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8 [[]HJbc`ca fYy`Y`n`]bhY[f]fUb]a]gkcf]hj Ua]fG8 BkE`G][bU]nUWY`U`yH`+`fGG+LkE`
HfYhUfUn`]]WU`G8 Bli dcfUVb]y`Y[UXYUfG] Dk`nUa YXbUfcXb]`j a Ygb]`E`'`"XY`.
5 VgUfU`hb]dfYg_i`yUb]`b]n`f5 HGL`]b`XY`bUXcXU`bU]bZ`fa UWY`U`nUdfYg_i`yUb`Y`
]nj YXVY`dfcfc`c`UfD`L`+LkE`DfcZ`fa UgdYWZ`UWY`U`nUcgbcj bYgkcf]hj Y

Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 33: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for basic services

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33.080	Digitalno omrežje z integriranimi storitvami (ISDN)	Integrated Services Digital Network (ISDN)
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European Standard (Telecommunications series)

**Integrated Service Digital Network (ISDN);
Signalling System No.7;
ISDN User Part (ISUP) version 3 for the international interface;
Part 33: Abstract Test Suite (ATS) and partial Protocol
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Contents

Intellectual Property Rights	5
Foreword.....	5
1 Scope	7
2 References	7
3 Definitions and abbreviations.....	8
3.1 Definitions	8
3.2 Abbreviations	9
4 Implementation under test and test methods	10
4.1 Identification of the system and implementation under test.....	10
4.2 ATM and testing configuration for ISUP '92	11
4.2.1 Intermediate exchanges.....	11
4.2.2 Local exchanges.....	13
4.2.3 Master-slave aspects in the test configuration	14
5 Conventions used within the ATS.....	15
5.1 Test suite parameters, constants and variables	15
5.2 Test case variables.....	15
5.3 ASP constraints	15
5.4 Timers	15
5.5 Test suite operations.....	15
5.6 Aliases	15
5.7 Test case and step identifiers.....	16
5.8 Constraints.....	16
5.9 Dynamic behaviour part.....	16
5.10 Pre-test conditions.....	17
6 Test Suite Structure (TSS).....	18
7 Test Purposes (TP)	20
7.1 Introduction	20
7.1.1 Test Purpose (TP) naming convention.....	20
7.1.2 Source of test purpose definition	21
7.1.3 Test Purpose structure.....	21
7.2 Test Purposes for the Basic Call.....	21
7.2.1 CSSV Circuit supervision and signalling supervision	21
7.2.2 NCS Normal call setup ordinary speech calls.....	47
7.2.3 NCR Normal call release	53
7.2.4 UCS Unsuccessful call setup	54
7.2.5 AS Abnormal situations.....	55
7.2.6 SCS Special call setup	57
7.2.7 BS Bearer services	62
7.2.8 CUF Congestion and user flow control.....	67
7.2.9 EC Echo control.....	68
7.2.10 TAR Temporary alternate routing	73
7.2.11 Hop Counter Procedure (HOP).....	73
7.2.12 Call Collect Request Procedure (CALLCOL)	74
7.2.13 N × 64 kbit/s connection type (N × 64 k)	74
8 Test coverage.....	83
8.1 General remarks	83
9 Conformance to the PICS proforma specification.....	83
Annex A (informative): Protocol Conformance Test Report (PCTR) Proforma for ISDN User Part (ISUP) v3	84

A.1	Identification summary.....	84
A.1.1	Protocol conformance test report.....	84
A.1.2	IUT identification.....	84
A.1.3	Testing environment.....	84
A.1.4	Limits and reservation.....	85
A.1.5	Comments.....	85
A.2	IUT Conformance status	85
A.3	Static conformance summary	85
A.4	Dynamic conformance summary.....	85
A.5	Static conformance review report.....	86
A.6	Test campaign report.....	86
A.7	Observations.....	95
Annex B (informative): PIXIT proforma for ISDN User Part (ISUP) v3 basic call		96
B.1	Identification summary.....	96
B.2	Abstract test suite summary	96
B.3	Test laboratory.....	96
B.4	Client identification.....	96
B.5	System under test	97
B.6	Ancillary protocols.....	97
B.7	Protocol information for ISUP.....	97
B.7.1	Protocol identification.....	97
B.7.2	IUT information - PIXIT proforma tables.....	97
B.7.2.1	General configuration.....	97
B.7.2.2	Parameter values.....	99
B.7.2.3	Timer values.....	99
B.7.2.4	Procedural information.....	100
Annex C (normative): ATS for ISDN User Part (ISUP) v3 basic call control procedures.....		101
C.1	The TTCN Graphical form (TTCN.GR).....	101
C.2	The TTCN Machine Processable form (TTCN.MP).....	101
Annex D (informative): Bibliography.....		102
History		103

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

The present document is part 33 of a multi-part deliverable covering the ISDN User Part (ISUP) version 3 for the international interface, as identified below:

- Part 1: "Basic services [ITU-T Recommendations Q.761 to Q.764 (1999) modified]";
- Part 2: "ISDN supplementary service [ITU-T Recommendation Q.730 (1999) modified]";
- Part 3: "Calling Line Identification Presentation (CLIP) supplementary service [ITU-T Recommendation Q.731, clause 3 (1993) modified]";
- Part 4: "Calling Line Identification Restriction (CLIR) supplementary service [ITU-T Recommendation Q.731, clause 4 (1993) modified]";
- Part 5: "Connected Line Identification Presentation (COLP) supplementary service [ITU-T Recommendation Q.731, clause 5 (1993) modified]";
- Part 6: "Connected Line Identification Restriction (COLR) supplementary service [ITU-T Recommendation Q.731, clause 6 (1993) modified]";
- Part 7: "Terminal Portability (TP) supplementary service [ITU-T Recommendation Q.733, clause 4 (1993) modified]";
- Part 8: "User-to-User Signalling (UUS) supplementary service [ITU-T Recommendation Q.737, clause 1 (1997) modified]";
- Part 9: "Closed User Group (CUG) supplementary service [ITU-T Recommendation Q.735, clause 1 (1993) modified]";
- Part 10: "Subaddressing (SUB) supplementary service [ITU-T Recommendation Q.731, clause 8 (1992) modified]";
- Part 11: "Malicious Call Identification (MCID) supplementary service [ITU-T Recommendation Q.731, clause 7 (1997) modified]";
- Part 12: "Conference Call, add-on (CONF) supplementary service [ITU-T Recommendation Q.734, clause 1 (1993) and implementors guide (1998) modified]";
- Part 14: "Explicit Call Transfer (ECT) supplementary service [ITU-T Recommendation Q.732, clause 7 (1996) and implementors guide (1998) modified]";
- Part 15: "Diversion supplementary service [ITU-T Recommendation Q.732, clauses 2 to 5 (1999) modified]";
- Part 16: "Call Hold (HOLD) supplementary service [ITU-T Recommendation Q.733, clause 2 (1993) modified]";
- Part 17: "Call Waiting (CW) supplementary service [ITU-T Recommendation Q.733, clause 1 (1992) modified]";

- Part 18: "Completion of Calls to Busy Subscriber (CCBS) supplementary service [ITU-T Recommendation Q.733, clause 3 (1997) modified]";
- Part 19: "Three-Party (3PTY) supplementary service [ITU-T Recommendation Q.734, clause 2 (1996) and implementors guide (1998) modified]";
- Part 20: "Completion of Calls on No Reply (CCNR) supplementary service [ITU-T Recommendation Q.733, clause 5 (1999) modified]";
- Part 21: "Anonymous Call Rejection (ACR) supplementary service [ITU-T Recommendation Q.731, clause 4 (1993)]";
- Part 31: "Protocol Implementation Conformance Statement (PICS) proforma specification for basic services";
- Part 32: "Test Suite Structure and Test Purposes (TSS&TP) specification for basic services";
- Part 33: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for basic services";**
- Part 34: "Protocol Implementation Conformance Statement (PICS) proforma specification for supplementary services";
- Part 35: "Test Suite Structure and Test Purposes (TSS&TP) specification for supplementary services";
- Part 36: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification for supplementary services".
- NOTE: Parts 13 and 22 to 30 have not been issued.

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National transposition dates

National transposition dates	
Date of adoption of this EN:	21 September 2001
Date of latest announcement of this EN (doa):	31 December 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2002
Date of withdrawal of any conflicting National Standard (dow):	30 June 2002

1 Scope

The present document contains the validation (conformance) test specification for ISUP v3 basic call control and signalling procedures defined in ITU-T Recommendation Q.764 [13] as endorsed by EN 300 356-1 [1]. The present document applies only to exchanges having implemented the ISUP v3 protocol specification. It is applicable for validation testing of all types of exchanges as defined in the ISUP v3 protocol specification.

NOTE: The compatibility tests are covered by ITU-T Recommendation Q.784.1 [9].

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.

- [1] ETSI EN 300 356-1 (V3.2.2): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 3 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1997), modified]"
- [2] ISO/IEC 9646-1 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".
- [3] ISO/IEC 9646-3: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN)".
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- [4] ISO/IEC 9646-5 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 5: Requirements on test laboratories and clients for the conformance assessment process".
- [5] ISO/IEC 9646-7: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".
- [6] ITU-T Recommendation E.164 (1997): "The international public telecommunication numbering plan".
- [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] ITU-T Recommendation Q.784.1 (1996): "Validation and compatibility for ISUP'92 and Q.767 protocols".
- [10] ITU-T Recommendation Q.784.2 (1997): "Abstract test suite for ISUP'92 basic call control procedures".
- [11] ITU-T Recommendation Q.784.3 (1999): "ISUP '97 basic call control procedures - Test suite structure and test purposes (TSS&TP)".
- [12] ITU-T Recommendation Q.761 (1997): "Signalling System No. 7 - ISDN User Part functional description".
- [13] ITU-T Recommendation Q.764 (1997): "Signalling System No. 7 - ISDN user part signalling procedures".
- [14] ITU-T Recommendation Q.730: "ISDN user part supplementary services".

- [15] ITU-T Recommendation Q.731: "Stage 3 description for number identification supplementary services using Signalling System No. 7".
- [16] ITU-T Recommendation Q.733: "Stage 3 description for call completion supplementary services using Signalling System No. 7".
- [17] ITU-T Recommendation Q.737: "Stage 3 description for additional information transfer supplementary services using Signalling System No. 7".
- [18] ITU-T Recommendation Q.735: "Stage 3 description for community of interest supplementary services using Signalling System No. 7".
- [19] ITU-T Recommendation Q.734 (1993): "Stage 3 description for multiparty supplementary services using Signalling System No. 7".
- [20] ITU-T Recommendation Q.732: "Stage 3 description for call offering supplementary services using Signalling System No. 7".
- [21] ITU-T Recommendation Q.762 (1997): "Signalling System No. 7 - ISDN User Part general functions of messages and signals".
- [22] ITU-T Recommendation Q.763 (1997): "Signalling System No. 7 - ISDN User Part formats and codes".
- [23] ITU-T Recommendation Q.767 (1991): "Application of the ISDN user part of CCITT signalling system No. 7 for international ISDN interconnections".
- [24] ITU-T Recommendation Q.724 (1988): "Telephone user part signalling procedures".

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3 Definitions and abbreviations (standards.iteh.ai)

3.1 Definitions

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

- terms defined in ISDN User Part (ISUP) reference specification ITU-T Recommendations Q.761 [12], Q.762 [21], Q.763 [22] and Q.764 [13] as endorsed by EN 300 356-1 [1];
- terms defined in ISO/IEC 9646-1 [2], ISO/IEC 9646-3 [3] and in ISO/IEC 9646-7 [5].

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, clause 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, clause 3.3.5)

Abstract Test Suite (ATS): test suite composed of abstract test cases (see ISO/IEC 9646-1, clause 3.3.6)

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, clause 3.3.43)

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

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, clause 3.3.54)

PICS proforma: document, in the form of a questionnaire, which when completed for an implementation or system becomes the PICS

PIXIT proforma: document, in the form of a questionnaire, which when completed for the IUT becomes the PIXIT

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, clause 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, clause 3.3.39 and clause 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, clause 3.3.41 and clause 3.3.81)

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

User: access protocol entity at the User side of the user-network interface where a T reference point or coincident S and T reference point applies

3.2 Abbreviations

The ISUP message acronyms can be found in table 2 of ITU-T Recommendation Q.762 [21] as endorsed by EN 300 356-1 [1].

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

ACH	Access signalling PCO - (D-channel)
APH	Access physical circuit PCO - (B-channel)
ASP	Abstract Service Primitive
ATC	Abstract Test Case
ATM	Abstract Test Method
ATS	Abstract Test Suite
CAB	PCO for AB circuits
CAC	PCO for AC circuits
CIC	Circuit Identification Code
DLE	Destination Local Exchange
DSS1	Digital Subscriber System No. one
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
InIE	Incoming International Exchange.
ITE	International Transit Exchange.
IUT	Implementation Under Test
LAB	PCO for signalling link AB
LAC	PCO for signalling link AC
LT	Lower Tester
MMI	Man Machine Interface
MNT	Maintenance PCO
MOT	Means Of Testing
MTC	Main Test Component
NTE	National Transit Exchange
OLE	Originating Local Exchange
OPR	Operator PCO
OutIE	Outgoing International Exchange
PCO	Point of Control and Observation
PCTR	Protocol Conformance Test Report
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
PTC	Parallel Test Component
SCS	System Conformance Statement

SP	Signalling Point
SUT	System Under Test
TP	Test Purpose
TCP	Test Coordination Procedures
TSS	Test Suite Structure
TSS&TP	Test Suite Structure and Test Purposes
TTCN	Tree and Tabular Combined Notation
UNI	User-Network Interface
UT	Upper Tester

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.

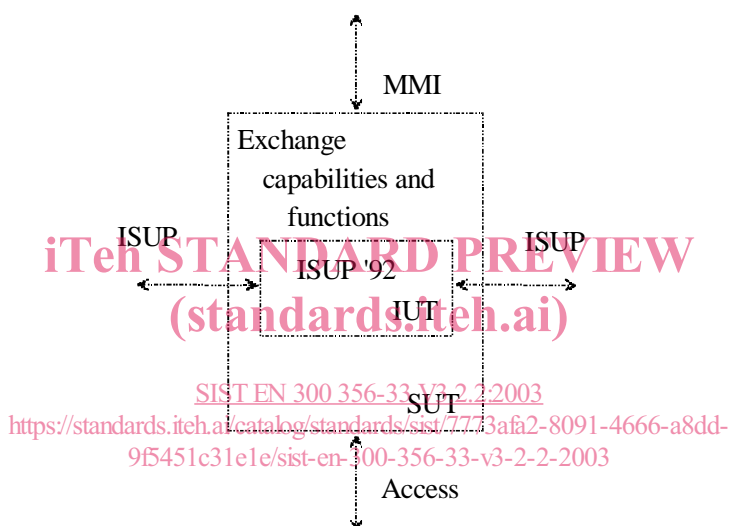


Figure 1/ITU-T Recommendation Q.784.2 [10]: Exchange as SUT

The implementation under test (IUT) is the ISUP '97 implementation in this exchange, as shown in figure 1/ITU-T Recommendation Q.784.2 [10].

The aim of the ISUP implementation is to assure capabilities and functions for circuit and signalling supervision on one hand and for call handling on the other.

Circuit supervision is done mainly through the MMI (man machine interface) of the exchange. The MMI interface is implementation dependent and thus not standardized.

The effects of signalling procedures of the ISDN User Part can be observed on the NNI (network-network interface), on the circuits controlled by the ISUP. The ISUP signalling protocol can be observed on the SS7 link on the NNI.

The ISUP implementation will in some exchanges have to interwork with the access signalling system on the UNI (user-network interface) and involve call handling in order to establish end-to-end connections.

From the ISUP reference standard several types of exchanges (or roles) can be identified as presented in figure 2/ITU-T Recommendation Q.784.2 [10].

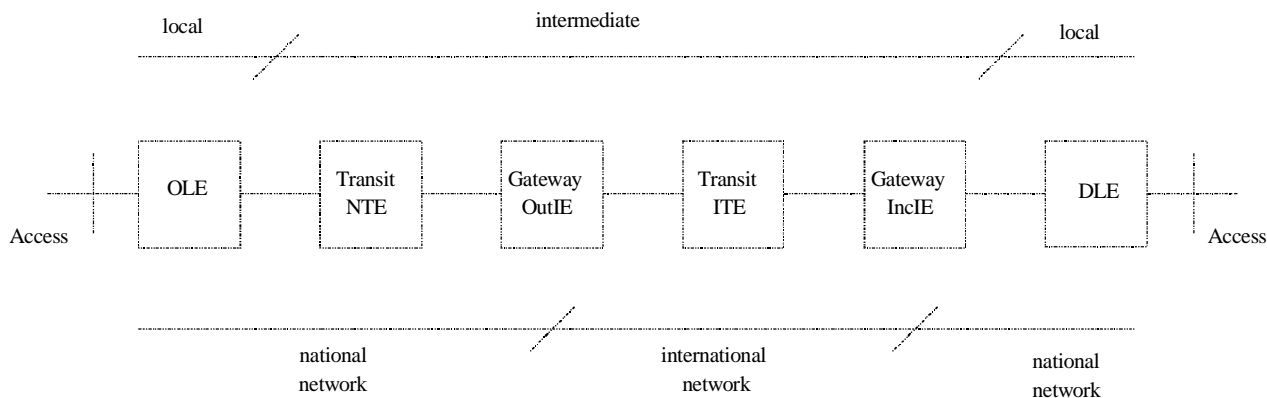


Figure 2/ITU-T Recommendation Q.784.2 [10]: Roles of exchanges

The exchanges can be divided in two main groups according to their functionality: local exchanges, where calls originate and terminate, and intermediate exchanges, with transit functionality. Local exchanges are national, i.e. belong to a national network. Intermediate exchanges are national or international. The international intermediate exchanges which permit access to the international network are the gateway exchanges (incoming and outgoing), also called ISCs - international switching centres.

The roles of the exchanges are summarized in table 1/ITU-T Recommendation Q.784.2 [10].

Table 1/ITU-T Recommendation Q.784.2 [10]: Roles of exchanges

	Type	Local Exchange	Intermediate Exchange	
			National	International
Originating Local Exchange	TypeA	OLE		
Transit Exchange	TypeB	NTE		ITE
Incoming/Gateway Exchange	TypeA			InclE
Outgoing/Gateway Exchange	TypeA			OutIE
Destination Local Exchange	TypeA	DLE		

4.2 ATM and testing configuration for ISUP '92

The Abstract Test Method (ATM) chosen for the ISUP '97 testing specification is the distributed multiparty 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 testing architectures are described in the following clauses.

The ATS is written in concurrent TTCN.

4.2.1 Intermediate exchanges

The configuration proposed for testing intermediate exchanges is shown in figure 3/ITU-T Recommendation Q.784.2 [10]. In order to test the protocol and functionality of transit and gateway exchanges one needs to consider the incoming and outgoing side of the SUT.

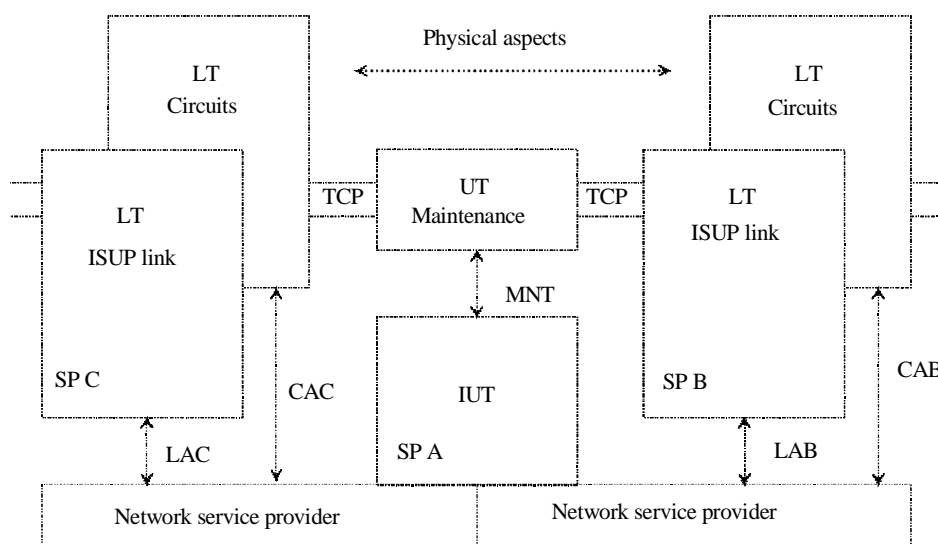


Figure 3/ITU-T Recommendation Q.784.2 [10]: ISUP test method for intermediate exchanges

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

The LAB and LAC PCOs are used by the lower testers (LT) for controlling the ISUP signalling link, whereas the CAB and CAC PCOs are used by the lower testers for observing circuit related events, such as connectivity, echo control check, alerting tone, etc.

The ISUP PDUs to be sent and observed on the LAB PCO side allow for PDU constraints to be specified and coded down to the bit-level.

The MNT PCO is used by the upper tester (UT) to control and observe the maintenance functions of the exchange.

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

Figure 4/ITU-T Recommendation Q.784.3 [11] shows the actual used configuration for intermediate exchanges, with a main testing component (MTC), responsible for the A-B interface and a slave parallel testing component (PTC), responsible for the C-A interface. The maintenance PCO (MNT) and the operator PCO (OPR), needed for a limited number of test cases are integrated in the MTC, for simplifying reasons.

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

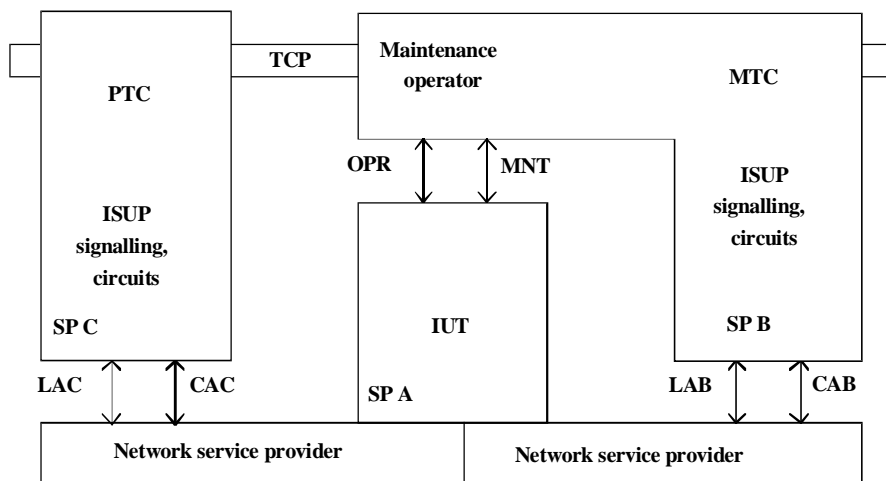


Figure 4/ITU-T Recommendation Q.784.2 [10]: ISUP test configuration for intermediate exchanges

4.2.2 Local exchanges

When testing a local exchange as specified in the reference standard, it is difficult, if not impossible, to observe only ISUP PDUs, if functionality such as connectivity, tones and announcements etc. associated with protocol events is to be considered and used to assign verdicts. The reference standard often refers to actions or events initiated by or to be observed by the calling or called user.

A Point of Control of Observation (PCO) from ISUP (IUT) to the access side is needed, e.g. for stimulating the local exchange to originate a call (send an IAM). Another PCO is needed to check connectivity or to check tones generated etc. by the local exchange.

There is no exposed interface from ISUP (the IUT) towards the access side. For practical testing purposes the natural choice is the access interface. It is therefore reasonable to make use of the access interface (e.g. the user access interface DSS1) as a PCO and to use existing naming conventions for the abstract service primitives (ASPs) to be used on this PCO.

Figure 5/ITU-T Recommendation Q.784.3 [11] presents a multiparty testing configuration for local exchanges. In this figure each tester has a single PCO. The PCO for the access uses the underlying access service provider (e.g. LAPD, in case of DSS1) for observing access events and stimulating the ISUP via the access. The ISUP implementation (IUT) cannot be tested without involving the user-network interface (UNI).

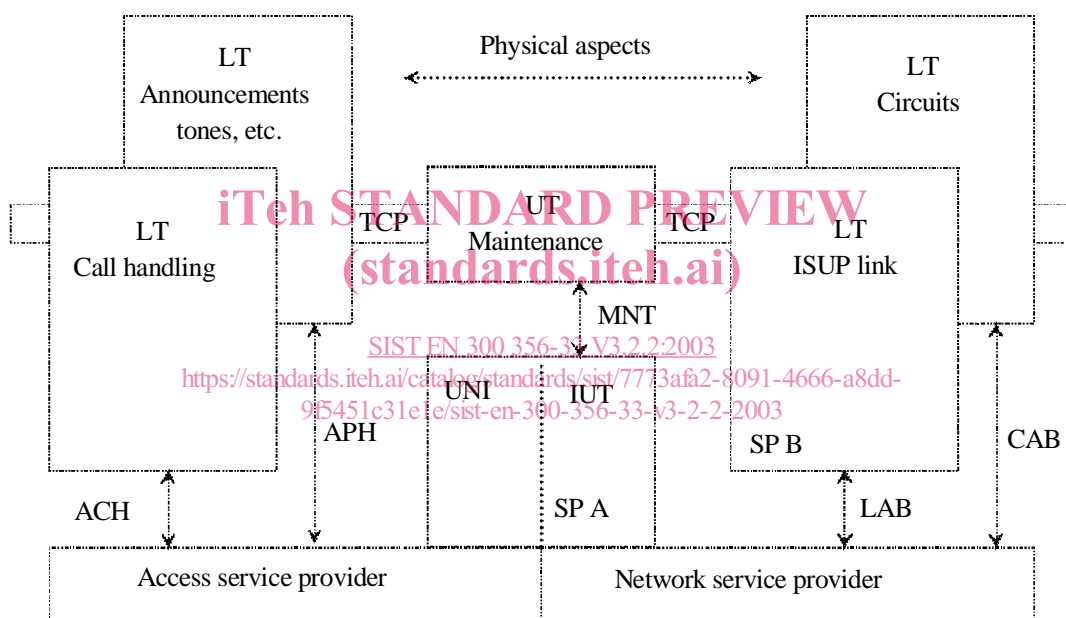


Figure 5/ITU-T Recommendation Q.784.2 [10]: ISUP test method for originating/destination exchanges

On the right side there are two PCOs as in the test configuration presented in the previous clause. The LAB PCO is used by the LT controlling the ISUP signalling link, whereas the CAB PCO is used by another LT controlling the traffic channels (for observing circuit related events, such as connectivity, echo control check, alerting tone, etc.).

The ISUP PDUs to be sent and observed on the LAB PCO side allow for PDU constraints to be specified and coded down to the bit level.

The MNT PCO is used by the Upper Tester to control and observe the maintenance functions of the exchange.

On the access side there are two PCOs and two LTs similar to the ones on network side. The ACH PCO is used to observe and control the Call Handling events, whereas the APH is used to control and observe physical aspects (e.g. tones and announcements).

The access PDUs to be sent and observed on the ACH PCO are chosen at an appropriate level of abstraction. For the access ASPs DSS1-like primitive names have been used, whereas access PDU constraints have not been coded to the bit level. The access aspects cannot be left out for local exchanges, widening in this respect to some extent the scope of the ISUP testing.