# ETSI TS 103 096-3 V1.2.1 (2015-09)

**TECHNICAL SPECIFICATION**

## Intelligent Transport Systems (ITS);
## Testing;
## Conformance test specifications for ITS Security;
## Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)

Reference

RTS/ITS-00530

Keywords

ATS, ITS, testing, security

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# Contents

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# Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 3 of a multi-part deliverable covering Conformance test specification for ITS Security as identified below:

Part 1:     "Protocol Implementation Conformance Statement (PICS)";

Part 2:     "Test Suite Structure and Test Purposes (TSS & TP)";

**Part 3:     "Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".**

# Modal verbs terminology

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# 1        Scope

The present document provides parts of the Abstract Test Suite (ATS) for Security as defined in ETSI TS 103 097 [1] in accordance with the relevant guidance given in ISO/IEC 9646-7 [10]. The objective of the present document is to provide a basis for conformance tests for security communication over GeoNetworking equipment giving a high probability of interoperability between different manufacturers' equipment.

The ISO standard for the methodology of conformance testing (ISO/IEC 9646-1 [7] and ISO/IEC 9646-2 [8]) as well as the ETSI rules for conformance testing (ETSI ETS 300 406 [11]) are used as a basis for the test methodology.

# 2        References

## 2.1      Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE:      While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1]        ETSI TS 103 097 (V1.2.1): "Intelligent Transport Systems (ITS); Security; Security header and certificate formats".

[2]        ETSI TS 102 871-2 (V1.3.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 2: Test Suite Structure and Test Purposes (TSS & TP)".

[3]        ETSI TS 102 871-3 (V1.3.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)".

[4]        ETSI TS 103 096-1 (V1.2.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for ITS Security; Part 1: Protocol Implementation Conformance Statement (PICS)".

[5]        ETSI TS 103 096-2 (V1.2.1): "Intelligent Transport Systems (ITS); Testing; Conformance test specifications for ITS Security; Part 2: Test Suite Structure and Test Purposes (TSS & TP)".

[6]        ETSI TR 103 099 (V1.3.1): "Intelligent Transport Systems (ITS); Architecture of conformance validation framework".

[7]        ISO/IEC 9646-1 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework - Part 1: General concepts".

[8]        ISO/IEC 9646-2 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".

[9]        ISO/IEC 9646-6 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 6: Protocol profile test specification".

[10]       ISO/IEC 9646-7 (1995): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

[11]             ETSI ETS 300 406 (1995): "Methods for testing and Specification (MTS); Protocol and profile
                 conformance testing specifications; Standardization methodology".

[12]             OpenSSL Project Toolkit Library V1.0.1j.

NOTE:       Available at www.openssl.org.

[13]             ETSI ES 201 873-1: "Methods for Testing and Specification (MTS); The Testing and Test Control
                 Notation version 3; Part 1: TTCN-3 Core Language".

## 2.2      Informative references

References are either specific (identified by date of publication and/or edition number or version number) or
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reference document (including any amendments) applies.

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              their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the
user with regard to a particular subject area.

[i.1]            ETSI EG 202 798: "Intelligent Transport Systems (ITS); Testing; Framework for conformance and
                 interoperability testing".

# 3          Definitions and abbreviations

## 3.1      Definitions

For the purposes of the present document, the terms given in ETSI TS 103 097 [1], ETSI TS 102 871-2 [2],
ETSI TS 102 871-3 [3], ISO/IEC 9646-6 [9] and ISO/IEC 9646-7 [10] apply.

## 3.2      Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| AA | Authorization Authority |
| AID | Application ID |
| ASP | Abstract Service Primitive |
| AT | Authorization Ticket |
| ATM | Abstract Test Method |
| ATS | Abstract Test Suite |
| BO | Inopportune Behaviour tests |
| BTP | Basic Transport Protocol |
| BV | Valid Behaviour tests |
| CAM | Cooperative Awareness Message |
| CERT | CERTificate testing |
| DEN | Decentralized Environmental Notification |
| DENM | Decentralized Environmental Notification Message |
| EN | European Norm |
| ES | ETSI Standard |
| GENMSG | GENeric MeSsaGes |
| GN | GeoNetworking |
| HSM | Hardware Security Module |
| HTML | HyperText Markup Language |
| ISO | International Organization for Standardization |
| ITS | Intelligent Transport System |
| ITSS | ITS-S data transfer |
| ITS-S | ITS Station |
| IUT | Implementation Under Test |
| MSG | Generic messages |

| | |
|---|---|
| NB | Normal Behaviour |
| PCTR | Protocol Conformance Testing Report |
| PEM | Privacy Enhanced Mail |

NOTE: Standard format for OpenSSL.

| | |
|---|---|
| PICS | Protocol Implementation Conformance Statement |
| PIXIT | Partial Protocol Implementation eXtra Information for Testing |
| PKI | Public Key Infrastructure |
| PX | PiXit |
| RCV | ReCeiVing behaviour |
| SAP | Service Access Point |
| SCS | System Conformance Statement |
| SCTR | Static Conformance Test Report |
| SEC | SECurity |
| SND | SeNDing behaviour |
| SSP | Service Specific Permissions |
| SUT | System Under Test |
| TC | Test Case |
| TP | Test Purposes |
| TR | Technical Report |
| TS | Test System |
| TSS | Test Suite Structure |
| TTCN | Testing and Test Control Notation |
| UT | Upper Tester |
| XML | Extensible Markup Language |

# 4 Contents of the ITS Security Test Suite

The ITS Security test suite contains:

- test implemented in TTCN-3 code

- certificate profiles and certificate generation tool

To execute the ITS Security Test Suite a Test Adapter implementation and a TTCN-3 compiler is required. The reference Test Adapter implementation can be found at http://forge.etsi.org. TTCN-3 compilers can be acquired at http://www.ttcn-3.org.

# 5 Abstract Test Method

## 5.1 Introduction

This clause describes the ATM used to test the ITS-Security framework.

## 5.2 Abstract protocol tester

The abstract protocol tester used by the ITS-Security test suite is described in figure 1. The Test System simulates valid and invalid protocol behaviour, and analyses the reaction of the IUT.
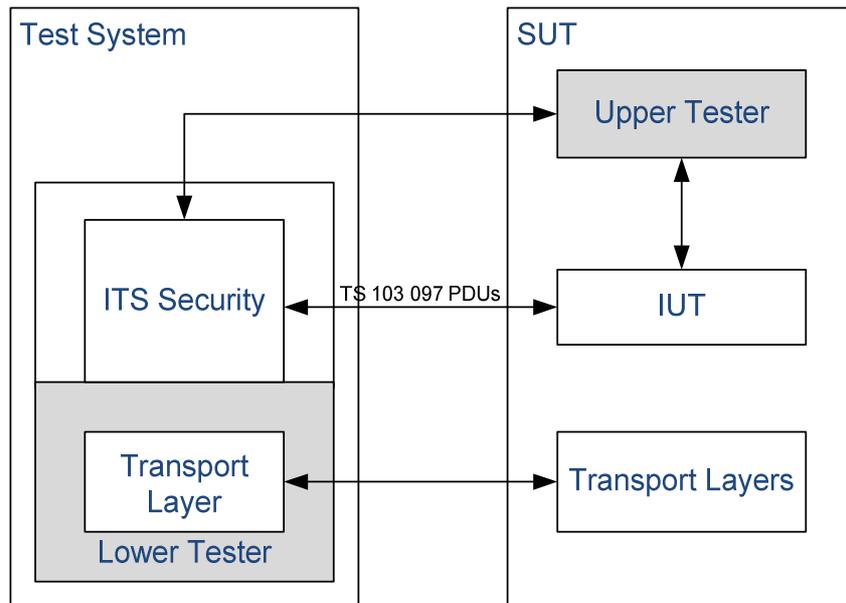
**Figure 1: Abstract protocol tester - Security**

# 5.3 Test Configuration

## 5.3.1 Introduction

This test suite uses test configurations defined in ETSI TS 102 871-3 [3], i.e. the tester simulates the ITS station implementing the ITS Security framework over GeoNetworking protocol.

## 5.3.2 PKI infrastructure

### 5.3.2.1 Overview

Before executing tests:

- security certificates need to be generated, see clause 5.3.2.5;

- security certificates need to be installed onto the IUT, see clause 5.3.2.6;

- and some Test System settings need to be configured, see clause 5.3.2.3.

### 5.3.2.2 PKI certificate hierarchy

The required PKI certificate hierarchy of the test infrastructure is presented in figure 2.
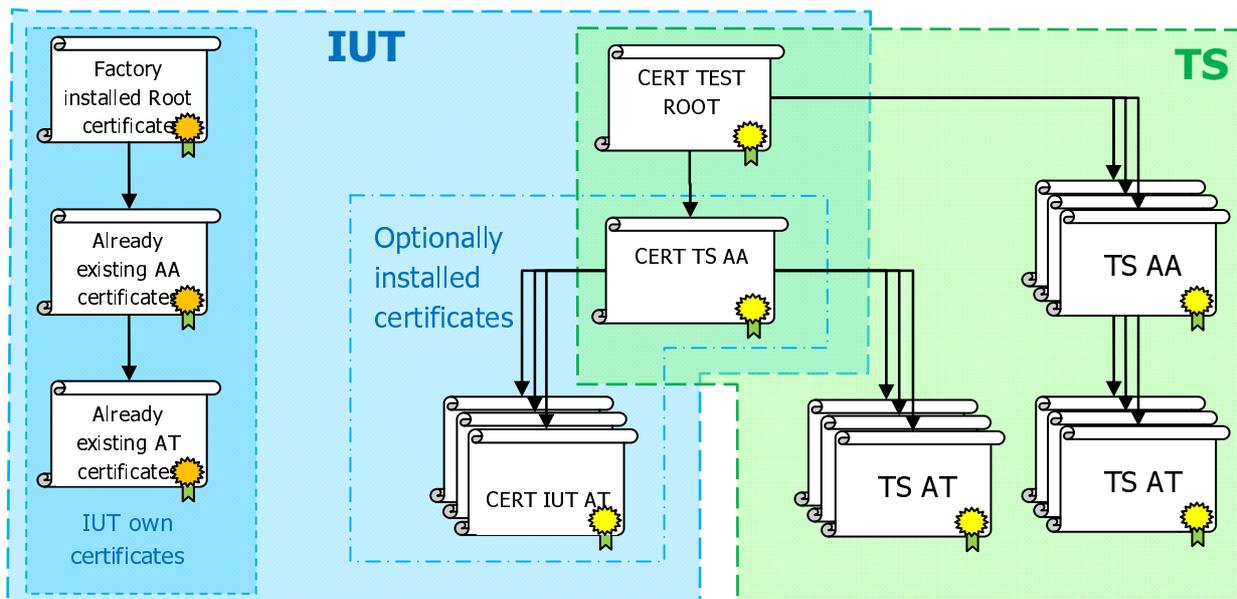
**Figure 2: Required PKI certificate hierarchy**

The following certificates are required for the test execution:

1)    The custom user-generated root certificate, referred as CERT_TEST_ROOT, is used to sign all AA certificates used by the Test System and by the IUT to verify the Test System certificates. For the generation procedure see clause 7.1.4. The IUT shall install this CERT_TEST_ROOT certificate and consider it as trusted. In the case where the IUT cannot install the CERT_TEST_ROOT, no tests can be executed.

2)    Further certificates to be installed on the IUT:

-    Option 1: Certificates (CERT_TS_AA and the set of CERT_IUT_AT) can be installed onto the IUT. Please refer to clause 5.3.2.6 for further details on certificate installation.

     If the IUT supports certificate selection using the UtInitialize Upper Tester command, than all mandatory tests can be executed and PICS_CERTIFICATE_SELECTION shall be set to true.

-    Option 2: The IUT can only use its own pre-installed certificates. In this case only a subset of mandatory tests can be executed and PICS_CERTIFICATE_SELECTION shall be set to false.

In both cases it is necessary to copy these certificates or just their digests to the subfolder of the location defined in PX_CERTIFICATE_POOL_PATH. The name of the subfolder shall be provided in PX_IUT_SEC_CONFIG_NAME. Certificate digests can be stored within a file; each file shall have the same name as the corresponding certificate (CERT_IUT_x_AT) and the 'dgs' extension.

It is not necessary to install IUT_ROOT and AA certificates onto the Test System when IUT and TS are using different PKIs. The TS trusts any root and AA certificate from IUT.

A set of certificates and private keys to be used on the Test System side to sign various messages and other Test System certificates. These files are generated by the generation script (see clause 5.3.2.5).

All certificates, private keys and digest shall be stored as a hexadecimal streams.

The TS selects certificate using its file name. Table 1 describes file extensions to be used to store certificates, private keys and digests.

**Table 1: PKI file extensions**

| File extension | File role |
|---|---|
| .crt | Certificate |
| .vkey | Verification private key |
| .ekey | Encryption private key |
| .dgs | Digest of certificate (16 bytes) |

Each Authorization Authority certificate contains:

- Start and End time

- Assurance level

- Permissions (AID list)

- Geographical Validity Restriction

Each Authorization Ticket certificate contains:

- Start and End time

- Assurance level

- Permissions (AID SSP list)

- Geographical Validity Restriction

### 5.3.2.3    Test system settings

#### 5.3.2.3.1    Test adapter settings

A reference Test Adapter has been developed and validated on the TTCN-3 runtime environments as listed in table 2 and can be downloaded at http://forge.etsi.org/.

**Table 2: TTCN-3 Tool Test Adapter Location**

| TTCN-3 Tool | Location |
|---|---|
| TTworkbench | taconfig.xml |
| TestCastT3 | org.etsi.its.tool.elvior.res.ta.properties |

The relevant Test adapter parameters for the Test System security support are listed in table 3.

**Table 3: TTCN-3 Tool Test Adapter Parameters**

| Parameter | Role | Default value |
|---|---|---|
| TsSecuredMode | Shall be set to FALSE to be able to test security envelope on TTCN-3 level | false |
| TsSecuredPath | Secured root path to access certificate files | "data/certificates" |
| TsSecuredConfiId | Vendor specific configuration identifier. This should be actually a name of the subfolder inside the TsSecuredPath, containing the IUT certificates or digests, e.g. "data/certificates/vendorA" | vendorA |

#### 5.3.2.3.2    Test Suite Parameters

Most of test parameters are the same as for GeoNetworking test suite and described in ETSI TS 102 871-3 [3]. Additional security-related parameters and some important GN parameters, PICS and PIXITS, are described in tables 4 and 5 respectively.

**Table 4: PICS Parameters**

| Parameter | Reference | Role | Default value |
|---|---|---|---|
| PICS_GN_SECURITY | ETSI TS 102 871-2 [2], A.32/12 | Shall be set to true to be able to execute security tests | false |
| PICS_CERTIFICATE_SELECTION | ETSI TS 103 096-2 [5], clause 5.1.5, T3/2 | Certificate selection option | true |
| PICS_USE_CIRCULAR_REGION PICS_USE_RECTANGULAR_REGION PICS_USE_POLYGONAL_REGION PICS_USE_IDENTIFIED_REGION | ETSI TS 103 096-2 [5], clause 5.1.5, T3/3-6 | The supporting of various region types. | true |
| PICS_ITS_AID_OTHER_PROFILE | ETSI TS 103 096-2 [5], clause 5.1.5, T3/7 | The value of the ITS_AID to be used for third profile testing. Set to zero to skip third profile testing. | 0 (skip) |

**Table 5: PIXIT Parameters**

| Parameter | Reference | Role | Default value |
|---|---|---|---|
| PX_CERTIFICATE_POOL_PATH | clause B.6 | The path to the pool of certificates and keys | /data/certificates |
| PX_IUT_SEC_CONFIG_NAME | clause B.7 | The name of the subfolder in PX_CERTIFICATE_POOL_PATH with IUT certificates or digests | vendor |
| NOTE: PX_CERTIFICATE_POOL_PATH and PX_IUT_SEC_CONFIG_NAME shall be set to the same values as TsSecuredPath and TsSecuredConfId. | | | |

## 5.3.2.4    Certificate profiles

The ITS Security Test Suite contains certificate profiles describing content of certificates to be used by both TS and IUT. Then certificate profiles are used by the Certificate Generation Tool to generate all necessary certificates, see clause 5.3.2.5.

EXAMPLE:

```
<certificate name="CERT_TEST_ROOT" keep-existing="yes">
    <version>2</version>
    <signer type="self"></signer>
    <subject type="ROOT" name="">
        <!-- verification_key -->
        <attribute type="verification_key">
            <public_key algorythm="ecdsa_nistp256_with_sha256">
                <ecc_point type="uncompressed"/>
            </public_key>
        </attribute>
        <!-- assurance_level -->
        <attribute type="assurance_level">
            <assurance level="6" confidence="0"/>
        </attribute>
        <!-- its_aid_list -->
        <attribute type="its_aid_list">
            <aid value="36"/> <!-- CAM -->
            <aid value="37"/> <!-- DENM -->
        </attribute>
    </subject>
    <validity>
        <restriction type="time" start="2015-01-01" end="2016-01-01"/>
        <restriction type="region">
            <none/>
        </restriction>
    </validity>
    <signature algorithm="0"/>
</certificate>
```

```
<certificate name="CERT_TS_B_AT">
    <version>2</version>
    <signer type="digest" name="CERT_TS_B_AA"/>
    <subject type="AT" name="">
        <attribute type="verification_key">
            <public_key algorythm="0" point-type="uncompressed"/>
        </attribute>
        <attribute type="assurance_level">
            <assurance level="3"/>
        </attribute>
        <attribute type="its_aid_ssp_list">
            <ssp aid="36">&#0;</ssp> <!-- CAM -->
            <ssp aid="37">&#0;</ssp> <!-- DENM -->
        </attribute>
    </subject>
    <validity>
        <restriction type="time" start="2015-01-01" end="2016-01-01"/>
        <restriction type="region">
            <circle latitude="43.616908" longitude="7.052847" radius="5000"/>
        </restriction>
    </validity>
    <signature algorithm="0"/>
</certificate>
```

NOTE 1:   Time and region restriction can be provided in relative way, defining the difference to the reference values.

NOTE 2:   The name of resulting file is taken from the attribute 'name' of the certificate profile.

## 5.3.2.5    Certificate generation

Certificates can be generated based on certificate profiles using the certificate generation tool, provided as a part of the test suite. Certificate generation tool does not make any validation of the input profile, it just transforms the XML representation to the binary certificate and signs it with the proper private key. Certificate generation tool uses openssl crypthographical library v.1.0.1j [12] or greater. This tool is a command line tool written in plain C and can be compiled for any operating system that has openssl library installed. The tool is open source software and distributed under the CeCILL-C free software license. The full certificate pool can be generated by running the script 'gencerts.sh' or 'gencerts.bat'.

The name of the IUT configuration folder has to be provided as a first parameter of the script.

The second parameter is the name of the public key file to be used as a verification key for IUT certificates generation. It is necessary for some IUTs, which are using HSM to store private keys. In this case the path to this public key file in binary (65 bytes), hexadecimal (130 bytes) or PEM file format shall be provided to the script as a second parameter.

Optionally, certificates can be regenerated using Makefile provided in the profiles directory.

Certificates and private keys generated by the tool are ready to be used by TS and IUT.

## 5.3.2.6    Certificate installation

The ATS requires installing some certificates onto the IUT. The installation procedure is manual, customer dependent and out of scope of the present document.

Certificates that shall be installed in order to run the mandatory tests:

- CERT_TEST_ROOT

- CERT_TS_A_AA

Certificates that shall be installed in order to run the optional tests:

- CERT_TS_B_AA (AA certificate with circular region restrictions)

- CERT_TS_C_AA (AA certificate with rectangular region restrictions)

- CERT_TS_D_AA (AA certificate with polygonal region restrictions)

- CERT_TS_E_AA (AA certificate with identified region restrictions)

At least the CERT_TEST_ROOT and CERT_TS_A_AA certificates shall be installed onto the IUT to be able to validate messages sent by the TS. All certificates used by the test suite are derived from the CERT_TEST_ROOT certificate.

Most of the test cases can be executed with any valid certificate installed on the IUT, which are permitting to send CAM/DENM (the way how this certificate has been obtained and installed is out of scope of the present document). This IUT certificate or at least its digest shall be installed onto the test system with the name CERT_IUT_A_AT.crt or CERT_IUT_A_AT.dgs.

However, there are some tests that require using special IUT AT certificates, mostly with different geographical region conditions, named:

- CERT_IUT_A_AT (no region restrictions)

- CERT_IUT_B_AT (circular region restrictions)

- CERT_IUT_C_AT (rectangular region restrictions)

- CERT_IUT_D_AT (polygonal region restrictions)

- CERT_IUT_E_AT (identified region restrictions)

These certificates can be generated and should be installed onto the IUT and can be selected by the TS using UT interface during the start-up phase of test case execution (ETSI TR 103 099 (V1.3.1) [6], clause 5.5 and clause C.1.1).

## 5.4 Test architecture

The ITS Security Test Suite is based on the test architecture described in ETSI TS 102 871-3 [3]. The test system communicates with the GeoNetworking SUT over the geoNetworkingPor and over the utPorts as described in clause 5.5.

## 5.5 Ports and ASPs

### 5.5.1 Introduction

Four ports are used by the ITS-Security ATS:

- The geoNetworking Port, of type geoNetworkingPort

- The utPort of type LibItsGeoNetworking_TestSystem.UpperTesterPort

- The denmUtPort of type LibItsDenm_TestSystem.UpperTesterPort

- The camUtPort of type LibItsCam_TestSystem.UpperTesterPort

### 5.5.2 Primitives of the geoNetworkingPort

Two types of primitives are used in the securityPort:

- The geoNetworkingInd primitive used to receive messages of type GeoNetworkingPacket

- The geoNetworkingReq primitive used to send messages of type GeoNetworkingPacket

### 5.5.3 Primitives of the utPort

The Upper Tester port uses these types of primitives:

- The UtInitialize primitive used to initialize IUT

- The UtCamTrigger primitive with the changeSpeed parameter is used to configure IUT to send CAM messages with high rate (greater than 1 Hz)

- The UtDenmTrigger primitive used trigger the event in the IUT to send a DEN message

- The UtDenmTermination primitive used cancel the event of DEN message

- The UtGnEventInd primitive is used to receive message from the SUT part to indicate that the message has been transmitted to the upper layer

# 6       External functions

The external functions, described in table 6, have been defined in order to perform cryptographic operations and handle complex computations.

**Table 6: External functions**

| Function | Parameters | | | Return | |
|---|---|---|---|---|---|
| | Dir. | Name | Type | Value | Type |
| fx_hashWithSha256 | in | p_toBeHashedData | octetstring | Hash | Oct32 |
| fx_signWithEcdsaNistp256WithSha256 | in | p_toBeSignedSecuredMessage | octetstring | Signature | octetstring |
| | in | p_privateKey | octetstring | | |
| fx_verifyWithEcdsaNistp256WithSha256 | in | p_toBeVerifiedData | octetstring | Status code | boolean |
| | in | p_signature | octetstring | | |
| | in | p_publicKeyX | octetstring | | |
| | in | p_publicKeyY | octetstring | | |
| fx_generateKeyPair | out | p_privateKey | octetstring | Status code | boolean |
| | out | p_publicKeyX | octetstring | | |
| | out | p_publicKeyY | octetstring | | |
| fx_loadCertificates | in | p_rootDirectory | charstring | Status code | boolean |
| | in | p_configId | charstring | | |
| fx_unloadCertificates | | | | Status code | boolean |
| fx_readCertificate | in | p_certificateId | charstring | Status code | boolean |
| | out | p_certificate | octetstring | | |
| fx_readCertificateDigest | in | p_certificateId | charstring | Status code | boolean |
| | out | p_certificate | octetstring | | |
| fx_readSigningKey | in | p_keysId | charstring g | Status code | boolean |
| | out | p_key | Oct32 | | |
| fx_readEncryptingKey | in | p_keysId | charstring g | Status code | boolean |
| | out | p_key | Oct32 | | |
| fx_isValidPolygonalRegion | in | p_region | PolygonalRegion | Status code | boolean |
| fx_isPolygonalRegionInside | in | p_parent | PolygonalRegion | Status code | boolean |
| | in | p_region | PolygonalRegion | | |
| fx_isLocationInsideCircularRegion | in | p_region | CircularRegion | Status code | boolean |
| | in | p_location | ThreeDLocation | | |
| fx_isLocationInsideRectangularRegion | in | p_region | RectangularRegions | Status code | boolean |
| | in | p_location | ThreeDLocation | | |
| fx_isLocationInsidePolygonalRegion | in | p_region | PolygonalRegion | Status code | boolean |
| | in | p_location | ThreeDLocation | | |
| fx_isLocationInsideIdentifiedRegion | in | p_region | IdentifiedRegion | Status code | boolean |
| | in | p_location | ThreeDLocation | | |
| fx_dms2dd (degree-minutes-seconds to degree-degree) | in | p_degrees | Int | Status code | boolean |
| | in | p_minutes | Int | | |
| | in | p_seconds | Float | | |
| | out | p_latlon | Oct1 | | |

# 7 Unimplemented test purposes

Table 7 gives a list of TPs, which are not implemented in the ATS.

**Table 7: Unimplemented test purposes**

| Test purpose |
| --- |
| TP_SEC_ITSS_SND_CERT_AA_10_01_BV |
| TP_SEC_ITSS_SND_CERT_AT_10_01_BV |
| TP_SEC_ITSS_RCV_CAM_04_05_BO |
| TP_SEC_ITSS_RCV_CAM_04_07_BO |
| TP_SEC_ITSS_RCV_CAM_04_10_BO |
| TP_SEC_ITSS_RCV_CAM_04_11_BO |
| TP_SEC_ITSS_RCV_CAM_05_01_BO |
| TP_SEC_ITSS_RCV_CAM_05_02_BO |
| TP_SEC_ITSS_RCV_CAM_05_03_BO |
| TP_SEC_ITSS_RCV_CAM_05_04_BO |
| TP_SEC_ITSS_RCV_CAM_06_01_BO |
| TP_SEC_ITSS_RCV_CAM_06_02_BO |
| TP_SEC_ITSS_RCV_DENM_02_01_BO |
| TP_SEC_ITSS_RCV_DENM_02_02_BO |
| TP_SEC_ITSS_RCV_DENM_04_01_BO |
| TP_SEC_ITSS_RCV_DENM_04_02_BO |
| TP_SEC_ITSS_RCV_DENM_04_03_BO |
| TP_SEC_ITSS_RCV_DENM_04_04_BO |
| TP_SEC_ITSS_RCV_DENM_04_05_BO |
| TP_SEC_ITSS_RCV_DENM_04_06_BO |
| TP_SEC_ITSS_RCV_DENM_04_07_BO |
| TP_SEC_ITSS_RCV_DENM_04_08_BO |
| TP_SEC_ITSS_RCV_DENM_04_09_BO |
| TP_SEC_ITSS_RCV_DENM_04_10_BO |
| TP_SEC_ITSS_RCV_DENM_04_11_BO |
| TP_SEC_ITSS_RCV_DENM_04_12_BV |
| TP_SEC_ITSS_RCV_DENM_05_01_BO |
| TP_SEC_ITSS_RCV_DENM_05_02_BO |
| TP_SEC_ITSS_RCV_DENM_05_03_BO |
| TP_SEC_ITSS_RCV_DENM_06_01_BO |
| TP_SEC_ITSS_RCV_DENM_06_02_BO |
| TP_SEC_ITSS_RCV_DENM_09_02_BO |
| TP_SEC_ITSS_RCV_DENM_09_03_BO |
| TP_SEC_ITSS_RCV_DENM_09_04_BO |
| TP_SEC_ITSS_RCV_DENM_09_05_BO |
| TP_SEC_ITSS_RCV_DENM_09_06_BO |
| TP_SEC_ITSS_RCV_DENM_10_01_BO |
| TP_SEC_ITSS_RCV_DENM_10_02_BO |
| TP_SEC_ITSS_RCV_DENM_11_01_BO |
| TP_SEC_ITSS_RCV_DENM_12_01_BO |
| TP_SEC_ITSS_RCV_DENM_12_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_01_01_BV |
| TP_SEC_ITSS_RCV_GENMSG_01_02_BV |
| TP_SEC_ITSS_RCV_GENMSG_01_03_BV |
| TP_SEC_ITSS_RCV_GENMSG_01_04_BV |
| TP_SEC_ITSS_RCV_GENMSG_01_05_BV |
| TP_SEC_ITSS_RCV_GENMSG_01_06_BV |
| TP_SEC_ITSS_RCV_GENMSG_01_07_BV |
| TP_SEC_ITSS_RCV_GENMSG_02_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_02_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_03_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_04_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_05_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_06_BO |

| Test purpose |
| --- |
| TP_SEC_ITSS_RCV_GENMSG_04_07_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_08_BO |
| TP_SEC_ITSS_RCV_GENMSG_04_09_BV |
| TP_SEC_ITSS_RCV_GENMSG_04_10_BV |
| TP_SEC_ITSS_RCV_GENMSG_05_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_05_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_05_03_BO |
| TP_SEC_ITSS_RCV_GENMSG_06_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_06_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_08_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_08_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_08_03_BO |
| TP_SEC_ITSS_RCV_GENMSG_08_04_BO |
| TP_SEC_ITSS_RCV_GENMSG_09_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_09_03_BO |
| TP_SEC_ITSS_RCV_GENMSG_09_04_BO |
| TP_SEC_ITSS_RCV_GENMSG_10_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_10_02_BO |
| TP_SEC_ITSS_RCV_GENMSG_11_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_12_01_BO |
| TP_SEC_ITSS_RCV_GENMSG_12_02_BO |
| TP_SEC_ITSS_RCV_CERT_01_01_BO |
| TP_SEC_ITSS_RCV_CERT_01_02_BO |
| TP_SEC_ITSS_RCV_CERT_01_03_BO |
| TP_SEC_ITSS_RCV_CERT_01_04_BO |
| TP_SEC_ITSS_RCV_CERT_02_01_BO |
| TP_SEC_ITSS_RCV_CERT_02_02_BO |
| TP_SEC_ITSS_RCV_CERT_03_01_BO |
| TP_SEC_ITSS_RCV_CERT_03_02_BO |
| TP_SEC_ITSS_RCV_CERT_04_01_BO |
| TP_SEC_ITSS_RCV_CERT_05_01_BO |
| TP_SEC_ITSS_RCV_CERT_05_02_BO |
| TP_SEC_ITSS_RCV_CERT_06_01_BV |
| TP_SEC_ITSS_RCV_CERT_06_02_BV |
| TP_SEC_ITSS_RCV_CERT_06_03_BO |
| TP_SEC_ITSS_RCV_CERT_06_04_BO |
| TP_SEC_ITSS_RCV_CERT_06_05_BO |
| TP_SEC_ITSS_RCV_CERT_07_01_BV |
| TP_SEC_ITSS_RCV_CERT_07_02_BV |
| TP_SEC_ITSS_RCV_CERT_07_03_BO |
| TP_SEC_ITSS_RCV_CERT_07_04_BO |
| TP_SEC_ITSS_RCV_CERT_07_05_BO |
| TP_SEC_ITSS_RCV_CERT_08_01_BV |
| TP_SEC_ITSS_RCV_CERT_08_02_BV |
| TP_SEC_ITSS_RCV_CERT_08_03_BO |
| TP_SEC_ITSS_RCV_CERT_08_04_BO |
| TP_SEC_ITSS_RCV_CERT_08_05_BO |
| TP_SEC_ITSS_RCV_CERT_08_06_BO |
| TP_SEC_ITSS_RCV_CERT_09_01_BV |
| TP_SEC_ITSS_RCV_CERT_09_02_BV |
| TP_SEC_ITSS_RCV_CERT_09_03_BV |
| TP_SEC_ITSS_RCV_CERT_09_04_BO |
| TP_SEC_ITSS_RCV_CERT_09_05_BO |
| TP_SEC_ITSS_RCV_CERT_09_06_BO |
| TP_SEC_ITSS_RCV_CERT_09_07_BO |
| TP_SEC_ITSS_RCV_CERT_10_01_BO |
| TP_SEC_ITSS_RCV_CERT_10_02_BO |
| TP_SEC_ITSS_RCV_CERT_10_03_BO |
| TP_SEC_ITSS_RCV_CERT_11_01_BO |
| TP_SEC_ITSS_RCV_CERT_11_02_BO |
| TP_SEC_ITSS_RCV_CERT_11_03_BO |
| TP_SEC_ITSS_RCV_CERT_11_04_BO |
| TP_SEC_ITSS_RCV_CERT_12_01_BO |

| Test purpose |
| --- |
| TP_SEC_ITSS_RCV_CERT_12_02_BO |
| TP_SEC_ITSS_RCV_CERT_12_03_BO |
| TP_SEC_ITSS_RCV_CERT_13_01_BO |
| TP_SEC_ITSS_RCV_CERT_13_02_BO |

# 8        ATS conventions

## 8.1        Introduction

The ATS conventions are intended to give a better understanding of the ATS but they also describe the conventions made for the development of the ATS. These conventions shall be considered during any later maintenance or further development of the ATS.

The ATS conventions contain the testing conventions, described in clause 8.2 and the naming conventions, described in clause 8.3. The testing conventions describe the functional structure of the ATS. The naming conventions describe the structure of the naming of all ATS elements.

To define the ATS, the guidelines of the document ETSI ETS 300 406 [11] was considered.

## 8.2        Testing conventions

### 8.2.1        Testing states

#### 8.2.1.1        Initial states

All test cases start with the function f_prInitialState. This function brings the IUT in an "initialized" state by invoking the upper tester primitive UtInitialize.

#### 8.2.1.2  Final state

All test cases end with the function f_poDefault. This function brings the IUT back to operational state. As no specific actions are required for the idle state in the ETSI TS 103 097 [1], the function f_poDefault does not invoke any action.

As necessary, further actions may be included in the f_poDefault function.

## 8.3        Naming conventions

### 8.3.1        Introduction

This test suite follows the naming convention guidelines provided in the ETSI EG 202 798 [i.1].

### 8.3.2        General guidelines

The naming convention is based on the following underlying principles:

- in most cases, identifiers should be prefixed with a short alphabetic string (specified in table 8) indicating the type of TTCN-3 element it represents;

- suffixes should not be used except in those specific cases identified in table 8;

- prefixes and suffixes should be separated from the body of the identifier with an underscore ("_");

EXAMPLE 1:    c_sixteen, t_wait.

- only module names, data type names and module parameters should begin with an upper-case letter. All other names (i.e. the part of the identifier following the prefix) should begin with a lower-case letter;

- the start of second and subsequent words in an identifier should be indicated by capitalizing the first character. Underscores should not be used for this purpose.

EXAMPLE 2:    `f_initialState.`

Table 8 specifies the naming guidelines for each element of the TTCN-3 language indicating the recommended prefix, suffixes (if any) and capitalization.

**Table 8: ETSI TTCN-3 generic naming conventions**

| Language element | Naming convention | Prefix | Example identifier |
|---|---|---|---|
| Module | Use upper-case initial letter | none | IPv6Templates |
| Group within a module | Use lower-case initial letter | none | messageGroup |
| Data type | Use upper-case initial letter | none | SetupContents |
| Message template | Use lower-case initial letter | m_ | m_setupInit |
| Message template with wildcard or matching expression | Use lower-case initial letters | mw_ | mw_anyUserReply |
| Modifying message template | Use lower-case initial letter | md_ | md_setupInit |
| Modifying message template with wildcard or matching expression | Use lower-case initial letters | mdw_ | mdw_anyUserReply |
| Signature template | Use lower-case initial letter | s_ | s_callSignature |
| Port instance | Use lower-case initial letter | none | signallingPort |
| Test component instance | Use lower-case initial letter | none | userTerminal |
| Constant | Use lower-case initial letter | c_ | c_maxRetransmission |
| Constant (defined within component type) | Use lower-case initial letter | cc_ | cc_minDuration |
| External constant | Use lower-case initial letter | cx_ | cx_macId |
| Function | Use lower-case initial letter | f_ | f_authentication() |
| External function | Use lower-case initial letter | fx_ | fx_calculateLength() |
| Altstep (incl. Default) | Use lower-case initial letter | a_ | a_receiveSetup() |
| Test case | Use ETSI numbering | TC_ | TC_COR_0009_47_ND |
| Variable (local) | Use lower-case initial letter | v_ | v_macId |
| Variable (defined within a component type) | Use lower-case initial letters | vc_ | vc_systemName |
| Timer (local) | Use lower-case initial letter | t_ | t_wait |
| Timer (defined within a component) | Use lower-case initial letters | tc_ | tc_authMin |
| Module parameters for PICS | Use all upper case letters | PICS_ | PICS_DOOROPEN |
| Module parameters for other parameters | Use all upper case letters | PX_ | PX_TESTER_STATION_ID |
| Formal Parameters | Use lower-case initial letter | p_ | p_macId |
| Enumerated Values | Use lower-case initial letter | e_ | e_syncOk |

## 8.3.3    ITS specific TTCN-3 naming conventions

Next to such general naming conventions, the following table 9 shows specific naming conventions that apply to the ITS TTCN-3 test suite.

**Table 9: ITS specific TTCN-3 naming conventions**

| Language element | Naming convention | Prefix | Example identifier |
|---|---|---|---|
| ITS Module | Use upper-case initial letter | Its"IUTname"_ | ItsSecurity_ |
| Module containing types and values | Use upper-case initial letter | Its"IUTname"_TypesAndValues | ItsSecurity_TypesAndValues |
| Module containing Templates | Use upper-case initial letter | Its"IUTname"_Templates | ItsSecurity_Templates |
| Module containing test cases | Use upper-case initial letter | Its"IUTname"_TestCases | ItsSecurity_TestCases |
| Module containing functions | Use upper-case initial letter | Its"IUTname"_Functions | ItsSecurity_Functions |
| Module containing external functions | Use upper-case initial letter | Its"IUTname"_ExternalFunctions | ItsSecurity_ExternalFunctions |
| Module containing components, ports and message definitions | Use upper-case initial letter | Its"IUTname"_Interface | ItsSecurity_Interface |
| Module containing main component definitions | Use upper-case initial letter | Its"IUTname"_TestSystem | ItsSecurity_TestSystem |
| Module containing the control part | Use upper-case initial letter | Its"IUTname"_TestControl | ItsSecurity_TestControl |

## 8.3.4　Usage of Log statements

All TTCN-3 log statements use the following format using the same order:

- Three asterisks

- The TTCN-3 test case or function identifier in which the log statement is defined

- One of the categories of log: INFO, WARNING, ERROR, PASS, FAIL, INCONC, TIMEOUT

- Free text

- Three asterisks

EXAMPLE 1:

```
log("*** TP_SEC_ITSS_ENR_NB_06: INFO: Preamble: Received and answered Enrolment
Request ***")
```

Furthermore, the following rules are applied for the ITS-Security ATS:

- Log statements are used in the body of the functions, so that invocation of functions are visible in the test logs

- All TTCN-3 *setverdict* statements are combined with a log statement following the same above rules (see example 2)

EXAMPLE 2:

```
setverdict(pass, "*** TP_SEC_ITSS_ENR_NB_06: PASS: Enrolment Response correctly
accepted ***")
```

## 8.3.5　Test Case (TC) identifier

Table 10 shows the test case naming convention, which follows the same naming convention as the test purposes.

**Table 10: TC naming convention**

| Identifier: | TC_<ts>_<tgt>_<gr>_<sgr>_<rn>_<tn>_[x] | | |
|---|---|---|---|
| | <ts> = test suite | SEC | Security Test suite |
| | <tgt> = target | ITSS | ITS Station |
| | <gr> = group | SND | Send Data |
| | | RCV | Receive Data |
| | <sgr> =sub-group | MSG | General messages |
| | | CAM | CAM Profile |
| | | DENM | DENM Profile |
| | | GENMSG | Other messages |
| | | CERT | Certificates |
| | <rn> = requirement sequence number | | |
| | <tn> = testcase sequence number | | |
| | [x] = type of testing | BV | Normal Behaviour |
| | | BO | Exceptional Behaviour |

EXAMPLE:        TP identifier: TP_SEC_ITSS_SND_CAM_01_01
                TC identifier: TP_SEC_ITSS_RCV_GENMSG_01_01_BV

# 8.4      On line documentation

The T3D tool enables providing on-line documentation browser in HTML, by tagging TTCN-3 comments. These tags are defined in table 11.

**Table 11: TTCN-3 comment tags**

| Tag | Description |
|---|---|
| @author | Specifies the names of the authors or an authoring organization which either has created or is maintaining a particular piece of TTCN-3 code. |
| @desc | Describes the purpose of a particular piece of TTCN-3 code. The description should be concise yet informative and describe the function and use of the construct. |
| @remark | Adds extra information, such as the highlighting of a particular feature or aspect not covered in the description. |
| @see | Refers to other TTCN-3 definitions in the same or another module. |
| @return | Provides additional information on the value returned by a given function. |
| @param | Documents the parameters of parameterized TTCN-3 definitions. |
| @version | States the version of a particular piece of TTCN-3 code. |

The HTML files result from the compilation of the TTCN-3 modules with the T3D tool. These HTML files are ready for browsing, and contain links enabling to navigate through the ATS.

EXAMPLE:

```
/**
 * @desc Check that ITS-S sends a SecuredMessage containing protocol version set to 2
 * @see     Draft ETSI TS 103 097 V1.1.14 Clause 5.1    SecuredMessage
 * @reference   EN 302 636-4-1 [1], clauses 9.3.2 , 8.6.2 and Annex G
 */
```

# Annex A (informative): ATS in TTCN-3

## A.1    TTCN-3 files and other related modules

This ATS has been produced using the Testing and Test Control Notation (TTCN) according to ETSI ES 201 873-1 [13].

This test suite has been compiled error-free using two different commercial TTCN-3 compilers.

The TTCN-3 library modules, which form parts of the present technical standard, are contained in the archive ts_10309603v010201p0.zip which accompanies the present document.

# Annex B (normative):
# Partial PIXIT pro forma for Security

## B.1    Partial cancellation of copyright

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the Partial PIXIT pro forma in this annex so that it can be used for its intended purposes and may further publish the completed Partial PIXIT.

## B.2    Introduction

The PIXIT pro forma is based on ISO/IEC 9646-6 [9]. Any needed additional information can be found in ISO/IEC 9646-6 [9].

## B.3    Identification summary

**Table B.1**

| | |
|---|---|
| PIXIT Number: | |
| Test Laboratory Name: | |
| Date of Issue: | |
| Issued to: | |

## B.4    ATS summary

**Table B.2**

| | |
|---|---|
| Protocol Specification: | ETSI TS 103 097 [1] |
| Protocol to be tested: | Security header and certificate formats |
| ATS Specification: | ETSI TS 103 096-3 |
| Abstract Test Method: | Clause 4 |

## B.5    Test laboratory

**Table B.3**

| | |
|---|---|
| Test Laboratory Identification: | |
| Test Laboratory Manager: | |
| Means of Testing: | |
| SAP Address: | |

# B.6 Client identification

**Table B.4**

| Client Identification: | |
|---|---|
| Client Test manager: | |
| Test Facilities required: | |

# B.7 SUT

**Table B.5**

| Name: | |
|---|---|
| Version: | |
| SCS Number: | |
| Machine configuration: | |
| Operating System Identification: | |
| IUT Identification: | |
| PICS Reference for IUT: | |
| Limitations of the SUT: | |
| Environmental Conditions: | |

# B.8 Protocol layer information

## B.8.1 Protocol identification

**Table B.6**

| Name: | ETSI TS 103 097 [1] |
|---|---|
| Version: | |
| PICS References: | ETSI TS 103 096-1 [4] |

## B.8.2    IUT information

**Table B.7: Security GN pixits**

| Identifier | Description | |
|---|---|---|
| PX_CERTIFICATE_POOL_PATH | Comment | Path to the certificates and private keys pool |
| | Type | Octetstring |
| | Def. value | /data/certificates |
| PX_IUT_SEC_CONFIG_NAME | Comment | Name of the IUT identifier (subfolder in PX_CERTIFICATE_POOL_PATH) |
| | Type | Octetstring |
| | Def. value | cfg01 |
| PX_IUT_DEFAULT_CERTIFICATE | Comment | The name (or digest) of the certificate to be used by the IUT by default |
| | Type | Octetstring |
| | Def. value | CERT_IUT_A_AT |
| PX_OTHER_ITS_AID | Comment | The ITS AID for Beacon messages. Use zero to skip tests of Secured Beacons. |
| | Type | Integer |
| | Def. value | 38 |

**Table B.8: Relevant GeoNetworking pixits**

| Identifier | Description | |
|---|---|---|
| PICS_GN_LOCAL_GN_ADDR | Comment | GeoNetworking address of the GeoAdhoc router |
| | Type | GN_Address |
| | Def. value | typeOfAddress := e_manual, stationType := e_passengerCar, stationCountryCode := c_uInt10Zero, mid := c_6ZeroBytes |
| PX_GN_UPPER_LAYER | Comment | The IUT's upper layer. |
| | Type | Enumerated |
| | Def. value | e_btpA |
| PX_BTP_IN_UT_IND | Comment | Is BTP header present in IUT's UT indication. Only applicable if PX_GN_UPPER_LAYER == e_btpA or e_btpB. |
| | Type | Boolean |
| | Def. value | True |
| PX_DESTINATION_PORT | Comment | BTP Destination port of the IUT Set it to predefined CAM or DENM ports regarding which parts is on the test now. |
| | Type | Integer |
| | Def. value | 0 |

Other GeoNetoworking PIXITs are described in ETSI TS 102 871-3 [3].

# Annex C (normative):
# PCTR pro forma for Security

## C.1     Partial cancellation of copyright

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the PCTR pro forma in this annex so that it can be used for its intended purposes and may further publish the completed PCTR.

## C.2     Introduction

The PCTR pro forma is based on ISO/IEC 9646-6 [9]. Any needed additional information can be found in ISO/IEC 9646-6 [9].

## C.3     Identification summary

### C.3.1     Protocol conformance test report

**Table C.1**

| | |
|---|---|
| PCTR Number: | |
| PCTR Date: | |
| Corresponding SCTR Number: | |
| Corresponding SCTR Date: | |
| Test Laboratory Identification: | |
| Test Laboratory Manager: | |
| Signature: | |

### C.3.2     IUT identification

**Table C.2**

| | |
|---|---|
| Name: | |
| Version: | |
| Protocol specification: | |
| PICS: | |
| Previous PCTR if any: | |

### C.3.3     Testing environment

**Table C.3**

| | |
|---|---|
| PIXIT Number: | |
| ATS Specification: | |
| Abstract Test Method: | |
| Means of Testing identification: | |
| Date of testing: | |
| Conformance Log reference(s): | |
| Retention Date for Log reference(s): | |

## C.3.4    Limits and reservation

Additional information relevant to the technical contents or further use of the test report, or the rights and obligations of the test laboratory and the client, may be given here. Such information may include restriction on the publication of the report.

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## C.3.5    Comments

Additional comments may be given by either the client or the test laboratory on any of the contents of the PCTR, for example, to note disagreement between the two parties.

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# C.4    IUT Conformance status

This IUT has or has not been shown by conformance assessment to be non-conforming to the specified protocol specification.

*Strike the appropriate words in this sentence. If the PICS for this IUT is consistent with the static conformance requirements (as specified in clause C.3 in this report) and there are no "FAIL" verdicts to be recorded (in clause C.6 in this report) strike the words "has or", otherwise strike the words "or has not".*

# C.5    Static conformance summary

The PICS for this IUT is or is not consistent with the static conformance requirements in the specified protocol.

*Strike the appropriate words in this sentence.*

# C.6    Dynamic conformance summary

The test campaign did or did not reveal errors in the IUT.

*Strike the appropriate words in this sentence. If there are no "FAIL" verdicts to be recorded (in clause C.6 of this report) strike the words "did or" otherwise strike the words "or did not".*

Summary of the results of groups of test:

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# C.7      Static conformance review report

If clause C.3 indicates non-conformance, this clause itemizes the mismatches between the PICS and the static conformance requirements of the specified protocol specification.

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# C.8      Test campaign report

**Table C.4: Test Cases**

| ATS Reference | Selected? | Run? | Verdict | Observations (Reference to any observations made in clause C.7) |
|---|---|---|---|---|
| TP_SEC_ITSS_SND_MSG_01_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_MSG_04_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_MSG_04_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_MSG_05_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_02_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_05_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_05_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_06_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_07a_01_TI | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_08_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_09_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_10_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_11_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_12_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_14_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CAM_16_01_BV | Yes/No | Yes/No | | |

| ATS Reference | Selected? | Run? | Verdict | Observations (Reference to any observations made in clause C.7) |
|---|---|---|---|---|
| TP_SEC_ITSS_SND_DENM_02_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_03_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_04_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_05_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_05_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_05_03_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_05_04_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_05_05_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_05_06_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_06_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_08_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_DENM_10_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_02_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_03_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_04_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_05_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_05_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_05_03_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_05_04_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_05_05_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_05_06_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_06_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_GENMSG_07_01_BV | Yes/No | Yes/No | | |

| ATS Reference | Selected? | Run? | Verdict | Observations (Reference to any observations made in clause C.7) |
|---|---|---|---|---|
| TP_SEC_ITSS_SND_CERT_01_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_01_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_02_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_04_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_04_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_05_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_05_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_06_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_06_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_06_03_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_06_04_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_07_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_08_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_09_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_09_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AA_01_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AA_02_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AA_04_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AA_05_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AA_06_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AA_08_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AT_01_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AT_02_01_BV | Yes/No | Yes/No | | |

| ATS Reference | Selected? | Run? | Verdict | Observations (Reference to any observations made in clause C.7) |
|---|---|---|---|---|
| TP_SEC_ITSS_SND_CERT_AT_03_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AT_04_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AT_05_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AT_07_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AT_08_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_SND_CERT_AT_09_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_01_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_01_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_01_03_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_02_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_02_02_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_04_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_04_02_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_04_03_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_04_04_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_04_06_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_04_08_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_04_09_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_07_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_09_02_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_09_03_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_09_04_BO | Yes/No | Yes/No | | |

| ATS Reference | Selected? | Run? | Verdict | Observations (Reference to any observations made in clause C.7) |
|---|---|---|---|---|
| TP_SEC_ITSS_RCV_CAM_09_05_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_09_06_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_10_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_10_02_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_11_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_11_02_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_12_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_CAM_12_02_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_01_01_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_01_02_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_01_03_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_01_04_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_01_05_BV | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_07_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_08_01_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_08_02_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_08_03_BO | Yes/No | Yes/No | | |
| TP_SEC_ITSS_RCV_DENM_08_04_BO | Yes/No | Yes/No | | |

# C.9　Observations

Additional information relevant to the technical content of the PCTR is given here.

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# History

| Document history | | |
|---|---|---|
| V1.1.1 | July 2013 | Publication |
| V1.2.1 | September 2015 | Publication |
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