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Technical Specification

**Telecommunications and Internet converged Services
and Protocols for Advanced Networking (TISPAN);
Interworking between Session Initiation Protocol (SIP) and
Bearer Independent Call Control Protocol (BICC) or
ISDN User Part (ISUP);
Part 4: Abstract Test Suite (ATS) and
partial Protocol Implementation eXtra Information for
Testing (PIXIT) for Profiles A and B**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

The present document is part 4 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) for Profile A and B";
- Part 3: "Test Suite Structure and Test Purposes (TSS&TP) for Profile C";
- Part 4: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) for Profiles A and B";**
- Part 5: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) for Profile C".

1 Scope

The present document specifies the Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma based on the Test suite Structure and Test purposes defined in TS 186 002-2 [1].

The TSS&TP have been developed to test the interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control Protocol (BICC) or ISDN User Part, Profiles A and B. 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.

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2.1 Normative references

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

- [1] ETSI TS 186 002-2: "Telecommunications and Internet Converged Services and Protocols for Advanced Networking (TISPAN); Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control Protocol (BICC) or ISDN User Part (ISUP); Part 2: Test Suite Structure and Test Purposes (TSS&TP) for Profile A and B".
- [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 186 002-1: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control Protocol (BICC) or ISDN User Part (ISUP); 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] Void.
- [12] ISO/IEC 9646-1 (1992): "Information Technology - Open Systems Interconnection - Conformance Testing Methodology and Framework - Part 1: General concepts".
- [13] ISO/IEC 9646-7 (1994): "Conformance testing methodology and framework - Part 7: Implementation Conformance Statement".
- [14] ITU-T Recommendation Q.761 (2000): "Specifications of Signalling System No.7 ISDN User Part (ISUP)".
- [15] ITU-T Recommendation Q.762(2000): "Specifications of Signalling System No.7 ISDN User Part (ISUP)".
- [16] ITU-T Recommendation Q.763 (2000): "Specifications of Signalling System No.7 ISDN User Part (ISUP); ISDN user part formats and codes".
- [17] ITU-T Recommendation Q.764 (2000): "Specifications of Signalling System No.7 ISDN User Part (ISUP)".
- [18] IETF RFC 3261 (2002): "SIP: Session Initiation Protocol".
- [19] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".
- [20] ETSI ES 283 027: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Endorsement of the SIP-ISUP Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks [3GPP TS 29.163 (Release 7), modified]".

- [21] ETSI EN 300 356-1 (V4.2.1): "Integrated Services Digital Network (ISDN); Signalling System No.7 (SS7); ISDN User Part (ISUP) version 4 for the international interface; Part 1: Basic services [ITU-T Recommendations Q.761 to Q.764 (1999) modified]".

2.2 Informative references

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

- [i.1] ITU-T Recommendation Q.931: "ISDN user-network interface layer 3 specification for basic call control".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions are given in:

- SIP/ISUP interworking reference specification defined in EN 383 001 [4];
- ISDN layer 3 reference specification defined in EN 300 356-1 [21];
- ISDN User Part (ISUP) reference specification defined in EN 300 356-1 [21];
- ISO/IEC 9646-1 [12] and ISO/IEC 9646-7 [13];
- ES 201 873-1 [8] (TTCN-3).

and the following 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 [19]

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 apply:

NOTE: The ISUP message acronyms can be found in table 2/Q.762 in ITU-T Recommendation Q.762 [15].

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
BICC	Bearer Independent Call Control
CIC	Circuit Identification Code
DSS1	Digital Subscriber System No. 1
EDS	Encoding/Decoding System
ETS	Executable Test Suite
FCI	Forward Call Indicators
G/W Type 1	GateWay Type 1
G/W Type 2	GateWay Type 2
IETF	Internet Engineering Task Force
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
IUT	Implementation Under Test
IWU	InterWorking Unit
IXIT	Implementation eXtra Information for Testing
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
SA	System Adapter
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SN	Signalling Node
STC	Signalling Transport Converter (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
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
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.

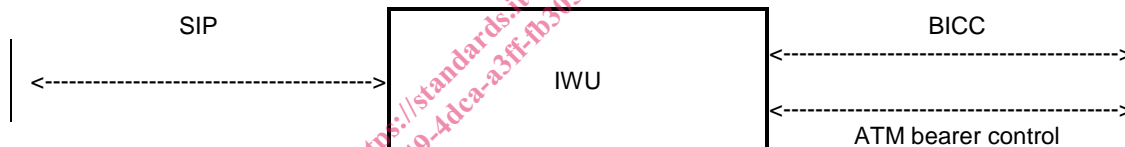


Figure 2: Interworking between SIP and BICC

NOTE: There are 3 profiles defined for IWU: Profile A, Profile B and Profile C (out of scope of the present document). Figures 1 and 2 in clause 5 of TS 186 002-2 [1] show the substructures of the IWU for Profiles A and B in terms of gateways and signalling nodes. In the ATS the SUT (IWU) represents either a G/W Type 1 (Profile A) or the combination of G/W Type 2 and SN (Profile B).

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.

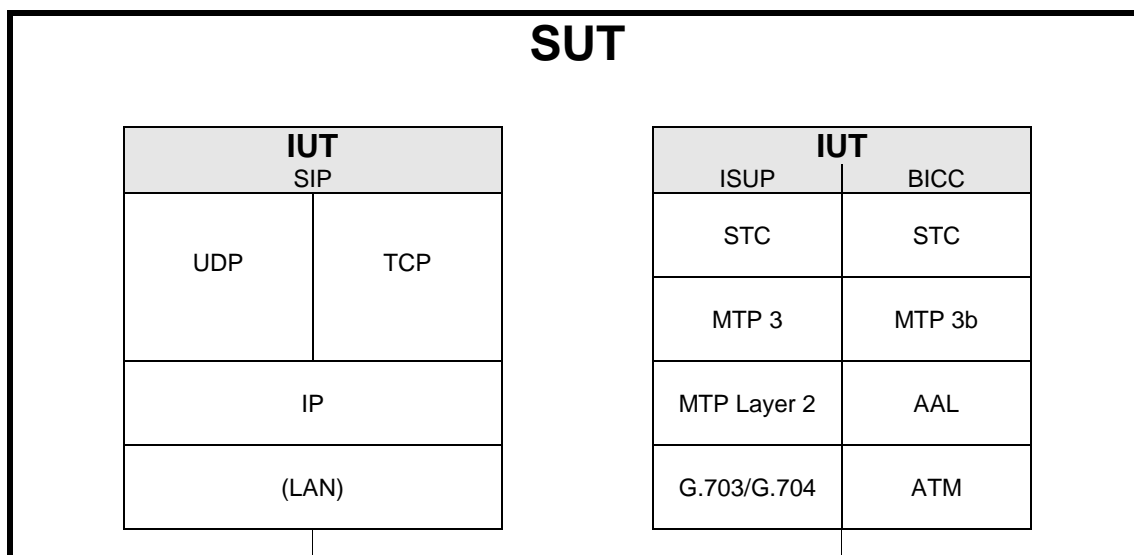


Figure 3: Protocol architecture of the SIP-ISUP-Interworking ATS

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.

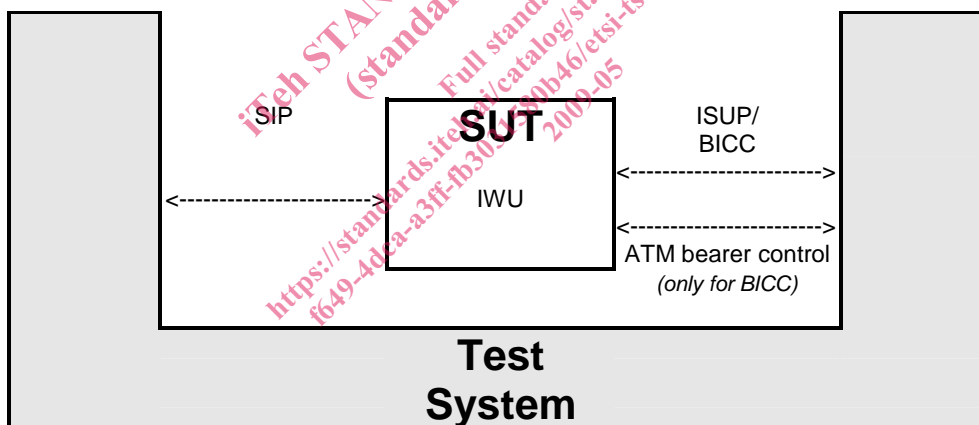


Figure 4: Interconnection of TS and SUT

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].

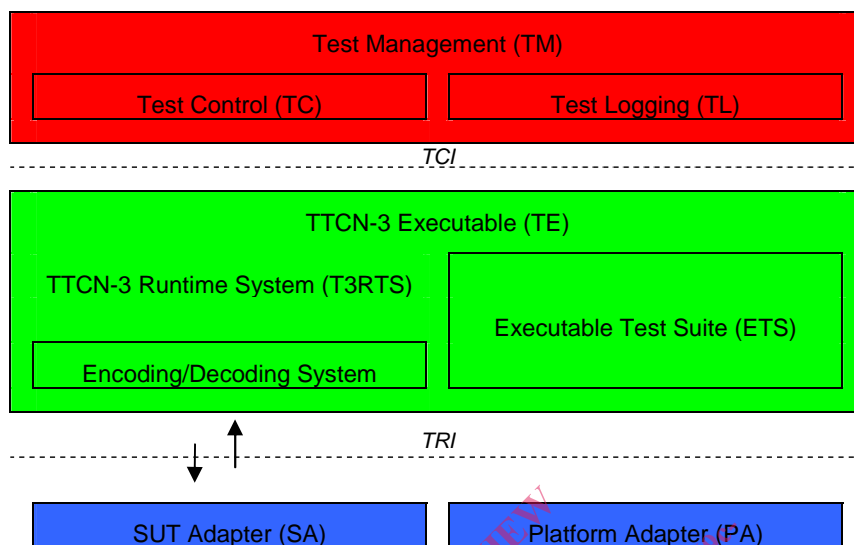


Figure 5: Abstract Test System Architecture

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.

The following 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 only evaluated in SA if ISUP has been selected in 'isupBiccSelection'.
routingLabel	RoutingLabel	The contents of this ASP parameter is only evaluated in SA if ISUP has been selected in 'isupBiccSelection'.
circuitIdentityCode	CircuitIdentityCode	The contents of this ASP parameter is only evaluated in SA if ISUP has been selected in 'isupBiccSelection'.
callInstanceCode	CallInstanceCode	The contents of this ASP parameter is only evaluated in SA 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	Bit8	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 only evaluated in TE if ISUP has been selected in 'isupBiccSelection'.
routingLabel	RoutingLabel	The contents of this ASP parameter is only evaluated in TE if ISUP has been selected in 'isupBiccSelection'.
circuitIdentityCode	CircuitIdentityCode	The contents of this ASP parameter is only evaluated in TE if ISUP has been selected in 'isupBiccSelection'.
callInstanceCode	CallInstanceCode	The contents of this ASP parameter is only evaluated in TE 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>		