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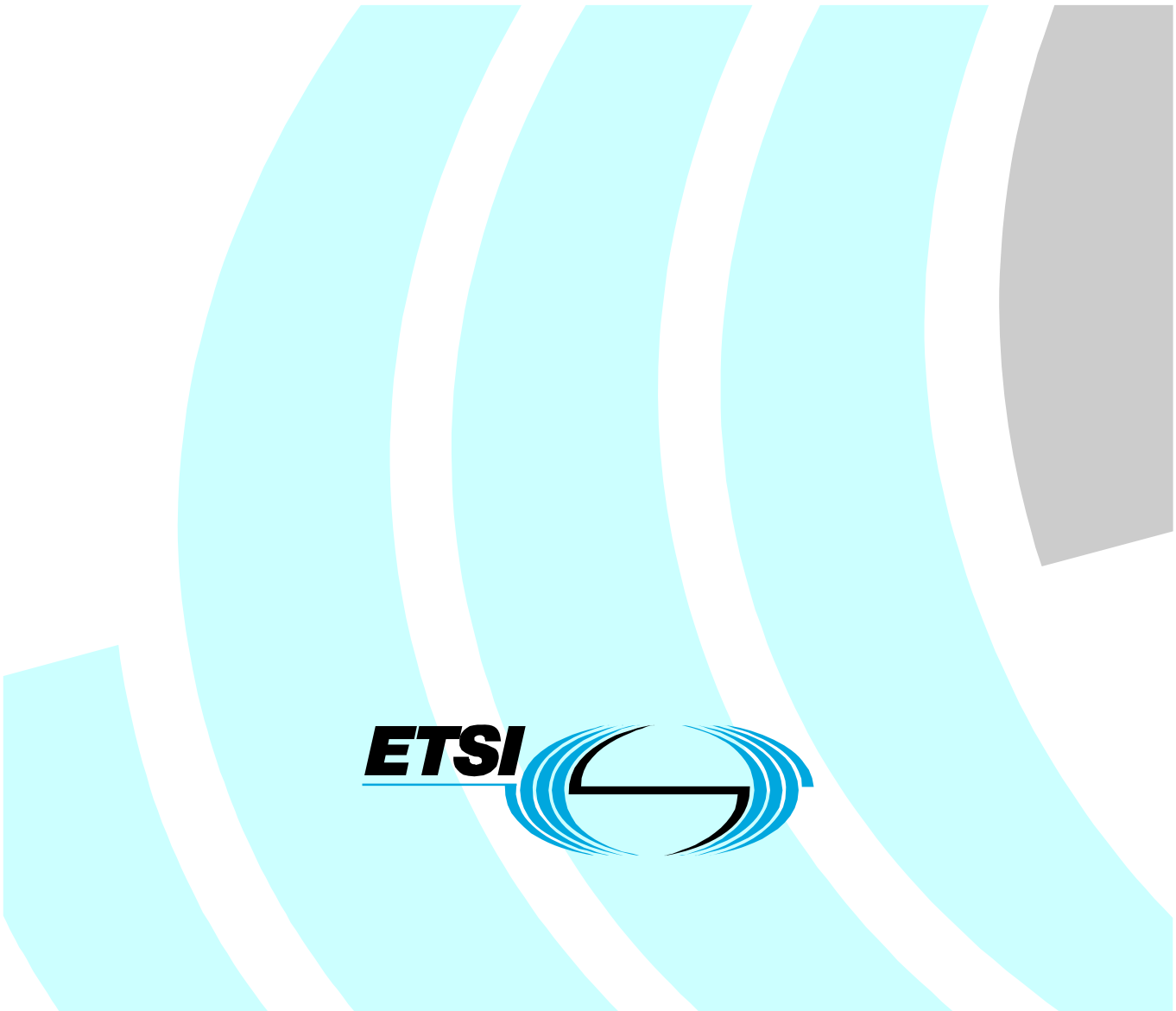
Technical Specification

Technical Committee for IMS Network Testing (INT);
IMS NNI Interworking Test Specifications;
Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT)



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Contents

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Foreword

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

The present document is part 3 of a multi-part deliverable covering IMS NNI Interworking Test Specifications, as identified below:

Part 1: "Test Purposes for IMS NNI Interworking";

Part 2: "Test descriptions for IMS NNI Interworking";

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

1 Scope

The present document describes the Abstract Test Suite (ATS) to test interoperability at IMS NNI for IP multimedia call control protocol based on [1]. The ATS has been specified on the basis of the Test Descriptions for IMS NNI interoperability testing presented in TS 186 011-2 [3]. It defines a TTCN-3 framework as well as codec and adapter requirements for analysing interoperability test execution traces generated from the manual or automatic execution of IMS interoperability tests.

The scope of this ATS is not to cover all requirements specified in [1]. It has only assesses requirements that are observable at the NNI between two IMS core network implementations specified in TS 186 011-1 [2].

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

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 indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI ES 283 003 (V1.8.0): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 (Release 7), modified]".

[2] ETSI TS 186 011-1 (V2.2.1): "Technical Committee for IMS Network Testing (INT); IMS NNI Interworking Test Specifications; Part 1: Test Purposes for IMS NNI Interworking".

[3] ETSI TS 186 011-2 (V2.2.1): "Technical Committee for IMS Network Testing (INT); IMS NNI Interworking Test Specifications; Part 2: Test description for IMS NNI Interworking.".

[4] ETSI ES 201 873-5: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 5: TTCN-3 Runtime Interface (TRI)".

[5] ETSI ES 201 873-6: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 6: TTCN-3 Control Interface (TCI)".

[6] ETSI ES 201 873-10: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 10: TTCN-3 Documentation Comment Specification".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] 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".

[i.2] ETSI EG 202 568: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); Testing: Methodology and Framework".

3 Abbreviations

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

AS	(IMS) Application Server
ATS	Abstract Test Suite
CSCF	Call Session Control Function
IBCF	Interconnection Border Control Gateway
I-CSCF	Interrogating CSCF
IMS	IP Multimedia Subsystem
IP	Internet Protocol
MTC	Main Test Component
NNI	Network to Network Interface
PCO	Point of Control and Observation
P-CSCF	Proxy CSCF
PO	Point of Observation
PTC	Parallel Test Component
S-CSCF	Serving CSCF
SIP	Session Initiation Protocol
SUT	System Under Test
TA	Test Adapter
TD	Test Description
TP	Test Purpose
TSI	Test System Interface
TTCN-3	Testing and Test Control Notation 3
UE	User Equipment

4 Overview

4.1 Network architecture

The ATS is defined to observe the SIP communication at the Gm, Mw and ISC interface of two IMS core networks for interoperability testing. Figure 1 shows a general architecture of two IMS core networks including the related interfaces.

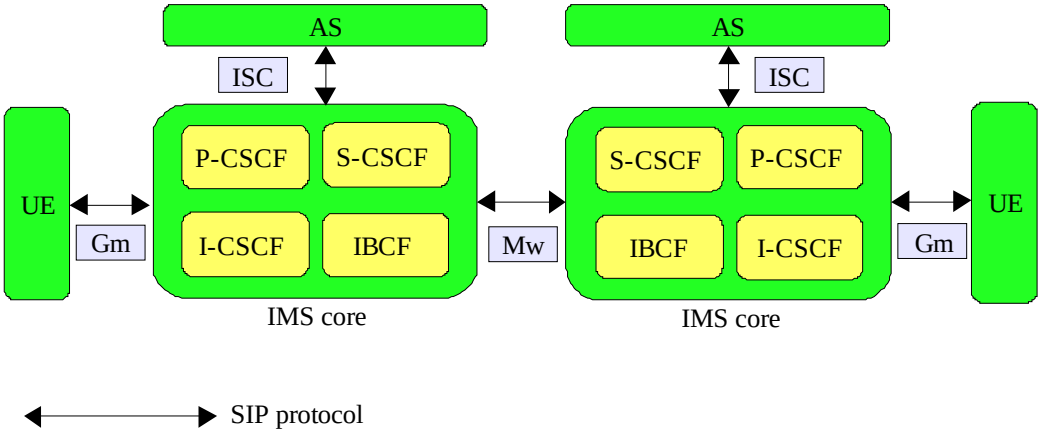

Figure 1: Network Architecture

4.1.1 Core IMS Nodes

The P-CSCF, S-CSCF, I-CSCF and the IBCF are considered to be within a "black box" for testing purposes, i.e. the System Under Test (SUT). Interfaces within the IMS are considered internal and not observable for testing purposes. The Mw interface between two IMS core networks is used as point of observation (PO) for NNI interoperability tests.

4.1.2 External IMS Nodes

4.1.2.1 UE

The UE is considered to act as stimulus node in this test specification. The Gm interface between the P-CSCF and the UE is used as a Point of Control and Observation (PCO) for NNI interoperability tests.

4.1.2.2 AS

The Application Server (AS) is considered to act as a stimulus node in this test specification. The ISC interface between the S-CSCF and the AS is used as Point of Control and Observation (PCO) for NNI interoperability tests.

5 Test configuration

The test configuration is described in detail in TS 186 011-2 [3].

6 Test system architecture

Figure 2 illustrate the IMS NNI interoperability test system. The test system architecture is based on the general TTCN-3 test system architecture specified in ES 201 873-6 [5] and ES 201 873-5 [4].

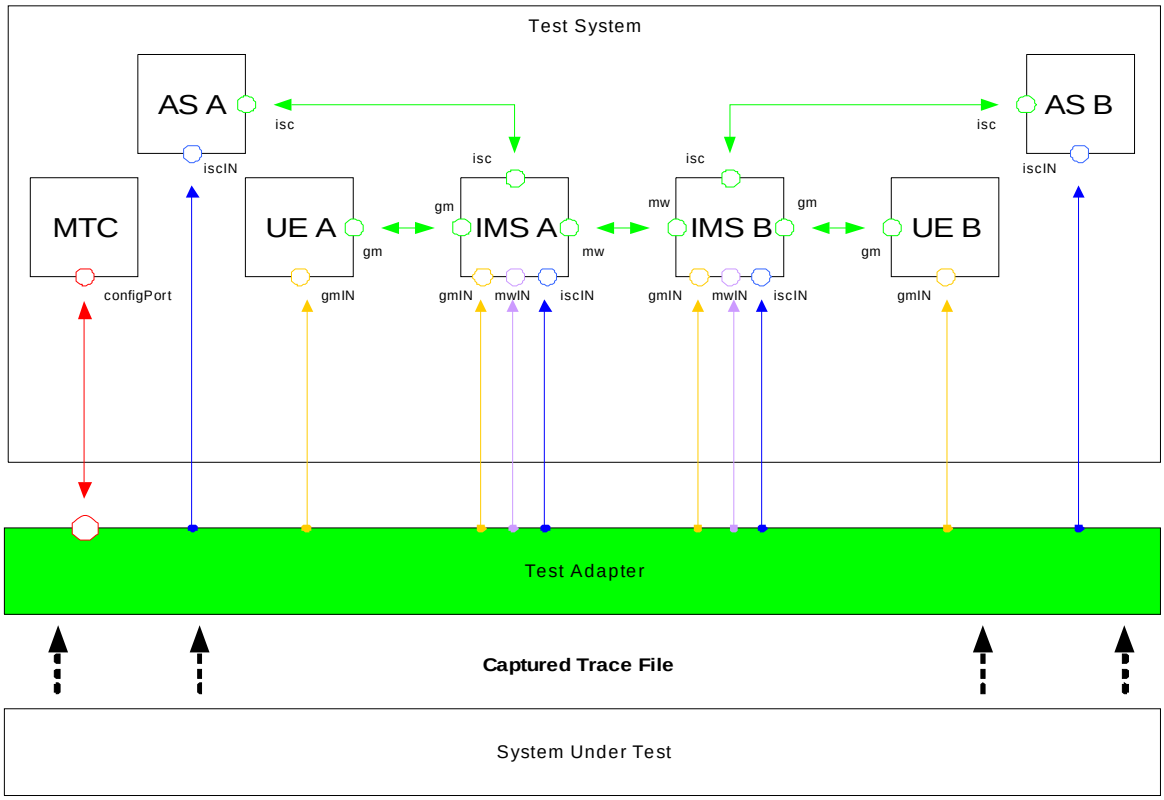

Figure 2: IMS NNI Test Configuration

The tasks of the different TTCN-3 components shown in figure 2 are:

- The Main Test Component (MTC) plays the role of the test coordinator, i.e. creating, terminating and evaluating the results of PTCs (Parallel Test Components) used in test cases. The association of IP addresses and ports with PTC ports is done by the MTC via its configuration port (red highlighted).
- PTCs play the role of lower testers. They use the relevant interface ports (orange, purple and blue highlighted) to receive and analyze incoming messages from the Test Adapter (TA). In the simulation test execution mode, PTCs also communicate with each other via intercomponent communication ports.

The TA realizes the communication between the test system and the SUT. In this specific case the TA filters SIP messages from a IMS core interoperability test trace file and enqueues them to TSI ports based on associated IP addresses and ports.

6.1 Test Adapter requirements

The test system needs to provide a TA that is able to read a trace file from previous test session including trace information from all relevant interfaces, i.e. Gm, ISC, Mw, and IC. Based on the configured association of IP addresses and ports with TSI ports the TA should enqueue SIP messages matching these addresses and ports in the order that they appear in the trace.

6.1.1 Test adapter configuration

The test system expects the TA to be configurable by primitives sent via the configuration TSI port. These primitives provide all necessary information required to enqueue captured SIP messages at specific TSI ports. To trigger the exchange of these configuration primitives the following functions are used:

Function	Parameters	Description
f_cf_Port()	p_addr p_ignore	This function must be called directly after mapping a PTC port to the TSI to configure the association of IP addresses and ports with a TSI port. The p_addr contains a list of IP address related to the previously mapped TSI port. The p_ignore parameter can be used to indicate how many SIP messages should be skipped on the given interface before starting to enqueue.
f_play_trace()	None	This function triggers the test adapter to start with the enqueueing of the captured SIP messages via the configuration TSI port.

6.2 Codec requirements

The test system needs to provide a full SIP codec which includes also decoding of XML message bodies.

7 Test design

The ATS has been specified using a library approach. Each library layer is composed of multiple TTCN-3 modules. The libraries are defined in different layers which build on top of each other:

- TracePlay Library: A collection of common TTCN-3 definitions and functions related to the configuration of the test adapter. These definitions are independent from SIP handling and can therefore also be reused for analysis of other IP based traces.
- SIP Library: A collection of TTCN-3 definitions and functions related to the SIP base standards and reusable only in context of SIP test suite implementations.
- IMS Library: TTCN-3 definitions specific to this particular test suite e.g. test case statements, SUT and adapter configurations, etc.

ATS specific TTCN-3 modules are organized as follows:

- TypesAndValue: This type of module collects TTCN-3 type definitions relevant for a specific layer. If applicable on module should be associated per specification document.
- TestSystem: Specifies a TTCN-3 component types and port types reflecting the interfaces.
- TestInterface: Contains only TTCN-3 port and component type definitions.
- TestConfiguration: Contains a collection of predefined functions to configure the test system like mapping or connecting the component ports.
- TestCases: A compilation of TTCN-3 test case definitions relevant for the specific layer.
- ModuleParameter: Collects all module parameters.
- Templates: A Collections of TTCN-3 templates specified based on the types defined in the layer.
- Functions: A collection of generic predefined functions for each interface which are defined for a specific library and useful for other libraries built on top of this library. The functions are independent of a particular interoperability test description (TD) or test purpose (TP). Parameters to these functions include a list of templates leading to a pass verdict, list of templates leading to a fail verdict, as well as a number of messages to be ignored prior to checking a received message.

- Behavior: A collection of TTCN-3 functions specific to a particular TD or TP.

7.1 Naming Conventions

The naming convention used in this test suite are based on the general principles specified in [i.2].

7.2 Documentation

In order to allow browsing of the ATS without the use of a specific TTCN-3 test development tool, this test suite has been documented using TTCN-3 documentation comments defined in [6]. The tags and their usage are summarized in the table below.

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.
@url	Associates references to external files or web pages with a particular piece of TTCN-3 code, e.g. a protocol specification or standard.
@return	Provides additional information on the value returned by a given function.
@member	Documents a member of structured TTCN-3 definitions.
@param	Documents a parameter of parameterized TTCN-3 definitions.
@version	States the version of a particular piece of TTCN-3 code.

7.3 Mapping of test descriptions to test cases

The test cases defined in the ATS follow the naming convention TC_<TD_ID>.

8 Test execution

8.1 Execution modes

The ATS contains two different execution modes: A normal mode and a simulation mode. The execution mode can be enabled by setting the PX_TA_SIMULATION_MODE module parameter to true.

8.1.1 Normal mode

In the normal mode the captured messages will be enqueued at the test component associated with the destination IP address. This mode is useful to see all captured message in TTCN-3 logging in case of IP address conflicts, e.g., when a IMS node receives a message from a unspecified IP address.

8.1.2 Simulation mode

In the simulation mode all messages are enqueued at the test component associated with the source IP address. This test component then forwards this message to the destination component via intercomponent communication. This mode enables the illustration of the captured call flow in TTCN-3 logging.

8.2 PIXIT

8.2.1 Address List Information

8.2.1.1 User A

- PX_ETS_UE1_ADDR: Address List of User A containing Domain, IP address and Port number.
- PX_ETS_UE1_SIP: User A SIP user name.
- PX_ETS_UE1_SIP_NUMBER: User A SIP user number (phone number using SIP schema).
- PX_ETS_UE1_TEL_NUMBER: User A phone number.
- PX_ETS_UE1_BARRED: SIP user name of a barred user.
- PX_ETS_UE1_UNKNOWN: SIP user name of an unknown user.

8.2.1.2 User B

- PX_ETS_UE2_ADDR: Address List of User B containing Domain, IP address and Port number.
- PX_ETS_UE2_SIP: User B SIP user name.
- PX_ETS_UE2_SIP_NUMBER: User B SIP user number (phone number using SIP schema).
- PX_ETS_UE2_TEL_NUMBER: User B phone number.
- PX_ETS_UE2_BARRED: SIP user name of a barred user.
- PX_ETS_UE2_UNKNOWN: SIP user name of an unknown user.

8.2.1.3 IMS A

- PX_ETS_PCSCF1_ADDR: Address List of P-CSCF containing Domain, IP address and Port number.
- PX_ETS_SCSCF1_ADDR: Address List of S-CSCF containing Domain, IP address and Port number.
- PX_ETS_ICSCF1_ADDR: Address List of I-CSCF containing Domain, IP address and Port number.
- PX_ETS_IBCF1_ADDR: Address List of IBCF containing Domain, IP address and Port number.
- PX_ETS_AS1_ADDR: Address List of AS containing Domain, IP address and Port number.

8.2.1.4 IMS B

- PX_ETS_PCSCF2_ADDR: Address List of P-CSCF containing Domain, IP address and Port number.
- PX_ETS_SCSCF2_ADDR: Address List of S-CSCF containing Domain, IP address and Port number.
- PX_ETS_ICSCF2_ADDR: Address List of I-CSCF containing Domain, IP address and Port number.
- PX_ETS_IBCF2_ADDR: Address List of IBCF containing Domain, IP address and Port number.
- PX_ETS_AS2_ADDR: Address List of AS containing Domain, IP address and Port number.

8.2.2 Miscellaneous

- PX_TA_SESSION_ID: A parameter that may be used by the test adapter to locate a trace file, e.g. folder name.

- PX_ENQUEUE_TIMER: Guard time to stop waiting for messages from test adapter.
- PX_TA_SIMULATION_MODE: Indicates the mode used for test execution.
- PX_TA_IGNORE_MESSAGES: Indicates if messages should ignored by the test adapter.
- PX_TA_TC_0XX_IGNORE: Defines how many messages should be skipped in the test adapter before starting to send messages to TSI ports. Note that XX indicates the specific test case number.

Annex A (normative): zip file with TTCN-3 code

A.1 The ATS in TTCN-3 core (text) format

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

The TTCN-3 core (text) representation corresponding to this ATS is contained in an ASCII file(s) (IMS_TestSystem.**ttcn3** contained in archive ts_18601103v020201p0.zip) which accompanies the present document.

Where an ETSI Abstract Test Suite (in TTCN-3) is published in both core and tabular format these two forms shall be considered equivalent. In the event that there appears to be syntactical or semantic differences between the two then the problem shall be resolved and the erroneous format (whichever it is) shall be corrected.

History

Document history		
V2.2.1	September 2009	Publication