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Q.785.2

Amendment 1

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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – Test
specification

ISUP'97 supplementary services – Test suite
structure and test purposes (TSS & TP)

**Amendment 1: New Appendix I – Additional test
configuration for ISUP'97 supplementary
services**

ITU-T Recommendation Q.785.2 – Amendment 1

(Formerly CCITT Recommendation)

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ITU-T Recommendation Q.785.2

ISUP'97 supplementary services – Test suite structure and test purposes (TSS & TP)

AMENDMENT 1

New Appendix I – Additional test configuration for ISUP'97 supplementary services

Summary

This Amendment contains an additional ATS implementation for ISUP'97 Supplementary Services conformance testing using a different test configuration to that in Annex D.

This Recommendation includes an electronic attachment containing the corresponding ATS in machine processable form and in graphical form.

Source

Amendment 1 to ITU-T Recommendation Q.785.2 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 6 December 2000.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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– ATS in graphical form	

ITU-T Recommendation Q.785.2

ISUP'97 supplementary services – Test suite structure and test purposes (TSS & TP)¹

AMENDMENT 1

New Appendix I – Additional test configuration for ISUP'97 supplementary services

Introduction

This appendix contains an additional ATS implementation of the conformance test specification for ISDN User Part (ISUP)'97 Supplementary Services. The ATS in this appendix uses a different test configuration to that in Annex D.

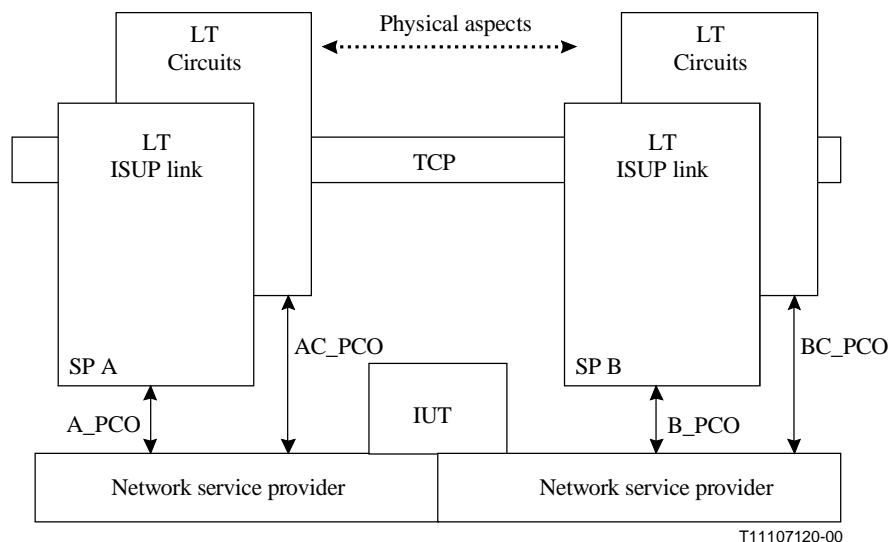
I.1 ATM and testing configuration

The Abstract Test Method (ATM) chosen for the ISUP'97 supplementary services testing 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 testing architectures are described in the following subclauses. The ATS is written in concurrent TTCN.

I.1.1 Intermediate exchanges

The configuration proposed for testing intermediate exchanges is shown in Figure I.1. 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. The IUT is observed and controlled from two ISUP links with associated circuits. The naming convention used conforms to the normal terminology of the telecom world i.e. the call originating side is marked with A (A-subscriber) and the call terminating side is marked with B (B-subscriber).

¹ This Recommendation includes an electronic attachment containing the ATS corresponding to Appendix I.



A_PCO	for signalling link between IUT and SPA	IUT	Implementation Under Test
AC_PCO	for circuits between IUT and SPA	LT	Lower Tester
B_PCO	for signalling link between IUT and SPB	PCO	Point of Control and Observation
BC_PCO	for circuits between IUT and SPB	SP	Signalling Point

Figure I.1/Q.785.2 – ISUP test method for intermediate exchanges

The points of control and observation (PCO) are labelled B_PCO and BC_PCO on one side, and A_PCO and AC_PCO on the other. The B_PCO and A_PCO are used by the lower testers (LT) for controlling the ISUP signalling link, whereas the BC_PCO and AC_PCO 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 B_PCO side allow for PDU constraints to be specified and coded down to the bit level.

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

Figure I.2 shows the actual used configuration for intermediate exchanges with a main test component (MTC), responsible for supervising two parallel test components (PTC): B_PTC responsible for the IUT-B interface and A_PTC responsible for the A-IUT interface.

The test coordination procedures (TCP) allow for communication between the testers. The test components are mostly implicitly coordinated (asynchronously) through the IUT; the TCPs are used only before checking the state of the circuits and when it is necessary to obtain the verdict from the parallel test components.

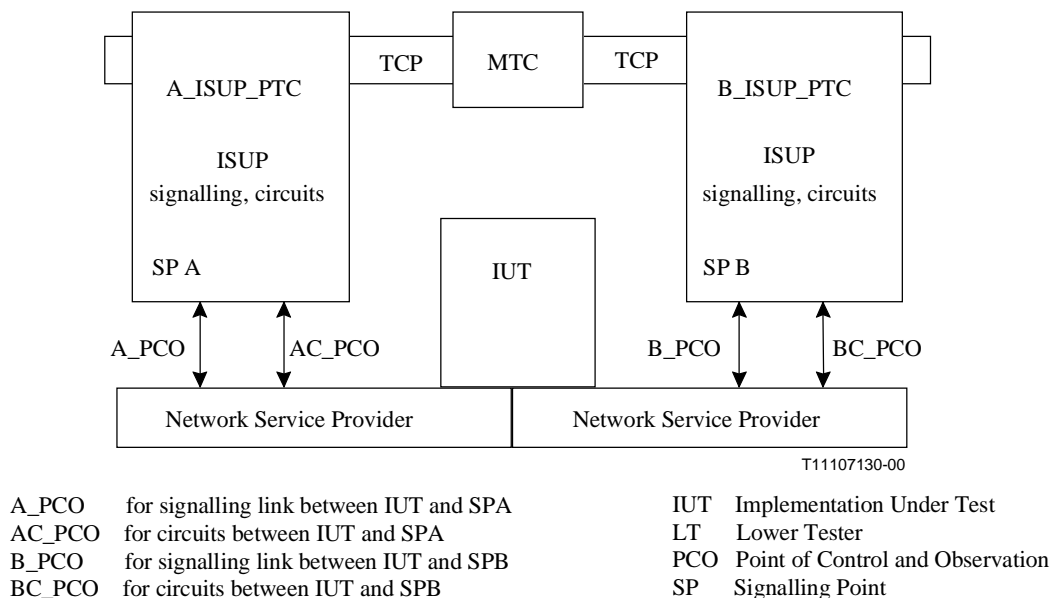


Figure I.2/Q.785.2 – ISUP test configuration for intermediate exchanges

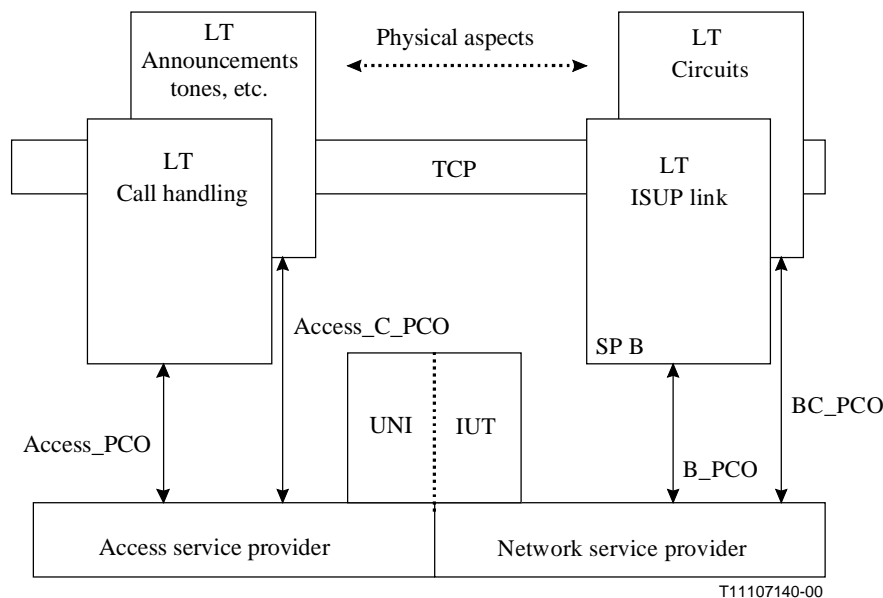
I.1.2 Local exchanges

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 and 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 generated tones 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. In the ATS there is a possibility to choose the used access protocol from DSS1, a more general access-like pseudo protocol, or just use manual operations to stimulate the ISUP IUT. The selection between execution modes is done with test suite parameters.

Figure I.3 presents a multi-party 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 the 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).



Access_PCO	Access signalling PCO (D-channel)	IUT	Implementation Under Test
Access_C_PCO	Access physical circuit PCO (B-channel)	LT	Lower Tester
B_PCO	PCO for IUT-B signalling link	TCP	Test Coordination Procedures
BC_PCO	Circuit PCO on IUT-B interface	SP	Signalling Point
		UNI	User-Network Interface

Figure I.3/Q.785.2 – ISUP test method for originating/destination exchanges

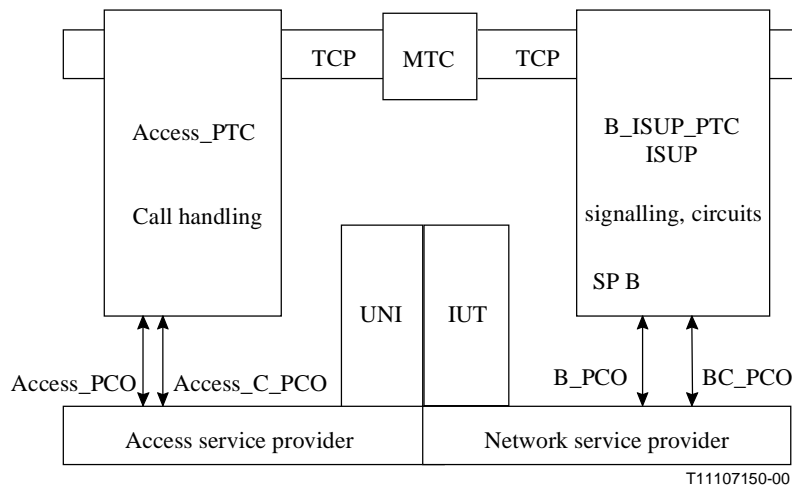
On the right side there are two PCOs as in the test configuration presented in I.1.2. The B_PCO is used by the LT controlling the ISUP signalling link, whereas the BC_PCO is used by another LT controlling the traffic channels (for observing circuit related events, such as connectivity, alerting tone, etc.).

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

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

The access PDUs to be sent and observed on the ACCESS_PCO are chosen at an appropriate level of abstraction. For the access ASPs DSS1-like primitive names have been used. In the ATS access PDU constraints are given for the DSS1 protocol whereas, for the pseudo access protocol, the 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.

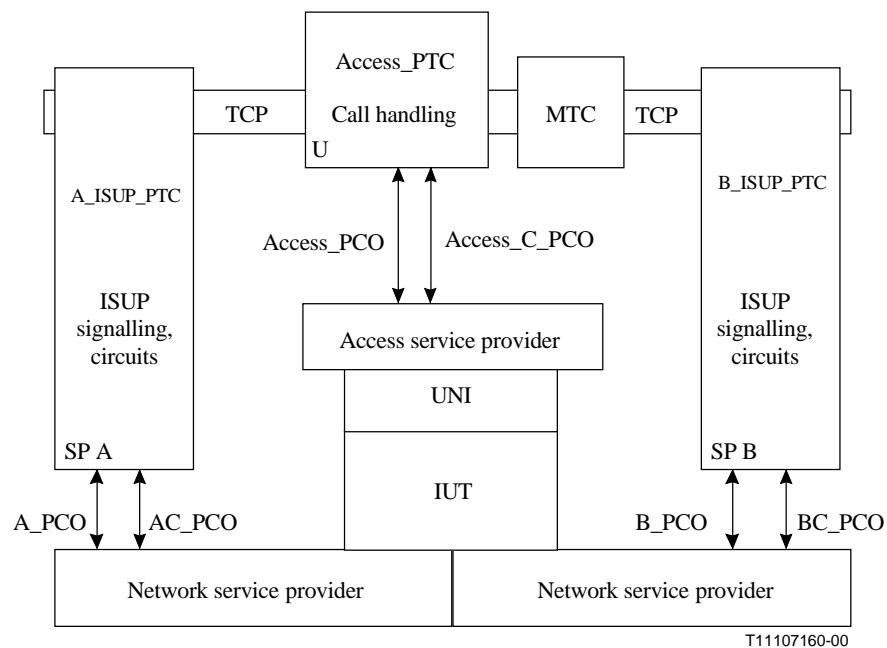
Figure I.4 shows the actual used configuration for local exchanges with a master test component (MTC) supervising two parallel test components (PTCs): B_ISUP_PTC responsible for the IUT B interface, and ACCESS_PTC responsible for the UNI access interface. The maintenance PCO is integrated in the MTC, for simplifying reasons.



Access_C_PCO	Access physical circuit PCO (B-channel)	IUT	Implementation Under Test
Access_PCO	Access call handling PCO (D-channel)	MTC	Main Test Component
B_PCO	PCO for IUT-B signalling link	PTC	Parallel Test Component
BC_PCO	Circuit PCO on IUT-B interface	TCP	Test Coordination Procedures

Figure I.4/Q.785.2 – ISUP test configuration for local exchanges

There are test cases for local exchanges for some supplementary services where a mixed configuration is used. This configuration is presented in Figure I.5 and it may be deduced from the configurations presented in Figures I.2 and I.4.



B_PCO	for the IUT-B signalling link	IUT	Implementation Under Test
BC_PCO	Circuit PCO for the IUT-B interface	MTC	Main Test Component
A_PCO	for the A-IUT signalling link	PTC	Parallel Test Component
AC_PCO	Circuit PCO for the AC interface	TCP	Test Coordination Procedures
Access	Access call handling PCO (D-channel)	U	user_call_handling point
Access_C_PCO	Access physical circuit PCO (B-channel)		

Figure I.5/Q.785.2 – ISUP mixed test configuration for local exchanges

In this configuration the main test component supervises three parallel test components: two ISUP PTCs and one access PTC. The local exchange (IUT) in this case is the exchange serving the user who activated the supplementary service.

I.1.3 Master-slave aspects in the test configuration

Figures I.2, I.4 and I.5 show the logical test components of the adopted test configuration. There is a main test component in every configuration supervising the parallel test components. There is always an ISUP parallel test component located on the right side of the IUT, whereas on the left side there are different parallel test components: ISUP (Figure I.2), access (Figure I.4) or both (Figure I.5).

The ATS is written so that the appropriate configuration is chosen – depending on the exchange's *role* to be tested.

The selected Abstract Test Configuration has the advantage that the test code, in test cases written with TTCN, can be presented in a same abstraction level in both sides of the IUT. This, on the other hand, allows the writing of a well structured TTCN code which is easy to understand and maintain.

The right side parallel test component may be an international or national ISUP and is configurable so that either of these two may be run, based on the answers given to PIXIT questions.

The left side parallel test component may be of any kind: it may be an international or national ISUP, an access signalling system or a non-ISUP user part. At test execution, one of these configurations will be chosen, based on the information provided in the PICS and PIXIT.

For the gateway exchanges it is assumed by default that the call is set up from the left PTC to the right PTC. So, for outgoing international exchange, the national network is located on the left side and the international network on the right side. For incoming international exchanges, the international network is located on the left side and the national network on the right side.

The message flow in the test cases is designed in such a way that the verdict is assigned based on observing the behaviour on both sides, the expected behaviour of both sides is needed to assign the verdict.

I.2 Conventions used within the ATS

The TTCN standard encourages usage of a long descriptive naming, and this ATS is written according to that recommendation. The naming in this ATS allows reading and understanding of the test cases without knowing much of TTCN as such. Some abbreviations are consistently used within the ATS written in TTCN and are useful for understanding and/or maintaining the coding detail level.

I.2.1 Test case structure

Test cases are structured so that the main flow of the test events, i.e. the signalling sequence required to fulfil the test purpose, is visible on the test case level. Reusable test steps are used to structure test cases and hide some TTCN notation features and general events which are not particularly interesting nor essential from the point of view of the test purpose. The test steps are written in a general and parameterized manner and, as a result, the number of the test steps has been kept to a reasonable level, i.e. the test steps are reusable also in practical terms.

I.2.2 Test case identifiers

The general naming convention for the test cases is: ISS{*_TC*}_X_N_n{*_n*}{*_a*}_more_specific.

Where: **TC** designates ASE specific test cases (optional, used only for CCBS), **X** is either: **V** – valid stimulus or **I** – inopportune stimulus; **N** is the sequence number of the supplementary service; the first **n** is a sequence number used within the supplementary service, the second **n** an additional used

number (optional, for UUS only) and **a** is a lowercase letter to distinguish between tests in case of variants deriving from the same test purpose, and **more_specific** describes the test case functionality i.e. test purpose briefly.

The beginning of the name conforms to the naming convention of the test purposes part of this Recommendation. The additional (**more_specific**) component is added to improve the readability of the test suite and to follow the TTCN standard recommendation of descriptive naming.

I.2.3 PDU type definitions

ISUP protocol data units (PDU) i.e. ISUP messages are defined with ASN.1. This is necessary since TTCN notation as such does not have data structures, which would allow the free order of the ISUP optional parameters. If TTCN tables would be used for defining the ISUP message structure, the test suite would not be abstract anymore: the structure and behaviour of the protocol would not be present in the test suite. However, the ASN.1 structures required to define ISUP PDUs are quite simple and it is easy to make mapping between the protocol structure presented in ITU-T Q.763 and the structure used in this ATS. ISUP PDUs are named according to the standard abbreviations of the ISUP message names (IAM, REL etc.).

DSS1 protocol data units (PDU), i.e. DSS1 messages, are defined with TTCN and named according to the message names.

I.2.4 PDU constraints

The naming scheme for PDU constraints is: PDU {**_m** or **_o**} {**_s** or **_r**}_XY_**more_specific**.

Where: PDU indicates the PDU type included, XY indicates the direction, **_m** or **_o** indicates if the PDU constraint contains only mandatory part or also the optional information elements, **_s** or **_r** indicates if the PDU is sent or received by the PTC, and **more_specific** (if any) describes the constraint with abbreviated naming convention.

Example: IAM_BA_CgPN – indicates an IAM sent from SP B to SP A, with a calling party number included.

I.2.5 ASP type definitions

All ASP types are defined with TTCN. Metatype PDU of the TTCN notation is used in the ASP type definitions so that all the different appropriate PDUs can be carried by the same ASP types.

I.2.6 ASP constraints

The ASP constraints are parameterized and the PDU constraints are delivered as parameters to the ASP constraints so that only a few ASP constraints are needed. The naming of the ASP constraints reflects the used abstract test configuration and usage of constraints (example: A_send – indicates send ASP constraint for the A side of the ISUP call).

I.2.7 Structured types

All protocol parameters are defined as structured types. Full parameter names are used for ISUP parameters. The DSS1 parameter structure names are defined with abbreviations in order to maintain consistency to some existing DSS1 test suites.

I.2.8 Structured type constraints

The structured type constraints follow the naming convention:
c_TYPENAME{**_protocolid**} {**_more_specific**}.

Where TYPENAME indicates the structured type used for this constraint, protocol id identifies the protocol where this constraint is used (in this ATS used only with DSS1) and the more specific part defines the purpose of the constraint.

Example: c_Transmission_medium_requirement_3_1khz_audio.

I.2.9 Test suite operations

All names for test suite operations follow the scheme: TSO_TestSuiteOperationName

The TSO functions are specified using the syntax of the C programming language or pseudo code.

I.2.10 Test suite parameters, constants and variables

All test suite parameters are named using the pattern: TSP_Xxx

All test suite variables are named using the pattern: TSV_Xxx

All test suite constants are named using the pattern TSC_Xxx

I.2.11 Test case variables

All test case variables are named using the pattern: TCV_Xxx

I.2.12 Timers

All timers are named using the prefix T: Tname[_min or _max]

T7_min (waiting for ACM timer)

TCFNR_max (call forwarding on no reply timer)

I.3 ATS for ISDN User Part (ISUP)'97 Supplementary Services

The ATS is written in TTCN according to ITU-T X.292 | ISO/IEC 9646-3 [30].

Because the ATS was developed on a TTCN tool, the TTCN tables are not completely referenced in the Table of Contents. The ATS itself contains a subclause test suite overview, which provides additional information about the ATS.

The ATS is available in graphical form (TTCN GR format) in a postscript file ("STMRE.PS") and in machine processable form (TTCN MP format) in an ASCII text file ("STMRE.MP"). All files are compressed files accompanied by a "README" text file.

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