTLS or TLS protocol. According to the data throughput or other security considerations the DTLS/TLS session MAY be exported from the secure element after the exchange of the finished messages.

This class of Secure Element is referred by this draft as an identity module (IdMod).

The expected benefits of identity modules are the following :

- Secure storage of pre-share keys or private keys
- Trusted simple or mutual authentication between the CoAP device and the CoAP client.
- The device identity is enforced by a non cloneable identity module.
- Trusted cryptographic support.
- Low power consumption for DTLS/TLS processing.

2 What is a Secure Element

A Secure Element (SE) is a tamper resistant microcontroller (see figure 1) equipped with host interfaces such as [[ISO7816](#)], SPI (Serial Peripheral Interface) or I2C (Inter Integrated Circuit).

The typical area size of these electronic chips is about 5x5 mm². They comprise CPU (8, 16, 32 bits), ROM (a few hundred KB), non volatile memory (EEPROM, FLASH, a few hundred KB) and RAM (a few ten KB). Security is enforced by multiple hardware and logical countermeasures.

According to the [[EUROSMART](#)] association height billion of such secure devices were shipped in 2013. Secure elements are widely deployed for electronic payment (EMV cards), telecommunication (SIM modules), identity (electronic passports), ticketing, and access control (PKCS15 cards).

Most of secure elements include a Java Virtual Machine (JVM) and therefore are able to execute embedded program written in the

JAVACARD language. Because these devices are dedicated to security

Urien

Expires December 2019

[Page 4]

purposes they support numerous cryptographic resources such as digest functions (MD5, SHA1, SHA2...), symmetric cipher (3xDES, AES) or asymmetric procedures (RSA, ECC).

A set of Global Platform [GP] standards control the lifecycle of embedded software, i.e. application downloading, activation and deletion.

As an illustration a typical low cost Secure Element has the following characteristics:

- JAVACARD operating system;
- Compliant with the GP (Global Platform) standards;
- 160 KB of ROM;
- 72 KB of EEPROM;
- 4KB of RAM;
- Embedded crypto-processor;
- 3xDES, AES, RSA, ECC;
- Certification according to Common Criteria (CC) EAL5+ level;
- Security Certificates from payment operators.

According to the state of art, TLS/DTLS stacks may run in secure elements, for example written as a javacard applications.

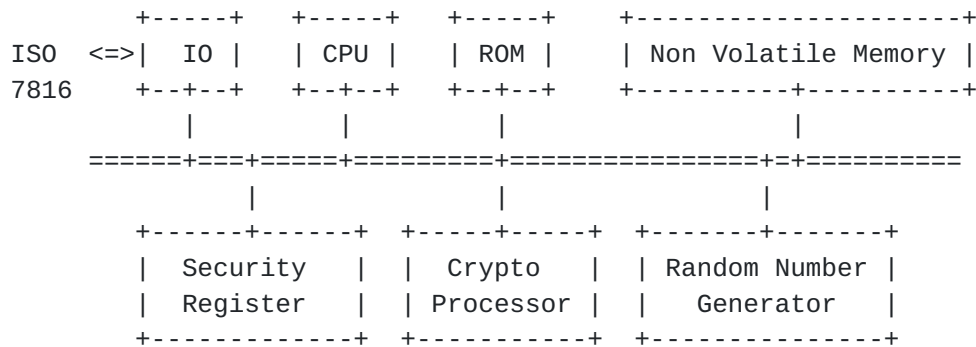


Figure 1. A typical hardware architecture of a Secure Element

3 Identity Module for CoAP

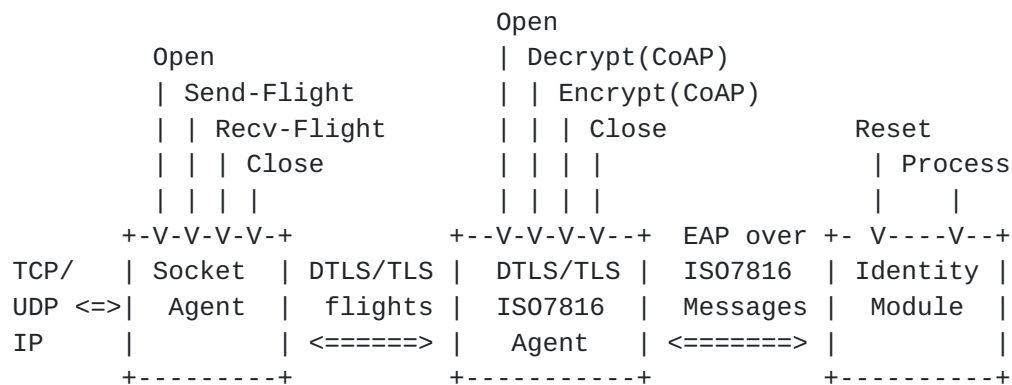


Figure 2. CoAP Identity module framework

IS07816 interface for Secure Elements providing TLS/DTLS stacks are detailed in [DTLS/TLS-SM]. The Identity module MUST support two commands Reset and Process.

TLS/DTLS packets are transported by the EAP protocol over IS07816 messages. This mechanism previously detailed by [EAPSC] provides a double segmentation procedure thanks to EAP and IS07816 facilities.

A DTLS/TLS-IS07816 software agent sends and receives DTLS/TLS flights to/from sockets over EAP/IS07816 messages to/from the identity module. Conceptually this component interface SHOULD have four procedures Open, Close, Encrypt and Decrypt.

A socket software agent extracts and send DTLS/TLS flights from/to UDP/TCP packets. Conceptually this component interface SHOULD have four procedures Open, Close, Recv-Flight, Send-Flight.

4 DTLS/TLS profile for CoAP security modules

To be done.

5 IANA Considerations

This draft does not require any action from IANA.

6 References

6.1 Normative References

[TLS] Dierks, T., Rescorla, E., "The Transport Layer Security (TLS) Protocol Version 1.1", [RFC 5746](#), August 2008

[DTLS] Rescorla, E. and N. Modadugu, "Datagram Transport Layer Security Version 1.2", [RFC 6347](#), January 2012.

[RFC7252] Shelby, Z., Hartke, K., and C. Bormann, "The Constrained Application Protocol (CoAP)", [RFC 7252](#), June 2014.

[RFC8323] CoAP (Constrained Application Protocol) over TCP, TLS, and WebSockets, February 2018.

[ISO7816] ISO 7816, "Cards Identification - Integrated Circuit Cards with Contacts", The International Organization for Standardization (ISO).

6.2 Informative References

[GP] Global Platform Standards, <http://www.globalplatform.org>

[EUROSMART] The EUROSMART association, <http://www.eurosmart.com>

[DTLS/TLS-SM] Urien, P., "TLS and DTLS Security Modules", [draft-urien-uta-tls-dtls-security-module-08.txt](#), June 2019

[EAPSC] Urien, P., "EAP Support in Smartcard", [draft-urien-eap-smartcard-37.txt](#), June 2019

7 Authors' Addresses

Pascal Urien
Telecom ParisTech
23 avenue d'Italie
75013 Paris
France

Phone: NA
Email: Pascal.Urien@telecom-paristech.fr

