



**IMS Network Testing (INT);
Interworking between the 3GPP Cs domain with BICC or ISUP
as signalling protocol and external SIP-I networks;
Part 3: Abstract Test Suite (ATS) and partial Protocol
Implementation eXtra Information for Testing (PIXIT)**

Reference

DTS/INT-00048-3

Keywords

ATS, BICC, interworking, ISUP, PIXIT, SIP,
testing, TTCN

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2012.
All rights reserved.

DECT™, PLUGTESTS™, UMTS™ and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.
3GPP™ and LTE™ are Trade Marks of ETSI registered for the benefit of its Members and
of the 3GPP Organizational Partners.

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	4
Foreword.....	4
1 Scope	5
2 References	5
2.1 Normative references	5
2.2 Informative references.....	6
3 Definitions and abbreviations.....	7
3.1 Definitions.....	7
3.2 Abbreviations	8
4 Abstract Test Method (ATM).....	9
4.1 Network architecture	9
4.2 Protocol architecture.....	9
4.3 Test architecture	10
4.3.1 Interconnection of TS and SUT	10
4.3.2 Test system architecture.....	10
4.3.2.1 General.....	10
4.3.2.2 Structure.....	11
4.3.2.3 Interaction between TTCN-3 Executable (TE) and SUT Adapter (SA).....	12
4.3.2.3.1 Control of the SUT Adapter (SA) by using ASPs	12
4.3.2.3.2 Sending and receiving SIP and ISUP/BICC messages.....	16
4.3.2.3.3 Logging conventions	19
5 The ATS development process.....	19
5.1 Requirements and Test Purposes.....	19
5.2 ATS structure	19
5.2.1 Test case grouping	19
5.2.2 Test case identifiers	21
5.3 ATS specification framework.....	22
5.3.1 ATS Library.....	22
5.3.2 Use of TTCN-3	23
5.3.2.1 General.....	23
5.3.2.2 TTCN-3 naming conventions.....	24
5.4 ATS archive.....	25
Annex A (normative): Partial PIXIT proforma	26
A.1 Introduction	26
A.2 PIXIT items	26
A.2.1 SIP-related PIXIT.....	26
A.2.2 ISUP/BICC-related PIXIT	28
Annex B (informative): TTCN-3 library modules.....	38
B.1 Electronic annex, zip file with TTCN-3 code	38
Annex C (informative): Bibliography.....	39
History	41

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://ipr.etsi.org>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

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 the Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control Protocol or ISDN User Part, 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)".**

1 Scope

The present document specifies the Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) for Interworking between the 3GPP Cs domain with BICC or ISUP as signalling protocol and external SIP-I networks) described in the ITU-T Recommendation Q.1912.5 [5] and TS 129 164 [20].

A further part of the present document specifies the Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma based on the present document.

The ATS is sometimes referred to in the present document as 'SIP-ISUP-Interworking ATS'.

The test notation used in the ATS is TTCN-3 (ES 201 873-1 [8]).

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 (IXIT) 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.

NOTE: References have been used both in the present document and in the TTCN-3 library modules (annex B).

- [1] ETSI TS 102 709-2: "Technical Committee for IMS Network Testing (INT);Interworking between the 3GPP Cs domain with BICC or ISUP as signalling protocol and external SIP-I networks; Part 2: Test Suite Structure and Test Purposes (TSS&TP)".
- [2] ETSI TS 102 351 (V2.1.1): "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Testing: Methodology and Framework".

- [3] ETSI TS 102 709-1: "Technical Committee for IMS Network Testing (INT); Interworking between the 3GPP Cs domain with BICC or ISUP as signalling protocol and external SIP-I networks; Part 1: Protocol Implementation Conformance Statement (PICS)".
- [4] ETSI EN 383 001: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control (BICC) Protocol or ISDN User Part (ISUP) [ITU-T Recommendation Q.1912.5, modified]".
- [5] ITU-T Recommendation Q.1912.5 (2004): "Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control protocol or ISDN User Part".
- [6] ITU-T Recommendation Q.2150.1 (2001): "Signalling transport converter on MTP3 and MTP3b".
- [7] ETSI TS 102 027-3 (V3.1.1): "Methods for Testing and Specification (MTS); Conformance Test Specification for SIP (IETF RFC 3261); Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma".
- [8] ETSI ES 201 873-1 (V3.1.1): "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".
- [9] ETSI ES 201 873-5 (V3.1.1): "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 5: TTCN-3 Runtime Interface (TRI)".
- [10] ETSI ES 201 873-6 (V3.1.1): "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 6: TTCN-3 Control Interface (TCI)".
- [11] ISO/IEC 9646-1 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".
- [12] ISO/IEC 9646-7 (1995): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".
- [13] ITU-T Recommendation E.164 (2010): "The international public telecommunication numbering plan".
- [14] ITU-T Recommendation Q.761 (1999): "Signalling System No. 7 - ISDN User Part functional description".
- [15] ITU-T Recommendation Q.762 (1999): "Signalling System No. 7 - ISDN User Part general functions of messages and signals".
- [16] ITU-T Recommendation Q.763 (1999): "Signalling System No. 7 - ISDN User Part formats and codes".
- [17] ITU-T Recommendation Q.764 (1999): "Signalling System No. 7 - ISDN User Part signalling procedures".
- [18] IETF RFC 3261 (2002): "SIP: Session Initiation Protocol".
- [19] IETF RFC 2617 (1999): "HTTP Authentication: Basic and Digest Access Authentication".
- [20] ETSI TS 129 164: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Interworking between the 3GPP Cs domain with BICC or ISUP as signalling protocol and external SIP-I networks (3GPP TS 29.164 version 8.0.0 Release 8)".

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.

- [i.1] IETF RFC 3398: "Integrated Services Digital Network (ISDN) User Part (ISUP) to Session Initiation Protocol (SIP) Mapping".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, definitions from the following list of documents apply:

- terms defined in SIP / ISUP interworking reference specification [5];
- terms defined in ISDN User Part (ISUP) reference specification [14] to [17];
- terms defined in ISO/IEC 9646-1 [11] and ISO/IEC 9646-7 [12]; and
- terms defined in ES 201 873-1 [8] (TTCN-3).

In particular, the following terms and definitions 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

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

Abstract Test Suite (ATS): test suite composed of abstract test cases

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

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

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

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

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

SIP number: number conforming to the numbering and structure specified in ITU-T Recommendation E.164 [13]

System Under Test (SUT): real open system in which the IUT resides

3.2 Abbreviations

For the purposes of the present document, the following abbreviations given in Table 2/Q.762 of ITU-T Recommendation Q.762 [15] (ISUP messages) and the following apply:

NOTE: Abbreviations have been used both in the present document and in the TTCN-3 library modules (annex B).

ACM	Address Complete Message
ANM	Answer Message
ASP	Abstract Service Primitive

NOTE: Exchanged between entities inside the TS or between the user of the ATS (operator) and the TS.

ATC	Abstract Test Case
ATM	Abstract Test Method
ATM	Asynchronous Transfer Mode
ATS	Abstract Test Suite
BCI	Backward Call Indicators
CIC	Circuit Identification Code
CON	Connect message
CPG	Call Progress message
CW	Call Waiting
DSS1	Digital Subscriber System No. 1
EDS	Encoding/Decoding System
ETS	Executable Test Suite
FCI	Forward Call Indicators
IAM	Initial Address Message
IETF	Internet Engineering Task Force
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
IUT	Implementation Under Test
IWU	Interworking Unit
LT	Lower Tester
MOT	Means Of Testing
MTP	Message Transfer Part
NCI	Nature of Connection Indicators
NGN	Next Generation Network
PA	Platform Adapter
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
PTC	Parallel Test Component
REL	Release message
SA	SUT Adapter
SAM	Subsequent Address Message
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SN	Signalling Node
STC	Signalling Transport Converter

NOTE: According to ITU-T Recommendation Q.2150.1 [6].

SUT	System Under Test
TC	Test Case
TCI	TTCN-3 Control Interface
TCP	Test Coordination Procedures
TD	Test Description
TE	Test Equipment
TL	Test Logging
TM	Test Management
TMR	Transmission Medium Requirement
TP	Test Purpose
TRI	TTCN-3 Runtime Interface

TS	Test System
TSS	Test Suite Structure
TSS&TP	Test Suite Structure and Test Purposes
TTCN	Tree and Tabular Combined Notation
TTCN-3	Testing and Test Control Notation edition 3

4 Abstract Test Method (ATM)

4.1 Network architecture

Figures 1 and 2 show the network architecture for SIP-ISUP/BICC Interworking Units.

Figure 1 shows the network architecture for SIP-ISUP Interworking.

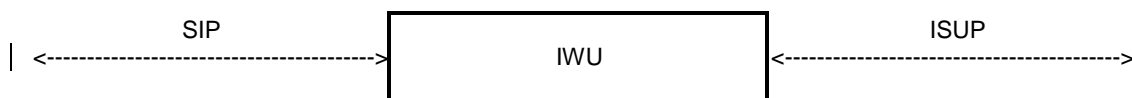


Figure 1: Interworking between SIP and ISUP

Figure 2 shows the network architecture for SIP-BICC Interworking.



Figure 2: Interworking between SIP and BICC

NOTE: There are 3 profiles defined for IWU: Profile A, Profile B and Profile C. Figures 3 to 7 in clause 4 of TS 102 709-1 [3] show the substructures of the IWU for Profiles C in terms of gateways and signalling nodes. In the ATS the SUT (IWU) represents either a G/W Type 3 or 4.

4.2 Protocol architecture

Figures 1 and 2 show that there are 2 interfaces of the IWU (representing the SUT in the testing environment described in the present document):

- a SIP interface; and
- an ISUP- or BICC interface.

Since the ISUP and BICC protocols are very similar (the latter one being derived from ISUP), they are treated here as one protocol.

NOTE: No signalling is used within the SIP-ISUP-Interworking ATS to control the ATM bearer in case of BICC (ASPs are used).

Figure 3 shows the protocol architecture in 2 branches.

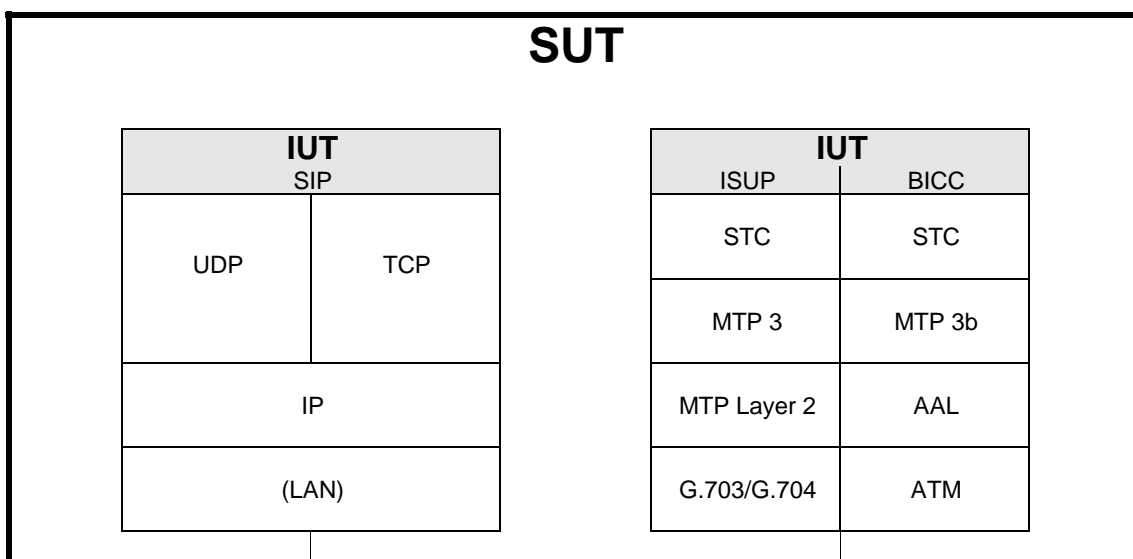


Figure 3: Protocol architecture of the SIP-ISUP-Interworking ATS

4.3 Test architecture

4.3.1 Interconnection of TS and SUT

Figure 4 shows the interconnection of TS and SUT in terms of signalling message flows.

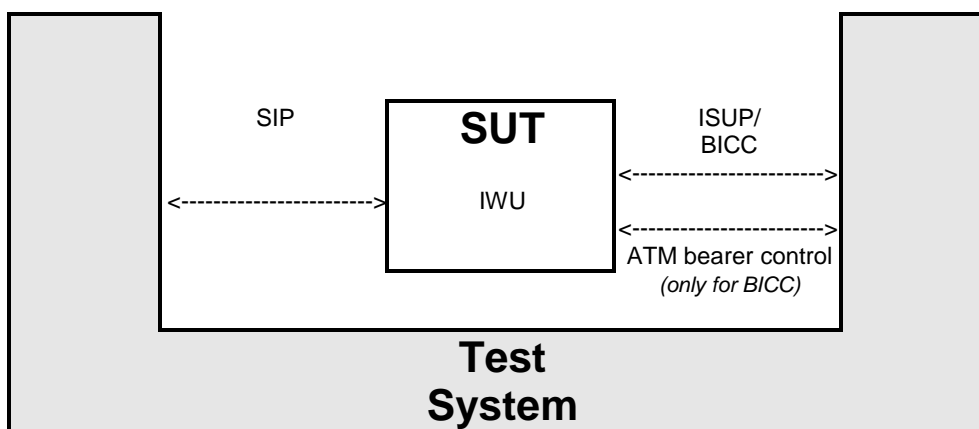


Figure 4: Interconnection of TS and SUT

4.3.2 Test system architecture

4.3.2.1 General

Test systems that implement this ATS shall conform to the requirements as defined in this clause.

4.3.2.2 Structure

An abstract architecture for a Test System (TS) implementing a TTCN-3 ATS is displayed in figure 5 and also stated in ES 201 873-5 [9].

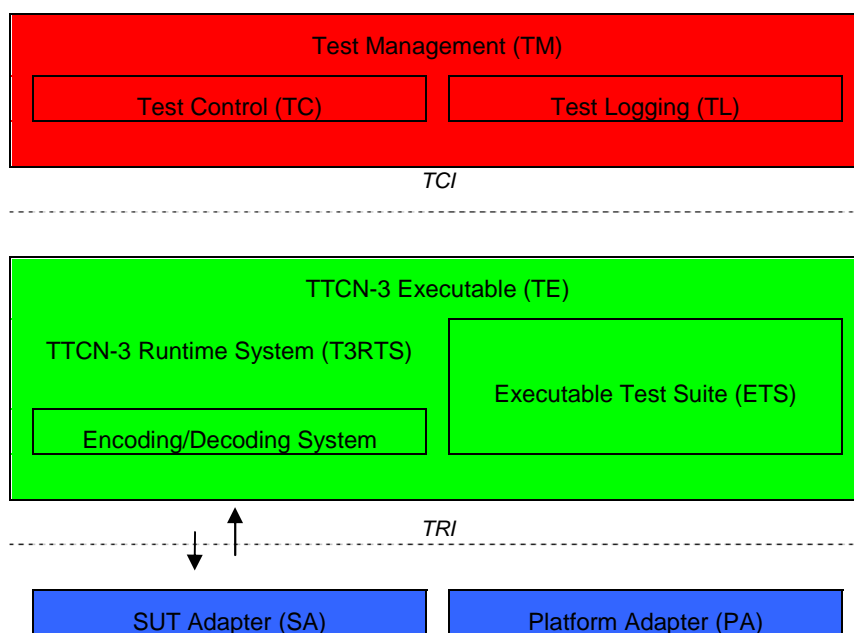


Figure 5: Abstract Test System Architecture

A TS has two interfaces, the TTCN-3 Control Interface (TCI) and the TTCN-3 Runtime Interface (TRI), which specify the interface between Test Management (TM) and TTCN-3 Executable (TE) entities, and TE, SUT Adapter (SA) and Platform Adapter (PA) entities, respectively. Out of these two interfaces the TRI has been standardized in ES 201 873-5 [9], whereas the specification and implementation of the TCI is in ES 201 873-6 [10].

The part of TS that deals with interpretation and execution of TTCN-3 modules, i.e. the Executable Test Suite (ETS), is shown as part of the TTCN-3 Executable (TE). This ETS corresponds either to the executable code produced by a TTCN-3 compiler or a TTCN-3 interpreter from the TTCN-3 ATS in a TS implementation. The remaining part of the TS, which deals with any aspects that cannot be concluded from information being present in the TTCN-3 ATS alone, can be decomposed into Test Management (TM), SUT Adapter (SA), and Platform Adapter (PA) entities. In general, these entities cover a TS user interface, test execution control, test event logging, communication of test data with the SUT, and timer implementation.

The part of SA used for SIP message transfer shall implement the TRI adaptation as well as the SIP transport protocol architecture described in clause 4.2.

The Encoding/Decoding System (EDS) entity, as far as applied to SIP messages, with the TE and Test Logging (TL) entity within the TM shall comply with the conventions defined in clause 4.3.2 of TS 102 027-3 [7].

The part of SA used for ISUP/BICC message transfer shall implement the TRI adaptation as well as the ISUP/BICC transport protocol architecture described in clause 4.2. For BICC, in addition, the ATM bearer control shall be implemented.

The Encoding/Decoding System (EDS) entity, as far as applied to ISUP/BICC messages, shall comply with the conventions and requirements defined in the following clauses.

4.3.2.3 Interaction between TTCN-3 Executable (TE) and SUT Adapter (SA)

4.3.2.3.1 Control of the SUT Adapter (SA) by using ASPs

Table 1 lists the ASPs used in the SIP-ISUP-Interworking ATS. Detailed descriptions of the ASPs together with their parameters follow.

Table 1: List of ASPs

ASP Name	Short description
InitializelsupBicc_req	Initialize ISUP/BICC part of the test system.
InitializelsupBicc_cnf	Answer whether all necessary ISUP/BICC test system initializations have been successfully performed.
ISUP_BICC_MSG_req	Used to send an ISUP/BICC message.
ISUP_BICC_MSG_ind	Used to receive an ISUP/BICC message.
BearerSetup_req	For BICC: request TS to setup the bearer connection between TS and SUT.
BearerSetup_acc	For BICC: answer to BearerSetup_req.
BearerSetup_ind	For BICC: indication that the bearer has been setup.
BearerRelease_req	For BICC: request to release established bearer connection.
BearerRelease_cnf	For BICC: confirmation that the requested bearer is released.
BearerRelease_ind	For BICC: indication that the bearer has been released (when no BearerRelease_req has been issued before).
s_IsupBicc_conversation	Check that conversation is possible on the bearer.
s_IsupBicc_ringing	Check that ringing occurs.

Tables 2 to 13 contain the descriptions of the ASPs used in the present document, including the ASP parameters (if any) and the types of values these may assume. No ASP parameter is optional.

Table 2: ISUP_BICC_MSG_req ASP structure

ASP Name: ISUP_BICC_MSG_req		
Port: sysPort		
Direction: TE -> SA		
Description: ASP used to send an ISUP/BICC message.		
Parameter	Type	Description
isupBiccSelection	SelectIsupOrBicc	Selector used to distinguish between ISUP and BICC testing. '00000000'B means 'ISUP' and any other value means 'BICC'.
serviceIndicatorOctet	ServiceIndicatorOctet	The contents of this ASP parameter is evaluated in SA only if ISUP has been selected in 'isupBiccSelection'.
routingLabel	RoutingLabel	The contents of this ASP parameter is evaluated in SA only if ISUP has been selected in 'isupBiccSelection'.
circuitIdentityCode	CircuitIdentityCode	The contents of this ASP parameter is evaluated in SA only if ISUP has been selected in 'isupBiccSelection'.
callInstanceCode	CallInstanceCode	The contents of this ASP parameter is evaluated in SA only if BICC has been selected in 'isupBiccSelection'.
iSUP_BICC_MSG	ISUP_BICC_MSG	ISUP_BICC_MSG is a union over all ISUP/BICC message body types, where a message body starts with the 'message type' field. This body is common for ISUP and BICC messages. When using this ASP, a particular message(body) template is selected from the union for transmission.
Comments:		
The SA takes from the ASP, depending on the value of parameter 'isupBiccSelection', either the ordered combination of 'serviceIndicatorOctet', 'routingLabel' and 'circuitIdentityCode' (ISUP), or 'callInstanceCode' (BICC), puts it in front of encoded parameter 'iSUP_BICC_MSG', and sends the so constructed message at the ISUP or BICC interface respectively.		

Table 3: ISUP_BICC_MSG_ind ASP structure

ASP Name: ISUP_BICC_MSG_ind		
Port: sysPort		
Direction: SA -> TE		
Description: ASP used to receive an ISUP/BICC message.		
Parameter	Type	Description
isupBiccSelection	SelectIsupOrBicc	Selector used to distinguish between ISUP and BICC testing. '00000000'B means 'ISUP' and any other value means 'BICC'.
serviceIndicatorOctet	ServiceIndicatorOctet	The contents of this ASP parameter is evaluated in TE only if ISUP has been selected in 'isupBiccSelection'.
routingLabel	RoutingLabel	The contents of this ASP parameter is evaluated in TE only if ISUP has been selected in 'isupBiccSelection'.
circuitIdentityCode	CircuitIdentityCode	The contents of this ASP parameter is evaluated in TE only if ISUP has been selected in 'isupBiccSelection'.
callInstanceCode	CallInstanceCode	The contents of this ASP parameter is evaluated in TE only if BICC has been selected in 'isupBiccSelection'.
iSUP_BICC_MSG	ISUP_BICC_MSG	ISUP_BICC_MSG is a union over all ISUP/BICC message body types, where a message body starts with the 'message type' field. This body is common for ISUP and BICC messages. When using this ASP, a particular message(body) template is selected from the union for receive matching.
Comments:		
<p>The SA takes from the received message, depending on the value of parameter 'isupBiccSelection', either the ordered combination of 'serviceIndicatorOctet', 'routingLabel' and 'circuitIdentityCode' (ISUP), or 'callInstanceCode' (BICC), and puts it into the associated ASP parameters. The complementary ASP parameters 'callInstanceCode' (ISUP) and combination of 'serviceIndicatorOctet', 'routingLabel' and 'circuitIdentityCode' (BICC) are filled by the SA with '0'-bits according to the lengths of their types.</p> <p>The TE does not evaluate the contents of the complementary parameters (but needs the correct lengths to identify the start of 'iSUP_BICC_MSG'.</p> <p>The received message (body) is put by the SA into parameter 'iSUP_BICC_MSG' and is matched in the ATS with an according receive template.</p>		

Table 4: InitializelsupBicc_req ASP structure

ASP Name: InitializelsupBicc_req		
Port: IsupBiccPort		
Direction: TE -> SA		
Description: Initialize ISUP/BICC part of the test system.		
Parameter	Type	Description
isupBiccSelection	SelectIsupOrBicc	Selector used to distinguish between ISUP and BICC testing. '00000000'B means 'ISUP' and any other value means 'BICC'.
ts_pointCode	Bit14	Signalling point code of the TS (ISUP).
sut_pointCode	Bit14	Signalling point code of the SUT (ISUP).
ts_address_sip	Octetstring	Address (e.g. IP) of the TS (SIP side). The use of this address is to enable the TS to communicate with the SUT at the SIP side to establish and maintain the lower layer connections.
ts_address_isup_bicc	Octetstring	Address (e.g. IP) of the TS (ISUP/BICC side). The use of this address is to enable the TS to communicate with the SUT at the ISUP/BICC side to establish and maintain the lower layer connections.
sut_address_isup_bicc	Octetstring	Address (e.g. IP) of the SUT (ISUP/BICC side). The use of this address is to enable the TS to communicate with the SUT at the ISUP/BICC side to establish and maintain the lower layer connections.
Comments: This ASP is used at the beginning of each test case to initiate the necessary initialization of the test system, particularly the interfaces to the SUT. If parameter isupBiccSelection indicates 'bicc', the values of parameters 'ts_pointCode' and 'sut_pointCode' shall be ignored by the SA. If parameter isupBiccSelection indicates 'isup', the values of parameters 'ts_address_isup_bicc' and 'sut_address_isup_bicc' may be ignored, if they are not necessary. Among the initializing actions there shall be: a) Verification that the ISUP/BICC link is operable between SUT and TS. b) Verification that the TS is ready to send and receive SIP messages. NOTE: It is a matter of TS implementation whether the TS, upon this request, sets up and initializes lower layer connections, if these are not setup. Other initialization actions may be TS-specific.		

Table 5: InitializelsupBicc_cnf ASP STRUCTURE

ASP Name: InitializelsupBicc_cnf		
Port: sysPort		
Direction: LT -> TTCN		
Description: Answer whether all necessary ISUP/BICC test system initializations have been successfully performed. The result can be positive or negative. The result will be positive only if the TS is able to send and receive messages at the ISUP/BICC-interface of the SUT.		
Parameter	Type	Description
result	Boolean	Indicating success or non-success of the whole initialization.
Comments:		

Table 6: BearerSetup_req ASP structure

ASP Name: BearerSetup_req		
Port: IsupBiccPort		
Direction: TE -> SA		
Description: For BICC: request TS to setup the bearer connection between TS and SUT.		
Parameter	Type	Description
cic	CallInstanceCode	Call Instance Code identifying the bearer connection.
Comments:		

Table 7: BearerSetup_acc ASP structure

ASP Name: BearerSetup_acc		
Port: IsupBiccPort		
Direction: SA -> TE		
Description: For BICC: answer to BearerSetup_req. The answer can be positive (bearer connection setup successful) or negative (bearer connection setup failed).		
Parameter	Type	Description
cic	CallInstanceCode	Call Instance Code identifying the bearer connection.
result	Boolean	The answer is positive when the bearer connection setup was successful and negative when the bearer connection setup failed.
Comments:		

Table 8: BearerSetup_ind ASP structure

ASP Name: BearerSetup_ind		
Port: IsupBiccPort		
Direction: SA -> TE		
Description: For BICC: indication that the bearer has been setup.		
Parameter	Type	Description
cic	CallInstanceCode	Call Instance Code identifying the bearer connection.
Comments:		

Table 9: BearerRelease_req ASP structure

ASP Name: BearerRelease_req		
Port: bcPort		
Direction: TE -> SA		
Description: For BICC: request to release the established bearer connection.		
Parameter	Type	Description
cic	CallInstanceCode	Call Instance Code identifying the bearer connection.
Comments:		

Table 10: BearerRelease_cnf ASP structure

ASP Name: BearerRelease_cnf		
Port: bcPort		
Direction: SA -> TE		
Description: For BICC: confirmation that the requested bearer is released.		
Parameter	Type	Description
cic	CallInstanceCode	Call Instance Code identifying the bearer connection.
result	boolean	Indication of whether the bearer is successfully released.
Comments: At release collision the result is still 'true'.		

Table 11: BearerRelease_ind ASP structure

ASP Name: BearerRelease_ind		
Port: bcPort		
Direction: SA -> TE		
Description: For BICC: indication that the bearer has been released (when no BearerRelease_req has been issued before).		
Parameter	Type	Description
cic	CallInstanceCode	Call Instance Code identifying the bearer connection.
Comments:		

Table 12: s_IsupBicc_conversation ASP structure

ASP Name: s_IsupBicc_conversation		
Port: operatorPort_IsupBicc		
Direction: SA <-> TE		
Description: Check that conversation is possible on the through-connected bearer.		
Parameter	Type	Description
text	Charstring	Request operator to check the conversation.
answer	Boolean	Check result entered by the operator.
Comments: This ASP has been implemented as a signature. "text" is an "input" parameter and "answer" is an output parameter.		

Table 13: s_IsupBicc_ringing ASP structure

ASP Name: s_IsupBicc_ringing		
Port: operatorPort_IsupBicc		
Direction: SA <-> TE		
Description: Check that occurs on the through-connected bearer.		
Parameter	Type	Description
text	Charstring	Request operator to check the ringing.
answer	Boolean	Check result entered by the operator.
Comments: This ASP has been implemented as a signature. "text" is an "input" parameter and "answer" is an output parameter.		

4.3.2.3.2 Sending and receiving SIP and ISUP/BICC messages

4.3.2.3.2.1 General

Before starting a test case, the SA shall be prepared to provide the transport of SIP and ISUP/BICC messages by establishing appropriate connections on the lower layers (see figure 3).

4.3.2.3.2.2 Encoding/Decoding System requirements

4.3.2.3.2.2.1 Encoding/Decoding System requirements for SIP

The Encoding/Decoding System (EDS) entity, as far as applied to SIP messages, shall comply with the conventions defined in clause 6.1 of TS 102 027-3 [7].

4.3.2.3.2.2.2 Encoding/Decoding System requirements for ISUP/BICC

4.3.2.3.2.2.2.1 General

ISUP/BICC messages are sent and received in the test suite by embedding them in ASPs ISUP_BICC_MSG_req and ISUP_BICC_MSG_ind respectively.

The ASPs contain all information to route the ISUP/BICC messages to/from the SUT.

ISUP messages and parameters are structured by using tables (see ITU-T Recommendation Q.763 [16]).

NOTE 1: The term 'parameter' is used as defined in the ISUP protocol context. It corresponds e.g. to the term 'Information Element' in other protocols.

All structure elements are bitstrings, hexstrings or octetstrings.

For ISUP message/parameter elements a specific way is defined to extend bitstring- or hexstring elements over octet boundaries. This is known as 'LowToHigh encoding', as shown in the following example.

EXAMPLE 1:

Coding of element 'Circuit Identity Code' (CIC), consisting of 12 bits:

Octet #	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
Octet 1	CIC (LSB)							
Octet 2	spare				CIC (MSB)			

Figure 6: Bit field structure of the 'CIC' parameter

The 8 least significant bits of the CIC value fill octet 1 (the least significant bit of CIC is assigned to bit 1 of octet 1), and the 4 most significant bits of the CIC value fill the lower 4 bits of octet 2.

NOTE 2: When a bitstring (hexstring) is presented as a sequence of bits (semi-octets) from left to right, the leftmost bit (semi-octet) is the most significant and the rightmost bit (semi-octet) is the least significant.

EXAMPLE 2:

Address digits

Several ISUP parameters have an element 'Address digits', where the individual digits are BCD-encoded (e.g. digit '0' is encoded as '0000'B, digit '9' is encoded as '1001'B).

When an address string is given as a sequence of ASCII digits, as a user would type them in, e.g. "0123456789", the encoded value is as shown on figure 7.

Octet #	Bits 8 7 6 5	Bits 4 3 2 1
Octet 1	0001	0000
Octet 2	0011	0010
Octet 3	0101	0100
Octet 4	0111	0110
Octet 5	1001	1000

Figure 7: Hex (BCD) field structure of an 'address digits' element

This also corresponds to a 'LowToHigh' encoding. In this particular case however, for the sake of ATS user convenience, a conversion function is used in the ATS in the following way:

- All module parameters containing address digits have type 'charstring' (resp. IA5String), which means that the user enters digits as ASCII characters '1', '2' and so on.
- Inside the address parameter templates the conversion function converts the ASCII string into a BCD-coded octetstring, taking also care of:
 - 'sending complete' digit (only applicable to the Called Party Number);
 - filler (final semi-octet), if the number of coded digits is odd.

The encoding of octetstrings however is not LowToHigh, as shown in the following example.

EXAMPLE 3:

octetstring value

The octetstring value '01234ABCDE'O is encoded as shown in figure 8.

Octet #	Bits 8 7 6 5	Bits 4 3 2 1
Octet 1	0000	0001
Octet 2	0010	0011
Octet 3	0100	1010
Octet 4	1011	1100
Octet 5	1101	1110

Figure 8: Octetstring field encoding

4.3.2.3.2.2.2.2 Decoding of parameters containing strings of variable length

Typical fields addressed here are e.g. the 'address digits' field in the 'Called Party Number' parameter, or the 'diagnostics' field in the 'Cause Indicators' parameter.

The above mentioned strings of variable length are the last elements of the related parameter, which has a preceding length field. A 'real' decoder deduces the length (and thereby the value) of such fields from the value of the 'length' field of the parameter and the position of the decoder where the field starts.

The decoder of the test system shall also be able to decode such fields when the value of the template is '?' or '*'.

In order to support this encoding the relevant types have a trailing "with { encode ..." statement, like in the following example (Called Party Number).

EXAMPLE 4:

```
....
with { encode (paramLen) "tag="CDN_paramLen";";
      encode (addressSignals) "length=valueOf(getTag("CDN_paramLen")).toInt()-2;"; }
```

End EXAMPLE 4

4.3.2.3.2.2.2.3 Decoding of parameters containing extension bits

Some parameters transport IEs from the DSS1 protocol (Q.931), such as the Bearer Capability IE:

- IEs of this kind contain extension bits specifying the presence of succeeding octets.

The decoder shall be able to evaluate the extension bits to deduce the presence of optional octets in case wildcards '?' or '*' are specified in templates of such IEs.

4.3.2.3.2.2.2.4 Receipt of unknown ISUP/BICC messages

Unknown messages in this context are messages not defined in the dated version of [16] referred to in the present document.

Unknown messages shall not be passed to TE by the test system.

4.3.2.3.2.2.2.5 Receipt of unknown ISUP/BICC parameters

Unknown parameters in this context are parameters not defined in the dated version of ITU-T Recommendation Q.763 [16] referred to in the present document, or defined parameters not being assigned in ITU-T Recommendation Q.763 [16] to the particular received message carrying this parameter.

Unknown parameters shall not be passed to TE by the test system (i.e. they shall be removed from the carrying known message before passing this message to TE).

4.3.2.3.2.2.6 Ordering of optional ISUP/BICC parameters and multiple occurrence of parameters

According to ITU-T Recommendation Q.763 [16] optional parameters may occur in any order in a message, and some (few) parameters may occur more than once.

For the controlled test environment specified in this ATS the following assumption has been made:

- Parameters that may occur more than once appear at most two times in a message.

For each message that may contain optional parameters the list of parameters has been specified in the ATS as a **set**.

The decoder shall be able to decode the parameters of a received message correctly, even if they appear in an order different from the one specified in the message template (and type).

4.3.2.3.3 Logging conventions

As the ATS defines on an abstract level the message exchange between TS and SUT the messages encoded messages send and received shall be logged. The TM entity in the TS shall provide access to this log.

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 102 709-1 [3]. The requirements applicable to this TP are given by a reference to RFC 3261 [18] (SIP) and ITU-T Recommendation Q.1912.5 [5] or EN 383 001 [4] (ISUP). There are no explicit formulations of requirements.

5.2 ATS structure

5.2.1 Test case grouping

The ATS structure defined in table 14 is based on the structuring of Test Purposes in clause 5 of TS 102 709-2 [1]. The group names in columns 1 to 3 of table 14 are those assigned in the ATS; they are based on the names provided in clause 5 of TS 102 709-2 [1], but use the naming conventions defined for the ATS (see clause 5.3.2.2).

Table 14: ATS structure

Group	Subgroup	Sub-Subgroup	Group Index
Basic call	SIP-ISUP		1
		Sending of the Initial Address Message (IAM)	101
		Sending of the Subsequent Address Message (SAM)	102
		Sending of COT	103
		Receipt of the Address Complete Message (ACM)	104
		Receipt of the Call Progress message (CPG)	105
		Receipt of the Answer Message (ANM)	106
		Receipt of the Connect message (CON)	107
		Receipt of the Release message (REL)	108
		Autonomous release at I-IWU	109
		Receipt of the BYE, CANCEL message / sending of a REL message	110
		Receipt of Reset Circuit Message (RSC), Circuit group reset message (GRS) or Circuit group blocking message (CGB) with the indication hardware failure oriented	111
		Receipt of the SUSPEND Message (SUS)	112
		Receipt of the RESUME Message (RES)	113
		Receipt of Confusion Message (CFN)	114
Receipt of Segmentation Message (SGM)	115		

Group	Subgroup	Sub-Subgroup	Group Index
	ISUP-SIP		3
		Sending of the INVITE message	301
		Receipt of the Subsequent address message (SAM)	302
		Sending of the Address complete message (ACM)	303
		Sending of the Call progress message (CPG)	304
		Sending of the answer message (ANM)	305
		Sending of the Connect message (CON)	306
		Receipt of the Release message (REL)	307
		Sending of the Release Message (REL)	308
		Receipt of Reset circuit message (RSC), Circuit group reset message (GRS) or Circuit group blocking message (CGB) with the indication hardware failure oriented	309
		Receipt of Confusion Message (CFN)	310
		Receipt of the SUSPEND Message (SUS) and RESUME Message (RES)	311
		Receipt of the Blocking Message (BLO)	312
		Receipt of the User Part Test Message (UPT)	313
		Receipt of Segmentation Message (SGM)	314
Supplementary Services			4
		Calling Line Identification Presentation (CLIP)	401
		Calling Line Identification Restriction (CLIR)	402
		Connected Line Identification Presentation (COLP)	403
		Connected Line Identification Restriction (COLR)	404
		Terminal Portability (TP)	405
		Subaddressing (SUB)	406
		Malicious call identification (MCID)	407
		Call Hold (HOLD)	408
		Call Waiting (CW)	409
		Call Diversion (CFB, CFNR, CFU, CD)	410
		Conference Calling (CONF)	411
		Explicit Call transfer (ECT)	412
		Three-Party (3PTY)	413
		User to User Signalling (UUS)	
		User to User service 1	4140
		User to User service 1	4141
		User to User service 1	4142

Group	Subgroup	Sub-Subgroup	Group Index	
ISDN SIP Interworking	BasicCall FromSIPtoISDN		5	
		SendingSETUP	501	
		SendingINFO	502	
		Receiving_ALERT_CALLPROC_PROGRESS	503	
		Receiving_CONNECT	504	
		Receiving_DISC_REL	505	
		Receipt_BYE_CANCEL	506	
	BasicCall FromISDNtoSIP			6
		Sending_INVITE		601
		Overlap_sending		602
		Sending_ALERT_CALLPROC		603
		Sending_CONNECT		604
		Receiving_DISC_REL		605
		Receipt_BYE_Backward_Resp_CANCEL		606
		Autonomous_release		607
	Supplementary Services			7
		CLIP		701
		CLIR		702
		COLP		703
		COLR		704
		TP		705
		USS1		7060
		USS2		7061
		USS3		7062
		CUG		707
		SUB		708
		MCID		709
		CONF		710
		ECT		711
		CFB_CFNR_CFU_CD		712
	HOLD		713	
CW		714		
3PTY		715		

5.2.2 Test case identifiers

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

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

where:

- double quotes (") are used to enclose literal strings;
- <Group path index> is the 3-digit (or 4-digit) number in column 4 of Table 14 (which uniquely identifies the path of groups/subgroups);
- <TC number> is a running 3-digit (or 2-digit) decimal number, starting in each subgroup path with "001" (or "01").

EXAMPLE:

TC_101_001:

- the identifier has Group index "101", i.e. it is in the subgroup having complete path: BasicCall/SIP-ISUP/Sending of the Initial address message (IAM)/;
- 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 102 709-2 [1] and test case names.

The TP identifier of TC_101_001 is TP101001.

5.3 ATS specification framework

5.3.1 ATS Library

For this interworking ATS there are 2 applicable base protocols:

- a) SIP protocol (RFC 3261 [18]); and
- b) ISUP protocol (ITU-T Recommendation Q.76n series [14] to [17], plus associated standards for supplementary services, etc.).

Since e.g. the data structures of these 2 base protocols are independent, and other objects like test cases are common, the TTCN-3 library modules are basically organized as:

- 1) SIP modules;
- 2) ISUP modules;
- 3) Common modules (generated for the present ATS);
- 4) LibCommon modules (taken from TS 102 351 [2]).

Table 15 shows the organization of the ATS as library of modules.

Table 15: Library of modules

Module Class	Module Id	Description
LibCommon	LibCommon_AbstractData	Generic data types for a stack and its operations.
	LibCommon_BasicTypesAndValues	Basic type and value definitions (integer and Boolean).
	LibCommon_DataStrings	Bit and Octet string types.
	LibCommon_Sync	Co-ordination/synchronization of test components.
	LibCommon_TextStrings	Basic character and string types with fixed length.
	LibCommon_Time	Time handling functions and module parameter.
CommonAts	SIPI_PICS	Module Parameter declarations associated with PICS.
	SIPI_PIXITS	SIP-ISUP common Module Parameter declarations associated with PIXIT.
	SIPI_TestCases	Test case functions.
	SIPI_TestConfiguration	Functions which implement the configuration of the SUT adapter and mapping of test components for establishing and tearing down different test configurations.
	SIPI_TestExecution	Module control: execute test cases depending on selection conditions; repeat parameterized test cases based on the "Variant-tables" defined in the test prose.
	SIPI_TestSystem	Common functions, components, ASPs controlling the test system.
SIPAts	SIPI_SIP_TCFUNCTIONS	PTC root functions for test cases (e.g. f_Sip_TC_101_001).
	SIPI_SIP_Types	SIP data types (messages, header fields) and parallel test component (according to TS 102 027-3 [7]).
	SIPI_SIP_Templates	Templates for SIP messages and header fields (according to RFC 3261 [18]).
	SIPI_SIP_Steps	SIP auxiliary functions.
	SIPI_SDPTypes	SIP SDP data types.
	SIPI_EncapsISUP	ISUP templates used for the encapsulated ISUP messages in SIP message bodies.
ISUPAts	SIPI_ISUP_Constants	Constant declarations, mostly corresponding to field values of ISUP messages/parameters.
	SIPI_ISUP_ParamTypes	ISUP data types (parameter types according to ITU-T Recommendation Q.763 [16] and types required for ASPs).
	SIPI_ISUP_MsgTypes	ISUP data types (message types according to ITU-T Recommendation Q.763 [16] and ASP type declarations).
	SIPI_ISUP_ParamTemplates	Templates for ISUP message parameters.
	SIPI_ISUP_MsgTemplates	Templates for ISUP messages.
	SIPI_ISUP_Steps	Test step declarations, including preambles, postambles and default.
	SIPI_ISUP_TCFUNCTIONS	Test case functions running on the Isup/Bicc component.

5.3.2 Use of TTCN-3

5.3.2.1 General

TTCN-3 as defined in ES 201 873-1 [8] is used as ATS specification language.

A number of requirements have been identified for the development and production of the TTCN-3 specification for the SIP/ISUP Interworking ATS:

- 1) Top-down design.
- 2) A uniquely defined testing architecture and test method.
- 3) Uniform TTCN-3 style and naming conventions.
- 4) TTCN-3 is human-readability.

- 5) TTCN-3 specification is feasible, implementable, compilable and maintainable.
- 6) Test cases shall be designed in a way to be easily adaptable, upwards compatible with the evolution of the base protocol and protocol interworking of future releases.
- 7) The test declarations, data structures and data values shall be largely reusable.
- 8) Modularity and modular working method.
- 9) Minimizing the requirements of intelligence on the emulators of the lower testers.
- 10) Giving enough design freedom to the test equipment manufacturers.

Fulfilling these requirements should ensure the investment of the test equipment manufacturers and users of the ATS having stable testing means for a relatively long period.

5.3.2.2 TTCN-3 naming conventions

Like in other software projects using a programming language, the use of naming conventions supports or increases:

- a) the readability;
- b) the detection of semantic errors;
- c) the shared work of several developers;
- d) the maintainability.

The naming conventions applied to the SIP/ISUP Interworking ATS are based on the following underlying principles:

- when constructing meaningful identifiers, the general guidelines specified for naming in clause 9 of [2] should be followed;
- the names of TTCN-3 objects being associated with standardized data types (e.g. in the base protocols) should reflect the names of these data types as close as possible (of course not conflicting with syntactical requirements or other conventions being explicitly stated);
- the subfield names of TTCN-3 objects being associated with standardized data type should also be similar to corresponding element names in the base standards (be recognizable in the local context);
- in most other cases, identifiers should be prefixed with a short alphabetic string (specified in table 3) indicating the type of TTCN-3 element it represents;
- prefixes should be separated from the body of the identifier with an underscore ("_");
- only test case names, module names, data type names and module parameters should begin with an upper-case letter. All other names (i.e. the part of the identifier following the prefix) should begin with a lower-case letter.

Table 16 specifies the naming guidelines for each element of the TTCN-3 language indicating the recommended prefix and capitalization.

Table 16: TTCN-3 naming conventions

Language element	Naming convention	Prefix	Example	Notes
Module	Use upper-case initial letter	none	IPv6Templates	
TSS grouping	Use all upper-case letters as specified in clause 7.1.2.1.1	none	TP_RT_PS_TR	
Item group within a module	Use lower-case initial letter	none	messageGroup	
ISUP message type	Use upper-case initial letter and message name abbreviations as defined in ITU-T Recommendation Q.762 [15]	none	IAM	
ISUP parameter type	Use upper-case initial letter and parameter name abbreviations taken from ITU-T Recommendation Q.763 [16]	none	CalledPartyNumber	
SIP message type	Use upper-case initial letter	none	Request, Response	Note 4
SIP header type	Use upper-case initial letter	none	MaxForwards	Note 4
Basic common data types (e.g. bit string types of fixed length)	Use upper-case initial letter	none	Take from common module	
Other Data types	Use upper-case initial letter	none	SetupContents	
Template	None	m_	m_IAM_Basic	Note 1 Note 5
Message template with wildcard or matching expression	None	mw_	mw_AnyUserReply	Note 2 Note 5
Signature template	Use lower-case initial letter	s_	s_callSignature	
Port instance	Use lower-case initial letter	none	signallingPort	
Test component ref	Use lower-case initial letter	none	userTerminal	
Constant	Use lower-case initial letter	c_	c_maxRetransmission	
External constant	Use lower-case initial letter	cx_	cx_macId	
Function	Use lower-case initial letter	f_	f_authentication()	
External function	Use lower-case initial letter	fx_	fx_calculateLength()	
Altstep (incl. Default)	Use lower-case initial letter	a_	a_receiveSetup()	
Test case	Use naming as specified in clause 5.2.2	TC_	TC_101_001	
Variable (local)	Use lower-case initial letter	v_	v_macId	
Variable (defined within a component)	Use lower-case initial letters	vc_	vc_systemName	
Timer (local)	Use lower-case initial letter	t_	t_wait	
Timer (defined within a component)	Use lower-case initial letters	tc_	tc_authMin	
Module parameter	Use initial upper case letters	PX	PX_MAC_ID	Note 3
Parameterization	Use lower-case initial letter	p_	p_macId	
Enumerated Value	Use lower-case initial letter	e_	e_syncOk	
<p>NOTE 1: This prefix must be used for all template definitions which do not assign or refer to templates with wildcards or matching expressions, e.g. templates specifying a constant value, parameterized templates without matching expressions, etc.</p> <p>NOTE 2: This prefix must be used in identifiers for templates which either assign a wildcard or matching expression (e.g. ?, *, value list, if present, pattern, etc.) or reference another template which assigns a wildcard or matching expression.</p> <p>NOTE 3: In this case it is acceptable to use underscore as a word delimiter.</p> <p>NOTE 4: This convention has been used in TS 102 027-3 [7] (SIP ATS).</p> <p>NOTE 5: Names of ISUP messages and parameters (IEs) start with a syllable being composed of capital letters only, like IAM e.g. This is different for SIP. Naming conventions concerning the first letter of a template (after prefix 'm_' or 'mw_', may be handled differently for ISUP/BICC and SIP respectively).</p>				

5.4 ATS archive

Annex B contains the ATS archive (.zip file expanding to text files with TTCN-3 code).

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 partial PIXIT proforma in this annex so that it can be used for its intended purposes and may further publish the completed partial 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 interworking type of ATS defined in the present document, the PIXIT are divided in SIP-related PIXIT and ISUP/BICC-related PIXIT (there are no common PIXIT defined, but a set of integer values due to the possibility to select test case variants, if appropriate to the test case definition only).

NOTE: The tables in this clause have been generated automatically from the TTCN-3 modules.

A.2.1 SIP-related PIXIT

For the SIP side of the ATS the PIXIT defined in TS 102 351 [2] apply. In addition the SIP-related PIXIT of tables A.1 to A.4 apply, which have been provided for the particular purposes of this ATS. Each PIXIT item corresponds to a Module Parameter of the ATS.

Table A.1: SIP-related PIXIT items (Connection)

Index / Identifier	Type / Description
1) PX_SIP_TRANSPORT	characterstring for used transport in upper case "UDP"/"TCP"
2) PX_SIP_IUT_PORT	characterstring for IUT port number to exchange SIP messages
3) PX_SIP_IUT_IPADDR	characterstring for IUT IP address to exchange SIP messages (used for CallId)
4) PX_SIP_IUT_HOME_DOMAIN	characterstring for IP host address of called user (used for CallId IP domain)
5) PX_SIP_IUT_HOME_DOMAIN_UNKNOWN	characterstring for IP host address of called user (invalid IP domain)
6) PX_SIP_IUT_USER	characterstring for URL user info (identity) to be called at ISDN side
7) PX_SIP_IUT_USER_FULL	characterstring for international format URL user info (identity) to be called at ISDN side
8) PX_SIP_IUT_USER_UNKNOWN	characterstring for invalid URL user info (identity) to be called at ISDN side
9) PX_SIP_ETS_IPADDR	characterstring for IP host address used by the ETS to exchange SIP messages
10) PX_SIP_ETS_PORT	Port number (integer) used by the ETS to exchange SIP messages
11) PX_SIP_ETS_BEARER_PORT	characterstring for port number used by the ETS to exchange media streams
12) PX_SIP_ETS_LOCAL_USER	characterstring for identity of the local user (URL user info for ETS)
13) PX_SIP_ETS_LOCAL_USER_FULL	characterstring for identity of the local user (format "+cc+ndc+sn, for ETS)
14) PX_SIP_REGISTRAR_DOMAIN	characterstring for IUT domain to register SIP user
15) PX_SIP_REGISTRAR_PORT	characterstring for IUT port number to register SIP user

Table A.2: SIP-related PIXIT items (Procedure)

Index / Identifier	Type / Description
16) PX_SIP_100rel	boolean flag on the support of the 100rel mechanism (true if support)
17) PX_SIP_precondition	boolean flag on the support of the precondition mechanism (true if support)
18) PX_SIP_BYE_CAUSE	cause value (integer) in reason header field of BYE request message
19) PX_SIP_CheckConversation	boolean flag value on the implementation of conversation check operation (user plane)
20) PX_SIP_CheckRinging	boolean flag value on the implementation of ringing check operation (user plane)
21) PX_SIP_REGISTRATION	boolean flag indicates if the SIP user has to register itself before executing a testcase
22) PX_SIP_REGISTRATION_AUTHENTICATION_ENABLED	boolean flag on option controlling if authentication is enabled/disabled for registration messages
23) PX_SIP_RFC2617_QOP	characterstring for IUT port number to register SIP user RFC 2617 [19] (3-2-1) qop options: Quoted string of one or more tokens indicating the "quality of protection" values supported by the server; the value "auth" indicates authentication; the value "auth-int" indicates authentication with integrity protection; example: "auth, auth-int"
24) PX_SIP_RFC2617_USERNAME	characterstring for name of user in the specified realm
25) PX_SIP_RFC2617_PASSWD	A known shared secret (charstring), the password of user of the specified username
26) PX_SIP_RFC2617_URI	URI (charstring) used for the calculation of the digists (external function)

Table A.3: SIP-related PIXIT items (Timer)

Index / Identifier	Type / Description
27) PX_T6	T6 float value on ISUP max allowed suspend time (1 min to 2 min)
28) PX_T8	T8 float value on ISUP max allowed time for continuity check (10 s to 15 s)
29) PX_T9	T9 float value on ISUP max allowed time for awaiting user answer (ACM) (90 s to 180 s)
30) PX_T39	T39 float value on ISUP max allowed time for awaiting MCID answer (IRS) (12 s to 15 s)
31) PX_TECT	T(ECT) float value for ISUP ECT explicit call transfer max value (2 s to 6 s)
32) PX_TOIW1	TOIW1 default (float) value for waiting for address complete signal (4 s to 6 s)
33) PX_SIP_TWAIT	default timeout (float) value for SUT request message INVITE, CANCEL, etc. (to avoid deadlock)
34) PX_SIP_TACK	default timeout (float) value for SUT acknowledge message ACK (to avoid deadlock)
35) PX_SIP_TRESP	default timeout (float) value for SUT response 1xx (to avoid deadlock)
36) PX_SIP_TNOACT	default timeout (float) value for SUT 'silence' (no message from SUT is received)

Table A.4: SIP-related PIXIT items (Message body)

Index / Identifier	Type / Description
37) PX_SIP_SDP_dyn	characterstring for SDP media-field fmt-subfield dynamic payload-type (default 0=PCMU is used in preamble)
38) PX_SIP_SDP_port1	integer for SDP media port for audio media (first port in case of 2 ports)
39) PX_SIP_SDP_port2	integer for SDP media port for audio media (second port in case of 2 ports)
40) PX_SIP_SDP_port3	integer for SDP media port for video media
41) PX_SIP_SDP_b_modifier	characterstring for SDP bandwidth modifier
42) PX_SIP_SDP_b_bandwidth	SDP bandwidth (integer) value
43) PX_SIP_SDP_encoding	characterstring for SDP media attribute encoding (used as default in preamble)
44) PX_SIP_SDP_transport	characterstring for SDP media-field transport protocol for T38
45) PX_SIP_MIME_Boundary	characterstring used in SIP message body to separate MIME parts (boundary)
46) PX_SIP_SDP_ContentType	characterstring used for the SDP content-type
47) PX_SIP_ISUP_ContentType	characterstring used for the ISUP content-type
48) PX_SIP_ISUP_ContentDisposition	characterstring used for the ISUP content-type version

A.2.2 ISUP/BICC-related PIXIT

Tables A.5 to A.7 list the ISUP/BICC-related PIXIT items associated with the ATS. Each PIXIT item corresponds to a Module Parameter of the ATS. Default values are not provided.

Table A.5: ISUP-related PIXIT items (Timer)

Index / Identifier	Type / Description
49) PX_TDelay_ACM	Time (float value) to delay ACM message before sending
50) PX_TDelay_ANM	Time (float value) to delay ANM message before sending
51) PX_TDelay_APM	Time (float value) to delay APM message before sending
52) PX_TDelay_BLA	Time (float value) to delay BLA message before sending
53) PX_TDelay_BLO	Time (float value) to delay BLO message before sending
54) PX_TDelay_CFN	Time (float value) to delay CFN message before sending
55) PX_TDelay_CGB	Time (float value) to delay CGB message before sending
56) PX_TDelay_CGU	Time (float value) to delay CGU message before sending
57) PX_TDelay_CON	Time (float value) to delay CON message before sending
58) PX_TDelay_COT	Time (float value) to delay COT message before sending
59) PX_TDelay_CPG	Time (float value) to delay CPG message before sending
60) PX_TDelay_FAA	Time (float value) to delay FAA message before sending
61) PX_TDelay_FAC	Time (float value) to delay FAC message before sending
62) PX_TDelay_FAR	Time (float value) to delay FAR message before sending
63) PX_TDelay_FRJ	Time (float value) to delay FRJ message before sending
64) PX_TDelay_GRS	Time (float value) to delay GRS message before sending
65) PX_TDelay_IDR	Time (float value) to delay IDR message before sending
66) PX_TDelay_IRS	Time (float value) to delay IRS message before sending
67) PX_TDelay_LOP	Time (float value) to delay LOP message before sending
68) PX_TDelay_REL	Time (float value) to delay REL message before sending
69) PX_TDelay_RES	Time (float value) to delay RES message before sending
70) PX_TDelay_RLC	Time (float value) to delay RLC message before sending
71) PX_TDelay_RSC	Time (float value) to delay RSC message before sending
72) PX_TDelay_SAM	Time (float value) to delay SAM message before sending
73) PX_TDelay_SEG	Time (float value) to delay SEG message before sending
74) PX_TDelay_SUS	Time (float value) to delay SUS message before sending
75) PX_TDelay_UBA	Time (float value) to delay UBA message before sending
76) PX_TDelay_UBL	Time (float value) to delay UBL message before sending
77) PX_TDelay_UPA	Time (float value) to delay UPA message before sending

Index / Identifier	Type / Description
78) PX_TDelay_UPT	Time (float value) to delay UPT message before sending
79) PX_TDelay_UUI	Time (float value) to delay UUI message before sending
80) PX_TDelay_UNKNOWN	Time (float value) to delay UNKNOWN message before sending
81) PX_Timeout_T2	Nominal timeout (float) value of ISUP protocol timer T2
82) PX_Timeout_T39	Nominal timeout (float) value of ISUP protocol timer T39
83) PX_Timeout_T4	Nominal timeout (float) value of ISUP protocol timer T4
84) PX_Timeout_T6	Nominal timeout (float) value of ISUP protocol timer T6
85) PX_Timeout_T7	Nominal timeout (float) value of ISUP protocol timer T7
86) PX_Timeout_T8	Nominal timeout (float) value of ISUP protocol timer T8
87) PX_Timeout_T9	Nominal timeout (float) value of ISUP protocol timer T9
88) PX_Timeout_T18	Nominal timeout (float) value of ISUP protocol timer T18
89) PX_Timeout_TOIW1	Nominal timeout (float) value of ISUP/SIP interworking protocol timer TOIW1
90) PX_Timeout_TOIW2	Nominal timeout (float) value of ISUP/SIP interworking protocol timer TOIW2
91) PX_Timeout_TECT	Nominal timeout (float) value of ISUP/SIP interworking protocol timer TECT
92) PX_ISUP_TAC	Time (float value) to control the reception of a message
93) PX_ISUP_TNOAC	Time (float value) to control that IUT sends nothing
94) PX_ISUP_TWAIT	Time (float value) to control that IUT reacts prior to Upper Tester action
95) PX_ISUP_TSYNC	Time (float value) to control that IUT reacts prior to Upper Tester action
96) PX_ISUP_TSYNC_TIME_LIMIT	Time (float value) to control that IUT reacts prior to Upper Tester action

Table A.6: ISUP-related PIXIT items (General)

Index / Identifier	Type / Description
97) PX_ISUP_IsupOrBicc	Select whether ISUP or BICC testing is done (selectIsup, selectBicc)
98) PX_ISUP_Isup	Flag (boolean) if ISUP is used
99) PX_ISUP_NW_IND	Network indicator (2 bits) inside the Service Indicator Octet (SIO)
100) PX_ISUP_PC_TS	Point code (14 bits) of the TS (ISUP interface)
101) PX_ISUP_PC_SUT	Point code (14 bits) of the SUT (ISUP interface)
102) PX_ISUP_SLS	Signalling Link Selection (SLS) value (4 bits) of the ISUP link between TS and SUT
103) PX_TS_ADRESS_ISUP_BICC	octetstring for address (eg IP) of the TS (ISUP/BICC side) - The use of this address is to enable the TS to communicate with the SUT at the ISUP/BICC side to establish and maintain the lower layer connections
104) PX_SUT_ADRESS_ISUP_BICC	octetstring for address (eg IP) of the SUT (ISUP/BICC side) - The use of this address is to enable the TS to communicate with the SUT at the ISUP/BICC side to establish and maintain the lower layer connections
105) PX_ISUP_TX_CIC_cicv1	Default Circuit Identity Code value (12 bits) for signalling connection 1)
106) PX_ISUP_TX_CIC_cicv2	Default Circuit Identity Code value (12 bits) for signalling connection 2)
107) PX_ISUP_TX_CIC_caicv1	Default Call Instance Code value (octetstring) for signalling connection 1)
108) PX_ISUP_TX_CIC_caicv2	Default Call Instance Code value (octetstring) for signalling connection 2)
109) PX_IsupBicc_CheckConversation	boolean value is true if conversation check is used
110) PX_IsupBicc_CheckRinging	boolean value is true if ringing check is used

Table A.7: ISUP-related PIXIT items (Message parameter)

Index / Identifier	Type / Description
111) PX_ISUP_CGB_RAS_raValue	8 bits for 'Range value' (Parameter value bigger than 1) sent in the 'Range and Status' parameter in the CGB, CGU message
112) PX_ISUP_CGB_RAS_statValue	octetstring for 'Status' value (Parameter value bigger than 1) sent in the 'Range and Status' parameter in the CGB, CGU message
113) PX_ISUP_CGB2_RAS_raValue	8 bits for 'Range value' (Parameter value bigger than 1) sent in the 'Range and Status' parameter in the second CGB, CGU message

Index / Identifier	Type / Description
114) PX_ISUP_CGB2_RAS_statValue	octetstring for 'Status' value (Parameter value bigger than 1) sent in the 'Range and Status' parameter in the second CGB, CGU message
115) PX_ISUP_FAC_comp_txDef	octetstring for 'component' value (accepted by the SUT without immediate response (PIXIT)) sent in the 'Facility' parameter in the FAC message
116) PX_ISUP_TX_CGC_cliPCategory_rxDef	8 bits for default value for element callingPartysCategory received inside Calling party's category parameter (CGC); Optional(O) format
117) PX_ISUP_IAM_CLD_digits_rxInat	characterstring for 'address digits' value (CC NDC SN) received in the 'Called party number' parameter in the IAM message, when the nature of address is 'international number'
118) PX_ISUP_IAM_CLD_digits_rxDef	characterstring for default 'address digits' value received in the 'Called party number' parameter in the IAM message
119) PX_ISUP_IAM_CLD_digits_rxNat	characterstring for 'address digits' value (NDC SN) received in the 'Called party number' parameter in the IAM message, when the nature of address is 'national number'
120) PX_ISUP_IAM_CLD_digits_txInat_encaps	characterstring for 'address digits' value (CC NDC SN) send in the 'Called party number' parameter in the IAM encapsulated message, when the nature of address is 'international number'
121) PX_ISUP_IAM_CLD_digits_txDef_encaps	characterstring for default 'address digits' value send in the 'Called party number' parameter in the encapsulated IAM message
122) PX_ISUP_IAM_CLD_digits_txNat_encaps	characterstring for 'address digits' value (NDC SN) send in the 'Called party number' parameter in the encapsulated IAM message, when the nature of address is 'national number'
123) PX_ISUP_TX_CDN_addrSignals_encaps	characterstring for default value for element addressSignals inside Called party number parameter (CDN) for encapsulated ISUP; Variable(V) format (to be sent when the TP does not specify a specific value for that field)
124) PX_ISUP_IAM_CLI_digits_rxInat	characterstring for default 'address digits' value received in the 'Calling party number' parameter in the IAM message, when the Called party number is 'international'
125) PX_ISUP_IAM_CLI_digits_rxNat	characterstring for default 'address digits' value received in the 'Calling party number' parameter in the IAM message, when the Called party number is 'national (sign) number'
126) PX_ISUP_IAM_CLI_digits_rxDef	characterstring for default 'address digits' value received in the 'Calling party number' parameter in the IAM message, when the Nature of address is not explicitly specified
127) PX_ISUP_IAM_CLI_numIncmplInd_rxDef	1 bit for default 'Number incomplete indicator' value received in the 'Calling party number' parameter in the IAM message
128) PX_ISUP_IAM_CLI_digits_txInat	characterstring for default 'address digits' value sent in the 'Calling party number' parameter in the IAM message, when the Called party number is 'international'
129) PX_ISUP_IAM_CLI_digits_txNat	characterstring for default 'address digits' value sent in the 'Calling party number' parameter in the IAM message, when the Called party number is 'national (sign) number'
130) PX_ISUP_TX{EIF}_v_eventInd	7 bits for default 'PROGRESS event indicator' value received in the 'Event information' parameter in the CPG message
131) PX_ISUP_IAM_FCI_nInatCallInd_rxDef	1 bit for default 'National/international call indicator' value received in the 'Forward call Indicators' parameter in the IAM message
132) PX_ISUP_IAM_FCI_eToEndMavail_rxDef	2 bits for default 'End-to-end method available' value received in the 'Forward call Indicators' parameter in the IAM message
133) PX_ISUP_IAM_FCI_interwInd_rxDef	1 bit for default 'Interworking indicator' value received in the 'Forward call Indicators' parameter in the IAM message
134) PX_ISUP_IAM_FCI_eToEndInfoInd_rxDef	1 bit for default 'End-to-end information indicator' value received in the 'Forward call Indicators' parameter in the IAM message
135) PX_ISUP_IAM_FCI_isdnUpInd_rxDef	1 bit for default 'ISDN user part indicator' value received in the 'Forward call Indicators' parameter in the IAM message
136) PX_ISUP_IAM_FCI_isdnUpPrefInd_rxDef	2 bits for default 'ISDN user part preference indicator' value received in the 'Forward call Indicators' parameter in the IAM message
137) PX_ISUP_IAM_FCI_isdnAcclInd_rxDef	1 bit for default 'ISDN access indicator' value received in the 'Forward call Indicators' parameter in the IAM message

Index / Identifier	Type / Description
138) PX_ISUP_IAM_FCI_sccpMind_rxDef	2 bits for default 'SCCP method indicator' value received in the 'Forward call Indicators' parameter in the IAM message
139) PX_ISUP_IAM_CLD_digits_auto	characterstring for complete 'address digits' value sent in the 'Called party number' parameter in the IAM message, when the destination is an automatically answering SIP
140) PX_ISUP_TX_CLD_natAddr_auto	7 bits for 'nature of address' value sent in the 'Called party number' parameter in the IAM message, when the destination is an automatically answering SIP
141) PX_ISUP_IAM_CLD_digits_analysis	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, when 'sending complete' is not sent, not the maximum number of digits are sent, the number is complete and completeness is determined by analysis of the number
142) PX_ISUP_TX_CLD_natAddr_analysis	7 bits for 'nature of address' value sent in the 'Called party number' parameter in the IAM message, when 'sending complete' is not sent, not the maximum number of digits are sent, the number is complete and completeness is determined by analysis of the number
143) PX_ISUP_IAM_CLD_digits_timeout	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, when 'sending complete' is not sent, not the maximum number of digits are sent, the number is complete and completeness is determined by timeout
144) PX_ISUP_TX_CLD_natAddr_timeout	7 bits for 'nature of address' value value sent in the 'Called party number' parameter in the IAM message, when 'sending complete' is not sent, not the maximum number of digits are sent, the number is complete and completeness is determined by timeout
145) PX_ISUP_IAM_CLD_digits_max	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, containing the maximum number of digits according to the national numbering plan, and no 'sending complete'
146) PX_ISUP_TX_CLD_natAddr_max	7 bits for 'nature of address' value sent in the 'Called party number' parameter in the IAM message, containing the maximum number of digits according to the national numbering plan, and no 'sending complete'
147) PX_ISUP_IAM_CLD_digits_min	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, containing the minimum number of digits required for routing, and no 'sending complete'
148) PX_ISUP_TX_CLD_natAddr_min	7 bits for 'nature of address' value sent in the 'Called party number' parameter in the IAM message, containing the minimum number of digits required for routing, and no 'sending complete'
149) PX_ISUP_IAM_CLD_digits_SipUri	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, converted by the IWU such that the To header field contains a sip: URI
150) PX_ISUP_TX_CLD_natAddr_SipUri	7 bits for 'nature of address' value sent in the 'Called party number' parameter in the IAM message, converted by the IWU such that the To header field contains a sip: URI
151) PX_ISUP_IAM_CLD_digits_txDef	characterstring for default 'address digits' value sent in the 'Called party number' parameter in the IAM message, containing the complete address and 'sending complete'
152) PX_ISUP_TX_CLD_natAddr_txDef	7 bits for default 'nature of address' value sent in the 'Called party number' parameter in the IAM message, containing the complete address and 'sending complete'
153) PX_ISUP_IAM_CLD_digits_Leading_subs	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, containing a leading part of an address (to be completed by 2 SAM messages), and where the nature of address is 'subscriber number'
154) PX_ISUP_IAM_CLD_digits_Leading_nat	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, containing a leading part of an address (to be completed by 2 SAM messages), and where the nature of address is 'national (sign) number'
155) PX_ISUP_IAM_CLD_digits_Leading_sipUri	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, containing a leading part of an address (to be completed by 2 SAM messages), converted by the IWU such that the To header field contains a sip: URI

Index / Identifier	Type / Description
156) PX_ISUP_IAM_CLD_digits_Leading_inat	characterstring for 'address digits' value sent in the 'Called party number' parameter in the IAM message, containing a leading part of an address (to be completed by 2 SAM messages), and where the nature of address is 'international number'
157) PX_ISUP_IAM_CLD_digits_txDef_inat	characterstring for default 'complete address digits' value sent in the 'Called party number' parameter in the IAM message, when the nature of address is specified as 'international number'
158) PX_ISUP_IAM_CLD_digits_txDef_nat	characterstring for default 'complete address digits' value sent in the 'Called party number' parameter in the IAM message, when the nature of address is specified as 'national (sign) number'
159) PX_ISUP_IAM_CLD_digits_less	characterstring for 'address digits' value (less than minimum number digits to route the call) sent in the 'Calling party number' parameter in the IAM message
160) PX_ISUP_IAM_CLD_natAddr_less	7 bits for 'nature of address' value (number of digits less than minimum number digits to route the call) sent in the 'Calling party number' parameter in the IAM message
161) PX_ISUP_REL_CAU_cVal	integer 'Cause' value (decimal) send in the 'Cause' parameter in the REL message
162) PX_ISUP_SAM_SQN_digits_rx1	characterstring for 'address digits' value (PIXIT) received in the 'Subsequent number' parameter in the first SAM message
163) PX_ISUP_SAM_SQN_digits_rx2	characterstring for 'address digits' value (PIXIT) received in the 'Subsequent number' parameter in the second SAM message
164) PX_ISUP_SAM_SQN_digits_txFinLess	characterstring for 'address digits' value sent in the 'Subsequent number' parameter in the first SAM message, containing the final part of the number, where the IAM contained less than the minimum digits to route the call
165) PX_ISUP_SAM_SQN_digits_txFinDef	characterstring for 'address digits' value sent in the 'Subsequent number' parameter in the second SAM message, completing the (subscriber) number
166) PX_ISUP_SAM_SQN_digits_txMidDef	characterstring for 'address digits' value sent in the 'Subsequent number' parameter in the first SAM message, containing the middle part of the complete (subscriber) number
167) PX_ISUP_SAM_SQN_digits_txFinNat	characterstring for final 'address digits' value sent in the 'Subsequent number' parameter in the second SAM message, completing the (national sign) number
168) PX_ISUP_SAM_SQN_digits_txMidNat	characterstring for middle 'address digits' value sent in the 'Subsequent number' parameter in the first SAM message, not completing the (national sign) number
169) PX_ISUP_SAM_SQN_digits_txFinPhone	characterstring for final 'address digits' value sent in the 'Subsequent number' parameter in the second SAM message, where the whole number is mapped to the addr-spec component of the To header field which includes the "user=phone" URI parameter
170) PX_ISUP_SAM_SQN_digits_txFinInat	characterstring for 'address digits' value sent in the 'Subsequent number' parameter in the second SAM message, completing the (international) number
171) PX_ISUP_SAM_SQN_digits_txMidPhone	characterstring for middle 'address digits' value sent in the 'Subsequent number' parameter in the first SAM message, where the whole number is mapped to the addr-spec component of the To header field which includes the "user=phone" URI parameter
172) PX_ISUP_SAM_SQN_digits_txMidInat	characterstring for 'address digits' value (PIXIT (middle part of standard international address/ to be completed by next SAM)) sent in the 'Subsequent number' parameter in the SAM message
173) PX_ISUP_TX_BCI_v_chargeInd	2 bits for default value for element chargeIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
174) PX_ISUP_TX_BCI_v_cldPStatInd	2 bits for default value for element calledPartysStatusIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)

Index / Identifier	Type / Description
175) PX_ISUP_TX_BCI_v_cldPCatInd	2 bits for default value for element calledPartysCategoryIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
176) PX_ISUP_TX_BCI_v_eTOeMethodInd	2 bits for default value for element end_to_endMethodIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
177) PX_ISUP_TX_BCI_v_interwInd	1 bit for default value for element interworkingIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
178) PX_ISUP_TX_BCI_v_eTOeInfoInd	1 bit for default value for element end_to_endInformationIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
179) PX_ISUP_TX_BCI_v_iSDNUserPartInd	1 bit for default value for element iSDNUserPartIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
180) PX_ISUP_TX_BCI_v_holdingInd	1 bit for default value for element holdingIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
181) PX_ISUP_TX_BCI_v_iSDNAccessInd	1 bit for default value for element iSDNAccessIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
182) PX_ISUP_TX_BCI_v_echoContrDevInd	1 bit for default value for element echoControlDeviceIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
183) PX_ISUP_TX_BCI_v_sCCPMethodInd	2 bits for default value for element sCCPMethodIndicator inside Backward call indicators parameter (BCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
184) PX_ISUP_TX_CDN_natOfAddressInd	7 bits for default value for element natureOfAddressIndicator inside Called party number parameter (CDN); Variable(V) format (to be sent when the TP does not specify a specific value for that field)
185) PX_ISUP_TX_CDN_numPlanInd	3 bits for default value for element numberingPlanIndicator inside Called party number parameter (CDN); Variable(V) format (to be sent when the TP does not specify a specific value for that field)
186) PX_ISUP_TX_CDN_iNN	1 bit for default value for element iNN inside Called party number parameter (CDN); Variable(V) format (to be sent when the TP does not specify a specific value for that field)
187) PX_ISUP_TX_CDN_addrSignals	characterstring for default value for element addressSignals inside Called party number parameter (CDN); Variable(V) format (to be sent when the TP does not specify a specific value for that field)
188) PX_ISUP_TX_CGC_cliPCategory	8 bits for default value for element callingPartysCategory inside Calling party's category parameter (CGC); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
189) PX_ISUP_TX_CPN_natOfaddressind	7 bits for default value for element natureOfaddressindicator inside Connected number parameter (CPN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
190) PX_ISUP_TX_CPN_screenInd	2 bits for default value for element screeningIndicator inside Connected number parameter (CPN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
191) PX_ISUP_TX_CPN_addrPresRestrInd	2 bits for default value for element APRI = 'presentation allowed' inside Connected number parameter (CPN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
192) PX_ISUP_TX_CPN_numplanInd	3 bits for default value for element numbering plan Indicator inside Connected number parameter (CPN); Optional(O) format (to be sent when the TP does not specify a specific value for that field).
193) PX_ISUP_TX_CPN_addrSignals_txNat	characterstring for default value for element 'addressSignals' (national format) inside 'Connected number' parameter; (to be sent when the TP does not specify a specific value for that field)

Index / Identifier	Type / Description
194) PX_ISUP_TX_CPN_addrSignals_txNat	characterstring for default value for element 'addressSignals' (international format) inside 'Connected number' parameter; (to be sent when the TP does not specify a specific value for that field)
195) PX_ISUP_TX_CPN_addrSignals_rxNat	characterstring for default 'addressSignals' value received in the 'Connected number' parameter in the ANM or CON message when the Called party number is 'national'
196) PX_ISUP_TX_CPN_addrSignals_rxNat	characterstring for default 'addressSignals' value received in the 'Connected number' parameter in the ANM or CON message when the Called party number is 'international'
197) PX_ISUP_TX_CTN_natOfaddressind	7 bits for default value for element natureOfaddressindicator inside Call transfer number (CTN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
198) PX_ISUP_TX_CTN_screenInd	2 bits for default value for element screeningIndicator inside Call transfer number (CTN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
199) PX_ISUP_TX_CTN_addrPresRestrInd	2 bits for default value for element addrPresRestrInd inside Connected number parameter (CPN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
200) PX_ISUP_TX_CTN_numblplanInd	3 bits for default value for element numberingplanIndicator inside Call transfer number (CTN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
201) PX_ISUP_TX_CTN_addrSignals_txNat	characterstring for default value for element 'addressSignals' (national format) inside Call transfer number (CTN) parameter; (to be sent when the TP does not specify a specific value for that field)
202) PX_ISUP_TX_CTN_addrSignals_rxNat	characterstring for default 'addressSignals' value received in the Call transfer number (CTN) parameter in the ANM or CON message when the Called party number is 'national'
203) PX_ISUP_TX_CTN_addrSignals_rxNat	characterstring for default 'addressSignals' (international format) value received in the Call transfer number (CTN) parameter in the ANM or CON message when the Called party number is 'national'
204) PX_ISUP_TX_FCI_natInternatCallInd	1 bit for default value for element natInternatCallIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
205) PX_ISUP_TX_FCI_endToEndMethodInd	2 bits for default value for element endToEndMethodIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
206) PX_ISUP_TX_FCI_interwInd	1 bit for default value for element interworkingIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
207) PX_ISUP_TX_FCI_eTOeInfoIndic	1 bit for default value for element endToEndInfoIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
208) PX_ISUP_TX_FCI_iSDNUserPartInd	1 bit for default value for element iSDNUserPartIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
209) PX_ISUP_TX_FCI_iSDNUserPartPrefInd	2 bits for default value for element iSDNUserPartPrefIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
210) PX_ISUP_TX_FCI_iSDNAccessInd	1 bit for default value for element iSDNAccessIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
211) PX_ISUP_TX_FCI_sCCPMethodInd	2 bits for default value for element sCCPMethodIndicator inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
212) PX_ISUP_TX_FCI_reserved	4 bits for default value for element reserved inside Forward call indicators parameter (FCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
213) PX_ISUP_TX_GEN_addrSignals_rxNat	characterstring for 'address digits' value received in the 'Generic number' parameter, when the Nature of Address is 'international number'

Index / Identifier	Type / Description
214) PX_ISUP_TX_GEN_addrSignals_rxNat	characterstring for 'address digits' value received in the 'Generic number' parameter, when the Nature of Address is 'national (sign number'
215) PX_ISUP_TX_GEN_addrSignals_txInat	characterstring for 'address digits' value sent in the 'Generic number' parameter, when the Nature of Address is 'international number'
216) PX_ISUP_TX_GEN_addrSignals_txNat	characterstring for 'address digits' value sent in the 'Generic number' parameter, when the Nature of Address is 'national (sign number'
217) PX_ISUP_TX_NCI_satelliteInd	2 bits for default value for element satelliteIndicator inside Nature of connection indicators parameter (NCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
218) PX_ISUP_TX_NCI_contCheckInd	2 bits for default value for element continuityCheckIndicator inside Nature of connection indicators parameter (NCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
219) PX_ISUP_TX_NCI_echoContrDevInd	1 bit for default value for element echoControlDeviceIndicator inside Nature of connection indicators parameter (NCI); Fixed(F) format (to be sent when the TP does not specify a specific value for that field)
220) PX_ISUP_TX_OCN_natOfAddressInd	7 bits for default value for element natureOfAddressIndicator inside Original called number parameter (OCN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
221) PX_ISUP_TX_OCN_addrPresRestrInd	2 bits for default value for element addrPresRestrInd inside Original called number parameter (OCN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
222) PX_ISUP_TX_OCN_numPlanInd	3 bits for default value for element numberingPlanIndicator inside Original called number parameter (OCN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
223) PX_ISUP_TX_OCN_addrSignals_Nat	characterstring for default value for element addressSignals inside Original called number parameter (OCN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
224) PX_ISUP_TX_OCN_addrSignals_Inat	characterstring for default 'addressSignals' value received in the 'Original called number' parameter in the IAM message when the called party number is 'international'
225) PX_ISUP_TX_RAS_range	8 bits for default value for element range inside Range and status parameter (RAS); Variable(V) format (to be sent when the TP does not specify a specific value for that field)
226) PX_ISUP_TX_RAS_status	octetstring for default value for element status inside Range and status parameter (RAS); Variable(V) format (to be sent when the TP does not specify a specific value for that field)
227) PX_ISUP_TX_RAS_status_noDefault	octetstring for default value for element status inside Range and status parameter (RAS); Variable(V) format (to be sent when the TP does not specify a specific value for that field)
228) PX_ISUP_TX_RDN_natOfAddressInd	7 bits for default value for element natureOfAddressIndicator inside Redirecting number parameter (RDN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
229) PX_ISUP_TX_RDN_addrPresRestrInd	2 bits for default value for element addrPresRestrInd inside Redirecting number parameter (RDN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
230) PX_ISUP_TX_RDN_numPlanInd	3 bits for default value for element numberingPlanIndicator inside Redirecting number parameter (RDN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
231) PX_ISUP_TX_RDN_addrSignals_Nat	characterstring for national value for element addressSignals inside Redirecting number parameter (RDN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)

Index / Identifier	Type / Description
232) PX_ISUP_TX_RDN_addrSignals_Inat	characterstring for international value for element addressSignals inside Redirection number parameter (RDN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
233) PX_ISUP_TX_RNN_natOfAddressInd	7 bits for default value for element natureOfAddressIndicator inside Redirection number parameter (RNN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
234) PX_ISUP_TX_RNN_numPlanInd	3 bits for default value for element numberingPlanIndicator inside Redirection number parameter (RNN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
235) PX_ISUP_TX_RNN_iNN	1 bit for default value for element Internal Network Number indicator inside Redirection number parameter (RNN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
236) PX_ISUP_TX_RNN_addrSignals_Nat	characterstring for national value for element addressSignals inside Redirection number parameter (RNN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
237) PX_ISUP_TX_RNN_addrSignals_Inat	characterstring for international value for element addressSignals inside Redirection number parameter (RNN); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
238) PX_ISUP_TX_RNS_presRestrInd	2 bits for default value for element presRestrIndicator inside Redirection number restriction parameter (RNS); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
239) PX_ISUP_TX_TMR_transmMedReq	8 bits for default value for element transmissionMediumRequirement inside Transmission medium requirement prime parameter (TMRP); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
240) PX_ISUP_TX_UUI_userInfo_S1	octetstring for default 'user-to-user information' (Service 1 data) value sent in the 'User-to-user information' parameter in the IAM message
241) PX_ISUP_TX_UUI_userInfo_S2	octetstring for default 'user-to-user information' (Service 2 data) value sent in the 'User-to-user information' parameter in the IAM message
242) PX_ISUP_TX_UUI_userInfo_S3	octetstring for default 'user-to-user information3' (Service 3 data) value sent in the 'User-to-user information' parameter in the IAM message
243) PX_ISUP_TX_HPC_hopCounter	5 bits for default value for element hopCounter inside Hop counter parameter (HPC); Optional(O) format (to be sent when the TP does not specify a specific value for that field)
244) PX_ISUP_TX_digits_Prefix	characterstring for default prefix digits defined for 'address digits' value
245) PX_ISUP_TX_unknown_parameter_type	8 bits for default value for an unknown parameter type (to be sent when the TP does not specify a specific value for that field)
246) PX_ISUP_TX_unknown_message_type	8 bits for default value for an unknown message type (to be sent when the TP does not specify a specific value for that field)
247) PX_ISUP_TX_cgps_information	octetstring for default value for calling party subaddress information in the Access transport (to be sent when the TP does not specify a specific value for that field)
248) PX_ISUP_TX_cgps_odd_even_indicator	1 bit for default value for calling party subaddress odd even indicator in the Access transport (to be sent when the TP does not specify a specific value for that field)
249) PX_ISUP_TX_cgps_type_of_subaddress	3 bits for default value for calling party subaddress type of subaddress in the Access transport (to be sent when the TP does not specify a specific value for that field)
250) PX_ISUP_TX_cdps_information	octetstring for default value for called party subaddress information in the Access transport (to be sent when the TP does not specify a specific value for that field)

Index / Identifier	Type / Description
251) PX_ISUP_TX_cdps_odd_even_indicator	1 bit for default value for called party subaddress odd even indicator in the Access transport (to be sent when the TP does not specify a specific value for that field)
252) PX_ISUP_TX_cdps_type_of_subaddress	3 bits for default value for called party subaddress type of subaddress in the Access transport (to be sent when the TP does not specify a specific value for that field)
253) PX_ISUP_TX_consub_type_of_subaddress	3 bits for default value for connected subaddress type of subaddress in the Access transport (to be sent when the TP does not specify a specific value for that field)
254) PX_ISUP_TX_consub_odd_even_indicator	1 bits for default value for connected party subaddress odd even indicator in the Access transport (to be sent when the TP does not specify a specific value for that field)
255) PX_ISUP_TX_consub_information	octetstring for default value for connected subaddress information in the Access transport (to be sent when the TP does not specify a specific value for that field)
256) PX_ISUP_TX_without_Cancel_Encaps	According to RFC 3398 [i.1] and Q.1912.5 [5], received CANCEL message does not contain encapsulated REL. If false, received CANCEL message with encapsulated REL is supported

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_10270903v030101p0.zip which accompanies the present document.

Annex C (informative): Bibliography

- ETSI ES 201 873-7 (V3.1.1): "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 7: Using ASN.1 with TTCN-3".
- ETSI TS 102 237-1 (V4.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Interoperability test methods and approaches; Part 1: Generic approach to interoperability testing".
- ETSI EG 202 106 (V2.1.1): "Methods for Testing and Specification (MTS); Guidelines for the use of formal SDL as a descriptive tool".
- ISO/IEC 9646-2 (1994): "Conformance testing methodology and framework - Part 2: Abstract Test Suite Specification".
- ISO/IEC 9646-3 (1992): "Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation".
- ISO/IEC 9646-3/DAM 1 (1992): "Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation; Amendment 1: TTCN extensions".
- ISO/IEC 9646-5 (1994): "Conformance testing methodology and framework - Part 5: Requirements on test laboratories and clients for the conformance assessment process".
- ITU-T Recommendation Q.1902.1 (2001): "Specifications of the Bearer Independent Call Control Protocol (BICC): Functional description".
- ITU-T Recommendation Q.1902.2 (2001): "Specifications of the Bearer Independent Call Control Protocol (BICC): General functions of messages and parameters".
- ITU-T Recommendation Q.1902.3 (2001): "Specifications of the Bearer Independent Call Control Protocol (BICC): Formats and codes".
- ITU-T Recommendation Q.1902.4 (2001): "Specifications of the Bearer Independent Call Control Protocol (BICC): Basic call procedures".
- ITU-T Recommendation Q.731.7 (1997): "Stage 3 description for number identification supplementary services using Signalling System No. 7: Malicious call identification (MCID)".
- ITU-T Recommendation Q.732.2 (1999): "Stage 3 description for call offering supplementary services using Signalling System No. 7: Call diversion services - Call Forwarding Busy (CFB)".
- ITU-T Recommendation Q.732.3 (1999): "Stage 3 description for call offering supplementary services using Signalling System No. 7: Call Forwarding No Reply (CFNR)".
- ITU-T Recommendation Q.732.4 (1999): "Stage 3 description for call offering supplementary services using Signalling System No. 7: Call Forwarding Unconditional (CFU)".
- ITU-T Recommendation Q.732.5 (1999): "Stage 3 description for call offering supplementary services using Signalling System No. 7: Call Deflection (CD)".
- ITU-T Recommendation Q.732.7 (1996): "Stage 3 description for call offering supplementary services using Signalling System No. 7: Explicit Call Transfer".
- ITU-T Recommendation Q.733.1 (1992): "Stage 3 description for call completion supplementary services using Signalling System No. 7: Call waiting (CW)".
- ITU-T Recommendation Q.733.2 (1993): "Stage 3 description for call completion supplementary services using Signalling System No. 7: Call hold (HOLD)".

- ITU-T Recommendation Q.733.3 (1997): "Stage 3 description for call completion supplementary services using Signalling System No. 7: Completion of calls to busy subscriber (CCBS)".
- ITU-T Recommendation Q.733.4 (1993): "Stage 3 description for call completion supplementary services using Signalling System No. 7: Terminal portability (TP)".
- ITU-T Recommendation Q.733.5 (1999): "Stage 3 description for call completion supplementary services using Signalling System No. 7: Completion of calls on no reply".
- ITU-T Recommendation Q.734.1 (1993): "Stage 3 description for multiparty supplementary services using Signalling System No. 7: Conference calling".
- ITU-T Recommendation Q.734.2 (1996): "Stage 3 description for multiparty supplementary services using Signalling System No. 7: Three-party service".
- ITU-T Recommendation Q.735.1 (1993): "Stage 3 description for community of interest supplementary services using Signalling System No. 7: Closed user group (CUG)".
- ITU-T Recommendation Q.735.3 (1993): "Stage 3 description for community of interest supplementary services using Signalling System No. 7: Multi-level precedence and preemption".
- ITU-T Recommendation Q.735.6 (1996): "Stage 3 description for community of interest supplementary services using Signalling System No. 7: Global Virtual Network Service (GVNS)".
- ITU-T Recommendation Q.736.1 (1995): "Stage 3 description for charging supplementary services using Signalling System No. 7: International Telecommunication Charge Card (ITCC)".
- ITU-T Recommendation Q.736.3 (1995): "Stage 3 description for charging supplementary services using Signalling System No. 7: Reverse charging (REV)".
- ITU-T Recommendation Q.737.1 (1997): "Stage 3 description for additional information transfer supplementary services using Signalling System No. 7: User-to-user signalling (UUS)".
- ITU-T Recommendation Q.850 (1998): "Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN User Part".
- IETF RFC 2046 (1996): "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types".
- IETF RFC 2327 (1998): "SDP: Session Description Protocol".
- IETF RFC 2806 (2000): "URLs for Telephone Calls".
- IETF RFC 3204 (2001): "MIME media types for ISUP and QSIG Objects".
- IETF RFC 3262 (2002): "Reliability of Provisional Responses in the Session Initiation Protocol (SIP)".
- IETF RFC 3264 (2002): "An Offer/Answer Model with the Session Description Protocol (SDP)".
- IETF RFC 3311 (2002): "The Session Initiation Protocol UPDATE Method".
- IETF RFC 3312 (2002): "Integration of Resource Management and Session Initiation Protocol (SIP)".
- IETF RFC 3323 (2002): "A Privacy Mechanism for the Session Initiation Protocol (SIP)".
- IETF RFC 3326 (2002): "The Reason Header Field for the Session Initiation Protocol".
- IETF RFC 1035 (1997): "Domain names - implementation and specification".

History

Document history		
V3.1.1	February 2012	Publication