IMS Network Testing (INT);
Communication Diversion (CDIV) using IP Multimedia (IM)
Core Network (CN) subsystem;
Conformance Testing;
Part 3: Abstract Test Suite (ATS) and partial Protocol
Implementation eXtra Information for Testing (PIXIT)
proforma specification
Reference
DTS/INT-00029-3

Keywords
ATS, CDIV, IMS, PIXIT, SIP, testing, TTCN

---------------------------------------------------------------------

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee IMS Network Testing (INT).

The present document is part 3 of a multi-part deliverable covering Communication Diversion (CDIV), 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 partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification"
1 Scope

The present document specifies the Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma based on the Test Suite Structure and Test Purposes defined in TS 186 014-2 [2].

The test notation used in the ATS is TTCN-3 (see ES 201 873-1 [7]).

The following test specification- and design considerations can be found in the body of the present document:

- the overall test suite structure;
- the testing architecture;
- the test methods and port definitions;
- the test configurations;
- the design principles, assumptions, and used interfaces to the TTCN3 tester (System Simulator);
- TTCN styles and conventions;
- the partial PIXIT proforma;
- the modules containing the TTCN-3 ATS.

Annex A provides the Partial Implementation Extra Information for Testing (PIXIT) Proforma of the ATS.

Annex B provides the Testing and Test Control Notation (TTCN-3) part of the ATS.

2 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.

2.1 Normative references

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

[1] ETSI TS 124 604 (V8.7.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Communication Diversion (CDIV) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification (3GPP TS 24.604 version 8.7.0 Release 8)".

[2] ETSI TS 186 014-2 (V3.1.1): "Technical Committee for IMS Network Testing (INT); PSTN/ISDN simulation services; Communication Diversion (CDIV); Part 2: Test Suite Structure and Test Purposes (TSS&TP)".

[3] ETSI TS 102 790-3: "Technical Committee for IMS Network Testing (INT); Network Integration Testing; IMS specific use of Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Conformance Testing; Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification".

ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

ISO/IEC 9646-7: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

ETSI ES 201 873-1 (V4.3.1): "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".

ETSI TS 102 351 (V2.1.1): "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Testing: Methodology and Framework".

ETSI TS 102 587-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio; Part 2: Conformance testing; Test Suite Structure and Test Purposes (TSS&TP) specification".

IETF RFC 2617: "HTTP Authentication: Basic and Digest Access Authentication".

2.2 Informative references

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.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO/IEC 9646-7 [6], TS 102 587-2 [9] and TS 102 790-3 [3] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO/IEC 9646-1 [5], ISO/IEC 9646-7 [6], TS 102 790-3 [3] and TS 124 604 [1] apply.

4 Abstract Test Method (ATM)

For the purposes of the present document, the ATM described in clause 4 of TS 102 790-3 [3] applies with following additions.

4.1 Configurations for testing UE

The Gm interface is located between SUT (UE) and the IMS.

![Figure 1: Test configuration CF_1GmUE](image)
The ISC interface provides an access to the AP.

![Test configuration CF_1ISC](image)

5 The ATS development process

5.1 Requirements and Test Purposes

For each test purpose there is a table defined in clause 5 of TS 186 014-2 [2]. The requirements applicable to this TP are given by a reference to TS 124 604 [1]. There are no explicit formulations of requirements.

5.2 ATS structure

5.2.1 Test case grouping

The ATS structure defined in Table 1 is based on the structuring of Test Purposes in clause 4 of TS 186 014-2 [2]. The group names in column 2 of Table 1 are those assigned in the ATS; they are based on the names provided in clause 4 of TS 186 014-2 [2], but use the naming conventions defined for the ATS (see clause 5.2.2).

<table>
<thead>
<tr>
<th>Netw</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ASdivertingUser/DivProcedures</td>
<td>CDIV_N01</td>
</tr>
<tr>
<td>ASdivertingUser/NotOrigUser</td>
<td>CDIV_N02</td>
</tr>
<tr>
<td>ASdivertingUser/NotDivUser</td>
<td>CDIV_N03</td>
</tr>
<tr>
<td>ASdiverted-to</td>
<td>CDIV_N04</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OrigUE</td>
<td>CDIV_U01</td>
</tr>
<tr>
<td>DivertingUE</td>
<td>CDIV_U02</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interaction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TIP</td>
<td>CDIV_N05.xxx</td>
</tr>
<tr>
<td>TIR</td>
<td>CDIV_N06.xxx</td>
</tr>
<tr>
<td>ACR-CB</td>
<td>CDIV_N07.xxx</td>
</tr>
<tr>
<td>ECT</td>
<td>CDIV_N08.xxx</td>
</tr>
</tbody>
</table>

5.2.2 Test case identifiers

The test case names are built up according to the following scheme:

"<TC>_"_<Group index>_"_<TC number>"
where:

a) double quotes (") are used to enclose literal strings;

b) <Group path index> is the group index in Table 1 (which uniquely identifies the path of groups/subgroups);

c) <TC number> is a running 3-digit decimal number, starting in each subgroup path with "001".

EXAMPLE:

TC_OIP_N01_001:

i) the identifier has Group index "CDIV_N01", i.e. it is in the subgroup having complete path:
   SupplementaryServices_CDIV/Netw/ASdivertingUser/DivProcedures;

ii) the identifier is the first test case of this group/subgroup.

NOTE: This naming scheme provides a 1-1 correspondence of TP identifiers as defined in TS 186 014-2 [2] and test case names.

The TP identifier of TC_CDIV_N01_001 is TP CDIV_N01_001.

5.3 ATS specification framework

5.3.1 ATS Library

For this ATS the TTCN-3 library modules are basically organized as:

1) AtsCommon modules.

2) LibIms modules.

3) LibSip modules (RFC 3261 [4]).

4) LibCommon modules (taken from an improved version of TS 102 351 [8]).

NOTE: Due to the common LibSip and LibIms library approach with some other parallel running projects there is necessary to create tag version of all library modules.

Table 2 shows the organization of the ATS as library of modules.

<table>
<thead>
<tr>
<th>Module Class</th>
<th>Module Id</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDIV</td>
<td>CDIV_TC_Functions</td>
<td>CDIV test case functions</td>
</tr>
<tr>
<td></td>
<td>CDIV_TestCases</td>
<td>CDIV test case definitions</td>
</tr>
<tr>
<td></td>
<td>CDIV_Templates</td>
<td>CDIV template definitions</td>
</tr>
<tr>
<td>AtsCommon</td>
<td>SS_Ims_PICS</td>
<td>Module Parameter declarations associated with PICS</td>
</tr>
<tr>
<td></td>
<td>SS_Ims_PIXITS</td>
<td>SIP common Module Parameter declarations associated with PIXIT</td>
</tr>
<tr>
<td></td>
<td>SS_Ims_TestConfiguration</td>
<td>Functions which implement the configuration of the SUT adapter and mapping of test components for establishing and tearing down different test configurations</td>
</tr>
<tr>
<td></td>
<td>SS_Ims_TestSystem</td>
<td>TSI components, test system internal ports</td>
</tr>
<tr>
<td></td>
<td>SS_Ims_TestCases</td>
<td>Test case definitions</td>
</tr>
<tr>
<td></td>
<td>SS_Ims_Functions</td>
<td>Test case functions</td>
</tr>
<tr>
<td>LibIms</td>
<td>LibIms_PIXITS</td>
<td>IMS specific common Module Parameter (e.g. addresses related to SUT components and TS) declarations associated with PIXIT</td>
</tr>
<tr>
<td></td>
<td>LibIms_Interface</td>
<td>IMS component</td>
</tr>
<tr>
<td></td>
<td>LibIms_SIPTypesAndValues</td>
<td>IMS specific user and interface specific profile data (see note)</td>
</tr>
<tr>
<td></td>
<td>LibIms_Templates</td>
<td>Modified templates with IMS specific header fields</td>
</tr>
<tr>
<td></td>
<td>LibIms_Steps</td>
<td>functions using IMS specific types</td>
</tr>
</tbody>
</table>
### Module Class | Module Id | Description
--- | --- | ---
LibSip | LibSip_PIXITS | SIP general common Module Parameter (e.g. SDP/SIP procedure options) declarations associated with PIXIT
LibSip | LibSip_Interface | SIP component
LibSip | LibSip_SIPTypesAndValues | SIP message types and constants, simple user profiles (see note)
LibSip | LibSip_SDPTypes | SDP types and constants
LibSip | LibSip_Templates | Basic and modified templates with SIP specific header fields
LibSip | LibSip_Steps | SIP specific behaviour function library
LibSip | LibSip_XMLTypes | XML types for SIP tests
LibCommon | LibCommon_AbstractData | Generic data types for a stack and its operations
LibCommon | LibCommon_BasicTypesAndValues | Basic type and value definitions (integer and Boolean)
LibCommon | LibCommon_DataStrings | Bit and Octet string types
LibCommon | LibCommon_Sync | Co-ordination/synchronization of test components
LibCommon | LibCommon_TextStrings | Basic character and string types with fixed length
LibCommon | LibCommon_Time | Time handling functions and module parameter
LibCommon | LibCommon_VerdictControl | Basic functions for setting of test component verdicts

**NOTE:** In order to build a comprehensive library all SIP message header (incl. IMS specific) have been defined in LibSip_SIPTypesAndValues only.

### 5.3.2 Use of TTCN-3

For the purposes of the present document, the description of the use of TTCN-3 described in clause 5.3.2 of TS 102 790-3 [3] applies.
Annex A (normative):
Partial PIXIT proforma

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

A.1 Introduction

This partial PIXIT proforma contained in the present document is provided for completion, when the related Abstract Test Suite is to be used against the Implementation Under Test (IUT).

The completed partial PIXIT will normally be used in conjunction with the completed PICS, as it adds precision to the information provided by the PICS.

A.2 PIXIT items

According to the type of ATS defined in the present document, the PIXIT are divided in PIXIT items for UE, AS and general PIXIT items that apply for all types of IUT. Each PIXIT item corresponds to a Module Parameter of the ATS.

NOTE: The PIXIT definitions are part of a SIP TTCN-3 library that contains additional PIXIT definitions that are not used in this ATS and are therefore not presented in the following tables.

A.2.1 PIXIT for UE Testing

Table A.1: PIXIT items for UE testing

<table>
<thead>
<tr>
<th>Id</th>
<th>Identifier</th>
<th>Type / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PX_IMS_TS_PCSCF_IPADDR</td>
<td>charstring, for TS/P-CSCF IP address to exchange SIP messages.</td>
</tr>
<tr>
<td>2</td>
<td>PX_IMS_TS_PCSCF_PORT</td>
<td>integer, for IUT/P-CSCF port number to exchange SIP messages.</td>
</tr>
<tr>
<td>3</td>
<td>PX_IMS_TS_UE1_IPADDR</td>
<td>charstring, for IP address used by the UE1 to exchange SIP messages.</td>
</tr>
<tr>
<td>4</td>
<td>PX_IMS_TS_UE1_PORT</td>
<td>integer, for port number used by the UE1 to exchange SIP messages.</td>
</tr>
<tr>
<td>5</td>
<td>PX_IMS_SUT_UE1_BEARER_IPADDR</td>
<td>charstring, for IP address used by the TS to exchange media streams for UE1.</td>
</tr>
<tr>
<td>6</td>
<td>PX_IMS_SUT_UE1_HOME_DOMAIN</td>
<td>charstring, for the identity of the tester UE1 local domain.</td>
</tr>
<tr>
<td>7</td>
<td>PX_IMS_SUT_UE1_PUBLIC_USER</td>
<td>charstring, for identity of the tester UE1 local user.</td>
</tr>
<tr>
<td>8</td>
<td>PX_IMS_SUT_UE1_PRIVAT_USERNAME</td>
<td>charstring, for RFC 2617 [10], clause 3.2.2 username of UE1: The name of user in the specified realm.</td>
</tr>
<tr>
<td>9</td>
<td>PX_IMS_SUT_UE1_PRIVAT_PASSWD</td>
<td>charstring, for RFC 2617 [10], clause 3.2.2.2 passwd of UE1: A known shared secret, the password of user of the specified username.</td>
</tr>
<tr>
<td>10</td>
<td>PX_IMS_SUT_UE1_QOP</td>
<td>charstring, for RFC 2617 [10], clause 3.2.1 qop options of UE1: Quoted string of one or more tokens indicating the &quot;quality of protection&quot; values supported by the server; the value &quot;auth&quot; indicates authentication; the value &quot;auth-int&quot; indicates authentication with integrity protection.</td>
</tr>
<tr>
<td>11</td>
<td>PX_IMS_SUT_UE1_REGISTRAR</td>
<td>charstring, for home (SUT) REGISTRAR domain of UE1.</td>
</tr>
<tr>
<td>12</td>
<td>PX_UK_REGISTRATION</td>
<td>boolean, En-/disable UE registration.</td>
</tr>
<tr>
<td>13</td>
<td>PX_UK_REG_EVENT_SUBSCRIPTION</td>
<td>boolean, En-/disable UE reg event subscription.</td>
</tr>
<tr>
<td>14</td>
<td>PX_SIP_TWAIT</td>
<td>float, for TWait default value for waiting an operator action.</td>
</tr>
<tr>
<td>15</td>
<td>PX_IMS_SUT_UE2_HOME_DOMAIN</td>
<td>charstring, for identity of the tester UE2 local domain.</td>
</tr>
</tbody>
</table>
## A.2.2 PIXIT for AS Testing

In addition to the PIXIT in table A.2, PICIT items A.1/6, A.1/7 and items from A.1/15 to A.1/18 apply.

### Table A.2: PIXIT items for AS testing

<table>
<thead>
<tr>
<th>Id</th>
<th>Identifier</th>
<th>Type / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>PX_IMS_SUT_UE2_PUBLIC_USER</td>
<td>charstring, for identity of the tester UE2 local user.</td>
</tr>
<tr>
<td>17</td>
<td>PX_IMS_SUT_UE3_HOME_DOMAIN</td>
<td>charstring, for identity of the tester UE3 local domain.</td>
</tr>
<tr>
<td>18</td>
<td>PX_IMS_SUT_UE3_PUBLIC_USER</td>
<td>charstring, for identity of the tester UE3 local user.</td>
</tr>
</tbody>
</table>

## A.2.3 General PIXIT

The following PIXIT items apply for all types of IUT.

### Table A.3: General PIXIT items (SDP and Synchronization)

<table>
<thead>
<tr>
<th>Id</th>
<th>Identifier</th>
<th>Type / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PX_SIP_SDP_dyn</td>
<td>charstring, for SDP dynamic port.</td>
</tr>
<tr>
<td>2</td>
<td>PX_SIP_SDP_b_modifier</td>
<td>charstring, for SDP bandwidth modifier.</td>
</tr>
<tr>
<td>3</td>
<td>PX_SIP_SDP_b_bandwidth</td>
<td>integer, for SDP bandwidth value.</td>
</tr>
<tr>
<td>4</td>
<td>PX_SIP_SDP_encoding</td>
<td>charstring, for SDP media attribute encoding supported by the IUT.</td>
</tr>
<tr>
<td>5</td>
<td>PX_TSYNC_TIME_LIMIT</td>
<td>float, Default time limit for a sync client to reach a synchronization point.</td>
</tr>
<tr>
<td>6</td>
<td>PX_TSHUT_DOWN_TIME_LIMIT</td>
<td>float, Default time limit for a sync client to finish its execution of the shutdown default.</td>
</tr>
</tbody>
</table>
Annex B (informative):
TTCN-3 library modules

B.1 Electronic annex, zip file with TTCN-3 code

The TTCN-3 library modules are contained in archive ts_18601403v030101p0.zip which accompanies the present document.
Annex C (informative):
Validation Report

C.1 Test Suite Validation Level
Level 3 validation (strong) was achieved.

C.2 TTCN-3 Edition
Release 4.3.1 of the TTCN-3 documents [7] were used.

C.3 TTCN-3 Tool(s)
The following TTCN-3 tools were used:
- Elvior TestCast®
- Ericsson® Titan
- Testing Technologies TTWorkbench®

C.3.1 TTCN-3 Tool Elvior TestCast®

C.3.1.1 Identification of the TTCN-3 Tool Elvior TestCast®
Elvior TestCast® T3 Version 6.4.3, no plugins necessary.

C.3.1.2 Compilation status
Full compilation, without any errors.

C.3.2 TTCN-3 Tool Ericsson® Titan

C.3.2.1 Identification of the TTCN-3 Tool Ericsson® Titan
Ericsson® Titan as in file ttcn3-1.8.pl4-mingw, no plugins necessary.

C.3.2.2 Compilation status
Partial compilation, as xml data structure were not supported by this version.
C.3.3 TTCN-3 Tool Testing Technologies TTWorkbench®

C.3.3.1 Identification of the TTCN-3 Tool Testing Technologies TTWorkbench®


C.3.3.2 Compilation status

Full compilation, without any errors.

C.3.4 Test Platform(s)

The test cases were run on the execution environment of the Testing Technology TTworkbench® tool mentioned in clause C.3.3.
# History

## Document history

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3.1.1</td>
<td>January 2012</td>
<td>Publication</td>
</tr>
</tbody>
</table>