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**Integrated Services Digital Network (ISDN);
Signalling System No.7;
ISDN User Part (ISUP);
Application transport mechanism;
Part 3: Test Suite Structure and
Test Purposes (TSS&TP) specification**

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Contents

Intellectual Property Rights	4
Foreword	4
1 Scope	5
2 References	5
3 Definitions and abbreviations	6
3.1 Definitions	6
3.2 Abbreviations	7
4 Implementation under test and test methods	8
4.1 Identification of the system and implementation under test	8
4.2 ATM and testing configuration for ISUP v3 - Application Transport Mechanism	9
4.3 Local exchanges - PIN/PAN	9
4.4 Transit exchanges - PIN/PAN	10
4.5 Transit exchanges - ISUP	10
5 Test Suite Structure (TSS)	11
6 Test purposes (TP)	12
6.1 Introduction	12
6.2 Test purpose (TP) naming convention	12
6.2.1 Source of test purpose definition	12
6.2.2 Test purpose structure	12
6.3 Test purposes for the SS7, Application Transport Mechanism (APM)	12
6.3.1 Application Transport Mechanism (APM ASE)	13
6.3.1.1 Normal Procedures - Sending	13
6.3.1.2 Normal Procedures - Receiving	13
6.3.1.2.1 Procedures at other times	14
6.3.1.2.2 Reception of the Send APM Transit primitive	16
6.3.1.3 Send of acknowledgement	17
6.3.1.4 Segmentation	17
6.3.1.4.1 Procedures for segmentation	17
6.3.1.4.2 Procedures for re-assembly	19
6.3.2 Unidentified Context and Error Handling (UCEH ASE)	21
6.3.2.1 Unidentified Context handling (PAN)	21
6.3.2.2 Unidentified Context handling (PIN)	23
6.3.2.3 Reassembly Error Handling	24
6.3.2.4 Exceptional Procedures - Context identifier error	25
6.3.2.5 Exceptional Procedures - Unrecognized Reason value	25
7 Test Coverage	26
Bibliography	27
History	28

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Signalling Protocol and Switching (SPS).

The present document is part 3 of a multi-part deliverable covering Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Application transport mechanism, as identified below:

- Part 1: "Protocol Specification" [ITU-T Recommendation Q.765, modified]";
- Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification";
- Part 3: "Test Suite Structure and Test Purposes (TSS&TP) specification";**
- Part 4: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) specification".

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1 Scope

The present document contains the validation (conformance) test specification for the Application Transport Mechanism defined in EN 301 069-1 [1]. The present document applies only to exchanges having implemented the ISUP v3 protocol specification for the Application Transport Mechanism of the exchange. It is applicable for validation testing of all types of exchanges as defined in the ISUP v3 protocol specification. It does not deal with compatibility testing.

The main body of the present document presents the Test Suite Structure and Test Purposes (TSS&TP) for the Application Transport Mechanism (APM). EN 301 069-2 [9] provides the protocol implementation conformance statements (PICS) for the Application Transport Mechanism defined in compliance with the relevant requirements and in accordance with the guidance given in ISO/IEC 9646-7 [4].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

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- [1] ETSI EN 301 069-1 (V1.2): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Application transport mechanism; Part 1: Protocol specification [ITU-T Recommendation Q.765, modified]"
- [2] ISO/IEC 9646-1 (1997): "Information technology - Open Systems Interconnection -Conformance testing methodology and framework - Part 1: General Concepts".
- [3] ISO/IEC 9646-3 (1997): "Delivery 6 - Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN)".
- [4] ISO/IEC 9646-7 (1997): "Information technology - Open Systems Interconnection -Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".
- [5] ITU-T Recommendation E.164 (1997): "The international public telecommunication numbering plan".
- [6] ITU-T Recommendation Q.761: "Signalling System No. 7 - ISDN User Part functional description".
- [7] ITU-T Recommendation Q.701 (1993): "Functional description of the message transfer part (MTP) of Signalling System No. 7".
- [8] ITU-T Recommendation Q.707 (1988): "Testing and maintenance".
- [9] ETSI EN 301 069-2: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Application transport mechanism; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [10] ITU-T Recommendation Q.762: "Signalling System No. 7 - ISDN user part general functions of messages and signals".

- [11] ITU-T Recommendation Q.763 (1997): "Formats and codes of the ISDN User Part of Signalling System No. 7".
- [12] ITU-T Recommendation Q.702 (1988): "Signalling data link".
- [13] ITU-T Recommendation Q.703 (1996): "Signalling link".
- [14] ITU-T Recommendation Q.704 (1996): "Signalling network functions and messages".
- [15] ITU-T Recommendation Q.705 (1993): "Signalling network structure".
- [16] ITU-T Recommendation Q.706 (1993): "Message transfer part signalling performance".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

- terms defined in ISDN User Part (ISUP) reference specification EN 301 069-1 [1];
- terms defined in ISO/IEC 9646-1 [2], ISO/IEC 9646-3 [3] and in ISO/IEC 9646-7 [4].

In particular, the following terms apply:

Abstract Test Case (ATC): complete and independent specification of the actions required to achieve a specific test purpose, defined at the level of abstraction of a particular Abstract Test Method, starting in a stable testing state and ending in a stable testing state (see ISO/IEC 9646-1 [2], subclause 3.3.3).

Abstract Test Method (ATM): description of how an IUT is to be tested, given at an appropriate level of abstraction to make the description independent of any particular realization of a Means of Testing, but with enough detail to enable abstract test cases to be specified for this method (see ISO/IEC 9646-1 [2], subclause 3.3.5).

Implementation Under Test (IUT): implementation of one or more OSI protocols in an adjacent user/provider relationship, being part of a real open system which is to be studied by testing (see ISO/IEC 9646-1 [2], subclause 3.3.43).

ISDN number: number conforming to the numbering and structure specified in ITU-T Recommendation E.164 [5].

Means of Testing (MOT): combination of equipment and procedures that can perform the derivation, selection, parameterization and execution of test cases, in conformance with a reference standardized ATS, and can produce a conformance log (see ISO/IEC 9646-1 [2], subclause 3.3.54).

point of control and observation: point within a testing environment where the occurrence of test events is to be controlled and observed, as defined in an Abstract Test Method (see ISO/IEC 9646-1 [2], subclause 3.3.64).

pre-test condition: setting or state in the IUT which cannot be achieved by providing stimulus from the test environment.

Protocol Implementation Conformance Statement (PICS): statement made by the supplier of a protocol claimed to conform to a given specification, stating which capabilities have been implemented (see ISO/IEC 9646-1 [2], subclause 3.3.39 and subclause 3.3.80).

Protocol Implementation eXtra Information for Testing (PIXIT): statement made by a supplier or implementor of an IUT (protocol) which contains or references all of the information related to the IUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the IUT (see ISO/IEC 9646-1 [2], subclause 3.3.41 and subclause 3.3.81).

System Under Test (SUT): real open system in which the IUT resides (see ISO/IEC 9646-1 [2], subclause 3.3.103).

3.2 Abbreviations

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

AI	Application Interface
APM	Application Transport Mechanism
APM_user	Application Transport Mechanism user Protocol Control e.g. PSS1
ASE	Application Service Entity
ASP	Abstract Service Primitive
ATM	Abstract Test Method
ATS	Abstract Test Suite
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
IUT	Implementation Under Test
LAB	Link AB
LAC	Access Signalling PCO
LT	Lower Tester
MOT	Means Of Testing
MTP	Message Transfer Part
NNI	Network Nodal Interface
PAN	Public Addressed Node
PCO	Point of Control and Observation
PICS	Protocol Implementation Conformance Statement
PIN	Public Initiated Node
PIXIT	Protocol Implementation eXtra Information for Testing
PSS1	Private network Q reference point Signalling System number 1
SP	Signalling Point
SS7	Signalling System N°7
SUT	System Under Test
TCP	Test Co-ordination Procedures
TE_P	Transit Exchange PIN/PAN
TP	Test Purpose (context dependent)
TSS	Test Suite Structure
TSS&TP	Test Suite Structure and Test Purposes
TTCN	Tree and Tabular Combined Notation
UAX	Access to the APM-user
UCEH	Unidentified Context and Error Handling
UT	Upper Tester
VPN	Virtual Private Network

The ISUP message acronyms can be found in table 2 of ITU-T Recommendation Q.762 [10].

The APM primitives acronyms can be found in the different tables of EN 301 069-1 [1].

The following abbreviations apply for ISUP parameters and parameter values:

ACI	Application Context Identifier
APP	Application Transport Parameter
ATII	Application Transport Instruction Indicator
PRI	Pre-Release
SLR	Segmentation Local Reference

4 Implementation under test and test methods

4.1 Identification of the system and implementation under test

The system under test (SUT) is an exchange. The implementation under test (IUT) is the ISUP v3 implementation in this exchange, mainly the part responsible for the Application Transport Mechanism (APM), as shown in figure 1.

The protocol functions for the Application Transport Mechanism relates to the signalling associations with a bearer (ISUP). Therefore the defined ISUP Basic Call and its associated formats and codes [11] are required to support the Application Transport Mechanism. The following main subjects have to be considered in this area:

- APM-user Protocol Control (APM-user Application Service Element)
- Application Transport Mechanism Protocol Control (APM Application Service Element)
- ISUP Basic Call (ISUP Application Service Element)

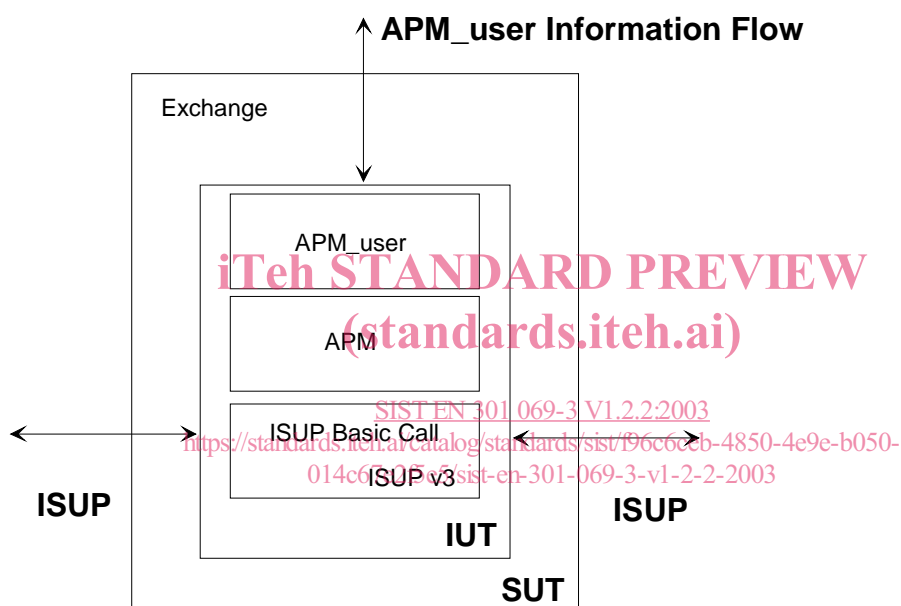


Figure 1: The system under test

The APM user primitives or APM user information flow can be observed through the individual reference point defined for each APM user or application process, respectively. In case of a PSS1 ASE (APM-user ASE for the VPN application) for example, the Q reference point is applicable.

The ISUP signalling protocol can be observed on the Signalling System No.7 (SS7) link on the Network Nodal Interface (NNI).

From the ISUP/APM reference standard several types of exchanges (or roles) can be identified:

- Local Exchanges in case of a Public Initiating Node (PIN) or a Public Addressed Node (PAN) with several APM-users;
- Transit Exchanges in the role of a PIN or PAN with several APM-users;
- National Transit Exchanges as defined in ITU-T Recommendation Q.761 [6].

The National Transit Exchanges pass on the APM messages without checking the messages. In the case of a PIN or PAN the messages related to an APM call are checked according to the corresponding APM user. If the peer APM user does not reside in the exchange, the call is passed on to the destination or to the addressed location (PAN).

4.2 ATM and testing configuration for ISUP v3 - Application Transport Mechanism

The Abstract Test Method (ATM) chosen for the Application Transport Mechanism specification is the distributed multi-party test method. The ATM is defined at an appropriate level of abstraction so that the test cases may be specified appropriately, without adding restrictions to the implementation under test.

The ATS is written in concurrent TTCN.

4.3 Local exchanges - PIN/PAN

As mentioned above, the IUT can be tested within different configurations. The following text describes the test configuration for the IUT where the software for ISUP V3 and also the APM part reside in a local exchange.

Figure 2 shows the logical test components of the adopted test configuration. The main test component is located on the right side of the IUT; it contains the ISUP part. On the left side there is a parallel test component which covers the APM part.

To observe and control the message flow on the ISUP and APM side for each side, a Point of Control and Observation (PCO) is needed. The PCO for the ISUP link is abbreviated with an 'L' followed by two letters indicating the interface. The naming convention for the PCO, specifying the Upper Tester, is the same but having an 'U' instead of the 'L' as the first character.

There is no defined interface from ISUP (the IUT) towards the APM user side. For testing the primitives specified in EN 301 069-1 [1], which are sent between the APM Application Service Element (ASE) and the APM user ASE, the above mentioned Upper Tester (UT) is needed. It is therefore necessary to make use of an application interface (AI) including a PCO and to use the specified primitive names given in EN 301 069-1 [1] for the abstract service primitives (ASPs) to be used on this PCO.

The LAB PCO is used by the lower tester (LT) to control and observe the ISUP on the signalling to the exchange. The other UAX PCO is needed to check if the expected primitives for the APM user are correctly generated by the exchange. The PDUs on this PCO are chosen at an appropriate level of abstraction.

The test co-ordination procedures (TCP) allow for communication between the testers. The test components are mostly implicitly co-ordinated (asynchronously); the TCPs are only used when it is necessary to obtain the verdict from the parallel test component.

This configuration to test the local exchanges is presented in figure 2.

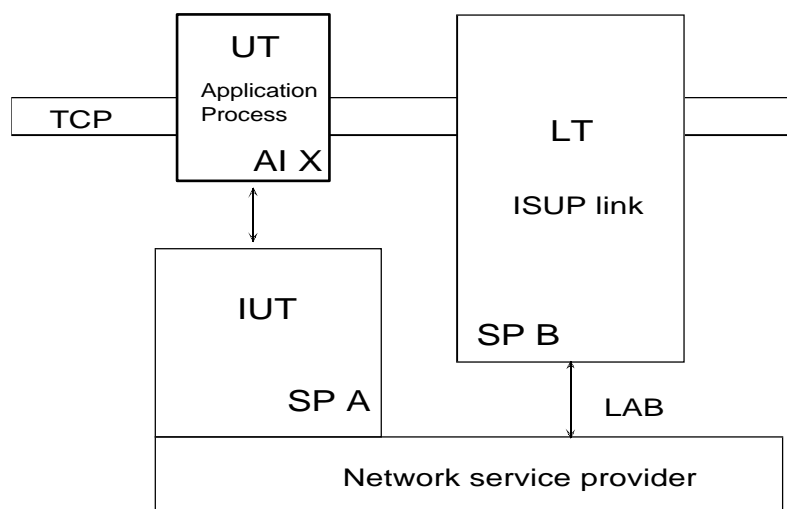


Figure 2: APM Test configuration for local exchanges

4.4 Transit exchanges - PIN/PAN

For this configuration the same rules and definitions are applicable as used in subclause 5.3.

4.5 Transit exchanges - ISUP

The configuration proposed for testing transit exchanges is shown in figure 3. In order to test the protocol and functionality of transit exchanges, one needs to consider the incoming and outgoing side of the SUT.

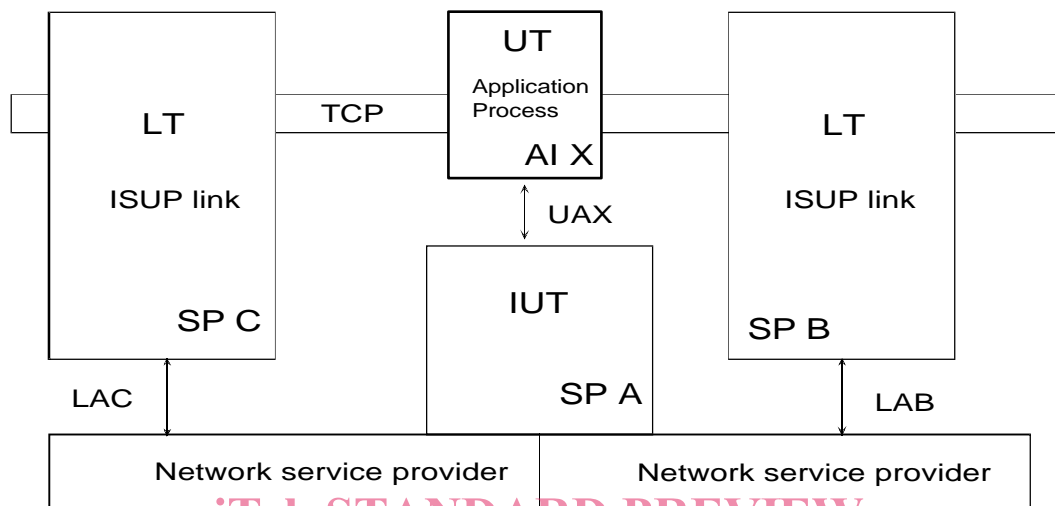


Figure 3: APM Test configuration for transit exchanges

The IUT is observed and controlled from two ISUP links with associated circuits. The points of Control and Observation (PCO) are labelled LAB on the one side and LAC on the other.

The LAB and LAC PCOs are used by the Lower Testers (LT) for controlling the ISUP signalling links.

The underlying network service provider is the Message Transfer Part (MTP) protocol as specified in ITU-T Recommendations Q.701 [7] to Q.707 [8].

The Test Co-ordination Procedures (TCP) allow for communication between the testers. The test components are mostly implicitly co-ordinated (asynchronously); the TCPs are only used when it is necessary to obtain the verdict from the parallel test component.

The Upper Tester (UT) and its UAX PCO is not used in this configuration.