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Intelligent Network (IN); Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Test Suite Structure and Test Purposes (TSS&TP) specification for Service Switching Function (SSF); Part 2: Call Party Handling (CPH)

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Foreword

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

The present document is part 2 of a multi-part deliverable covering the Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Test Suite Structure and Test Purposes (TSS&TP) specification for Service Switching Function (SSF), as identified below:

Part 1: "Basic capability set of CS3";

Part 2: "Call Party Handling (CPH)";

Part 3: "Specialized Resource Function (SRF)".

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1 Scope

The present document contains the Test Suite Structure and Test Purposes (TSS&TP) for Call Party Handling (CPH), part of CoreINAP CS-3.

The present document provides the Test Suite Structure and Test Purposes (TSS&TP) for the testing of the Call Party Handling (CPH) operations of the Service Switching Function (SSF), defined for the Intelligent Network Application Protocol (INAP) of Intelligent Network (IN) Capability Set 3 (CS3) according to EN 301 931-1 [1] and EN 301 931-2 [2].

The present document is completed by other parts constituting the testing of the CS3 Core INAP specifications: EN 301 931-1 [1] (Call party handling functions) and EN 301 933-3 [6] (Specialized resource functions).

ISO/IEC 9646-1 [8] and ISO/IEC 9646-2 [9] are used as the basis for the testing methodology.

2 References

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

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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[1] ETSI EN 301 931-1: "Intelligent Network (IN); Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Protocol specification; Part 1: Common aspects".

[2] ETSI EN 301 931-2: "Intelligent Network (IN); Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Protocol specification; Part 2: SCF-SSF interface".

[3] ETSI EN 301 931-3: "Intelligent Network (IN); Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Protocol specification; Part 3: SCF-SRF interface".

[4] ETSI EN 301 931-4: "Intelligent Network (IN); Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Protocol specification; Part 4: SDLs for SCF-SSF interface".

[5] ETSI EN 301 933-1: "Intelligent Network (IN); Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Test Suite Structure and Test Purposes (TSS&TP) specification for Service Switching Function (SSF); Part 1: Basic capability set of CS3".

[6] ETSI EN 301 933-3: "Intelligent Network (IN); Intelligent Network Capability Set 3 (CS3); Intelligent Network Application Protocol (INAP); Test Suite Structure and Test Purposes (TSS&TP) specification for Service Switching Function (SSF); Part 3: Specialized Resource Function (SRF)".

[7] Void.

[8] ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

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[9] ISO/IEC 9646-2: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification".

[10] ITU-T Recommendation Q.1224: "Distributed functional plane for intelligent network Capability Set 2".

3 Definitions and abbreviations

3.1 Definitions

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

- terms defined in EN 301 931-1 [1];
- terms defined in ISO/IEC 9646-1 [8] and in ISO/IEC 9646-2 [9].

In particular, the following terms defined in ISO/IEC 9646-1 [8] apply:

- Abstract Test Suite (ATS);
- Implementation Under Test (IUT);
- System Under Test (SUT);
- Protocol Implementation Conformance Statement (PICS).

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3.2 Abbreviations

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

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ATS	Abstract Test Suite
BI	Invalid Behaviour tests
BO	Inopportune Behaviour tests
BV	Valid Behaviour tests
CA	Capability tests
CS	Call Segment
CS	Capability Set
EDP-R	Event Detection Point - Request
FSM	Finite State Machine
IN	Intelligent Network
INAP	Intelligent Network Application Protocol
IP	Intelligent Peripheral
iS	initiating SSF
iSSP	initiating SSP
IUT	Implementation Under Test
MSC	Message Sequence Chart
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
SCF	Service Control Function
SCP	Service Control Point
SDF	Service Data Function
SDL	Specification and Description Language
SRF	Specialized Resource Function
SSF	Service Switching Function
SSP	Service Switching Point
SUT	System Under Test
TCAP	Transaction Capabilities Application Part
TP	Test Purpose
TSS	Test Suite Structure

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4 Test Purpose generalities

4.1 Introduction

A TP is defined for one or several conformance requirements to be tested. It is expected, that each TP will result in a test case keeping the same name, specified in the ATS.

4.2 Grouping of Test Purposes per elementary procedures

The Test Purposes are grouped by elementary procedures. A procedure groups elementary INAP operations which it is possible to test together. For each elementary procedure, are defined: how to invoke it; and what are the possible return results and return error(s) at the INAP interface.

NOTE: Some have no results at all at this INAP interface. In these cases, and to have a "visible" result, the PCO will be at the signalling control interface.

4.3 Source of Test Purpose definitions

The Test Purposes are based on the requirement documented in EN 301 931-1 [1] and EN 301 931-2 [2].

4.4 Method used for developing TPs

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4.4.1 Use of MSCs generated by the SDL model of Core INAP CS3

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The SDL model of INAP CS3 is specified with object oriented SDL (SDL"92") and specifies the behaviour of the SSF. The CS3 specification inherits the CS-1 and specifies the whole of CS-1 and CS-2. The SDL specification is the normative specification of the INAP behaviour and is contained in EN 301 931-4 [4].

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The SDL model specifies precisely and unambiguously the behaviour of and the interworking between the different functional entities of the SSF. The external interfaces of the SDL model are two signalling control interfaces (SigConA and SigConB) carrying abstract primitives, and the INAP interfaces to the SCF. Mappings are provided from SigConA and SigConB to DSS.1 and ISUP. The behaviour of the SDL model thus resembles an SSP, and can be used for service emulation and the development of Test Purposes and test cases. MSCs delivered by this SDL model are used in the TP definition and are provided in addition to the descriptive text.

The development of the Test Purposes (TP) is done in two steps:

a) the descriptive text is created together with a rough MSC defined by hand. It illustrates the basic behaviour in MSC-like form which is expected from the IUT. The rough MSC does not contain all the constraints in detail. The description makes reference to a preamble and a postamble;

b) a detailed MSC is developed by simulation:

   1) system level MSC for Autolink (the tool used to automatically generate the TTCN test cases based on the MSCs and the SDL model);

   2) MSC for documentation of the TPs.

The reason for developing the detailed MSC by simulation is that it can be done step by step while the SDL model prompts the developer for the correct options and parameters.

The MSCs identify the different entities (SSF, SCF, SigCon A and B) involved in a given configuration and shows the different components used for a test, in term of the IUT (representing the SSF for instance) and the testers (representing the SCF and the SigCon A, B or C).

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4.4.2 TCAP adapter primitives

In addition to showing the INAP protocol, and in order to ease the implementation of the test suite, the MSCs show the TCAP adapter primitives such as TC begin, TC continue, TC invoke and TC end and show using standard abbreviations the INAP operations which are embedded in the TCAP primitive, together with the operation arguments.

4.4.3 Generation of corresponding Test Cases

Using Computer Aided Test Generation techniques, TTCN test cases can be automatically generated from the SDL model. It is also possible to verify manually developed test cases against the SDL model.

4.5 Method used for TP description

4.5.1 Text and MSCs

In general, a TP is described using text presented in a table followed by an MSC.

The table describing each TP is as shown in table 1.

Table 1: Test purpose description sample

	TP name, e.g. IN3_A_BASIC_FC_BV_01
Work item no.:	Temporary work item number; to be deleted when the TPs are stable
IN2 Ref(tmp)	Reference to INAP CS2 TP (optional)
Purpose:	Textual phrasing of the TP to be achieved.
Requirements refs	Reference to clause(s) of EN 301 931-2 [2]. For TPs related to the SRF function: also reference to clause(s) of EN 301 931-3 [3]. In the latter case the part numbers are explicitly indicated (part 2 and/or part 3).
Selection Cond.	Reference to a formal selection expression, if the TP is related to an optional INAP feature. If the field is empty, the TP is unconditional (mandatory requirement(s)).
Preamble:	Reference to a preamble or "None".
Test description	Sequence of transmitted and received events and timeouts (see clause "TTCN-like notation"). Textual description is also used, as appropriate.
Pass criteria	Indication of reception (or assured non-reception) of decisive message(s) related to the TP.
Postamble:	Reference to a postamble or "None".

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The MSC which follows the TP description describes the test body, as the preambles and postambles are mostly defined by a single line in the MSC.

4.5.2 Test categories

Valid Behaviour tests (BV)

Predefined state transitions are considered as valid. The Test Purposes in the valid behaviour test sub group cover as far as reasonable the verification of the normal and exceptional procedures of the various Finite State Machines (FSMs), i.e. a valid behaviour test is a test where the message sequence and the message contents is considered as valid.

Invalid Behaviour tests (BI)

This test sub group is intended to verify that the IUT is able to react properly having received an invalid Protocol Data Unit (PDU). An invalid PDU is defined as a syntactically incorrect message.

Inopportune Behaviour tests (BO)

This test group is intended to verify that the IUT is able to react properly in the case an inopportune protocol event occurring. Such an event is syntactically correct but occurs when it is not expected, e.g. a correctly coded operation is received in a wrong state (the IUT may respond by sending error UnexpectedComponentSequence).

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4.5.3 Test purpose naming convention

The identifier of the TP is built according to the scheme in table 2.

Table 2: TP identifier naming convention scheme

Identifier:		**IN3_<i>_<sss>_<pp>_<cc>_<nn>**		
IN3		indicates IN Capability Set 3		
<i>	=	interface:	A	SSF-SCF interface
			B	SSF-SRF interface
			C	SCF-SCF interface
<sss>	=	common set	BASIC	Basic set for CS3
			CPH	Call Party Handling from Capability Set 3
			SRF	SRF-related functions from Capability Set 3
<pp>	=	procedure name like		
			SF	ServiceFiltering
<cc>	=	test category:		
			BV	Valid Behaviour tests
			BI	Invalid Behaviour tests
			BO	Inopportune Behaviour tests
<nn>	=	sequential number:		(01-99)
Example of Test Purpose and test case name: **IN3_A_BASIC_SF_BV_02**				

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4.5.4 Preambles and their naming conventions

Preambles are used to bring the IUT from the initial state to the state where the test takes place. In the CS3 scheme, the set of the preambles forms a tree, which means that in order to reach the state created by preamble P3, it is necessary to execute preamble P1 followed by preambles P2 then P3.

The naming convention used reflects the description of the connection view set by executing the preamble, in terms of nature of the legs per Call Segment (CS), starting from the stable legs then the ones on hold then the ones in transfer, with the indication of the number of legs, while the first letter indicates how this configuration was initiated.

The general form is:

a_[stableLegsParty or onHold (legs) or transfer(legs) for CallSegment 1]_[idem for CallSegment2]_[idem for CallSegment 3]

where:

a is letter:

- O for Originating (outgoing call for a user);
- T for Terminating (incoming call for a user);
- I for Initiate Call Attempt (initiated from the network).

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The state names and their abbreviations used are:

Null

1_Party 1P

Originating_Set-up OS

Terminating_Set-up TS

Originating_ 1_Party_Setup O1PS

Stable_1_Party S1P

Stable_2_Party S2P

Forward FW

Stable_Multi_Passive_Party (no. of passive legs n) SnPP

Stable_Multi_Party (no. of passive legs n) SnP

The term "null" stands for "none" as in preamble O_NULL_S2P_OH3.

There can be two set of CSs with the same nature of legs present at the same time, as in the preamble name O_S2P_S1P_S1P.

4.5.5 How to interpret the parameters and their values as used in the MSCs

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The MSCs show the exchanges of PDUs of the TCAP protocol, as well as the Core INAP protocol. PDUs of both protocols use parameters.

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The list of parameters for the TCAP protocol is recalled here for each TCAP primitives. Note that only mandatory parameters are used.

TCAP primitives from SCF to SSF:

TC_InvokeReq (InvokeID, Class, DialogueID, OperationCode, OperationArg, Timeout);

TC_BeginReq (DialogueID, OriginatingAddress);

TC_ContinueReq (DialogueID, OriginatingAddress);

TC_EndReq (DialogueID, Termination);

TC_AbortReq (DialogueID).

TCAP primitives from SSF to SCF:

TC_InvokeInd (InvokeID, DialogueID, OperationCode, OperationArg, LastComponent);

TC_BeginInd (DialogueID, OriginatingAddress, ComponentPresent);

TC_ContinueInd (DialogueID, OriginatingAddress, ComponentPresent);

TC_EndInd (DialogueID, Termination, ComponentPresent);

TC_AbortInd (DialogueID);

TC_ErrorInd (InvokeID, DialogueID, ErrorCode, LastComponent);

TC_ReturnResultInd (InvokeID, DialogueID, LastComponent, OperationCode, OperationArg);

TC_RejectInd (InvokeID, DialogueID).

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The values of these parameters are either mandatory and imposed by the specifications, or they are informative only and chosen arbitrarily in ranges compatible with the specifications.

Some preambles contain references to an ASP Mgt_SetTriggerTable. This does not exist in the protocol, but in the SDL model it allows which Trigger Detection points need to be set before commencing the test case.

5 Test configuration

Figure 1 shows the test configuration assumed for the CPH Test Purposes.

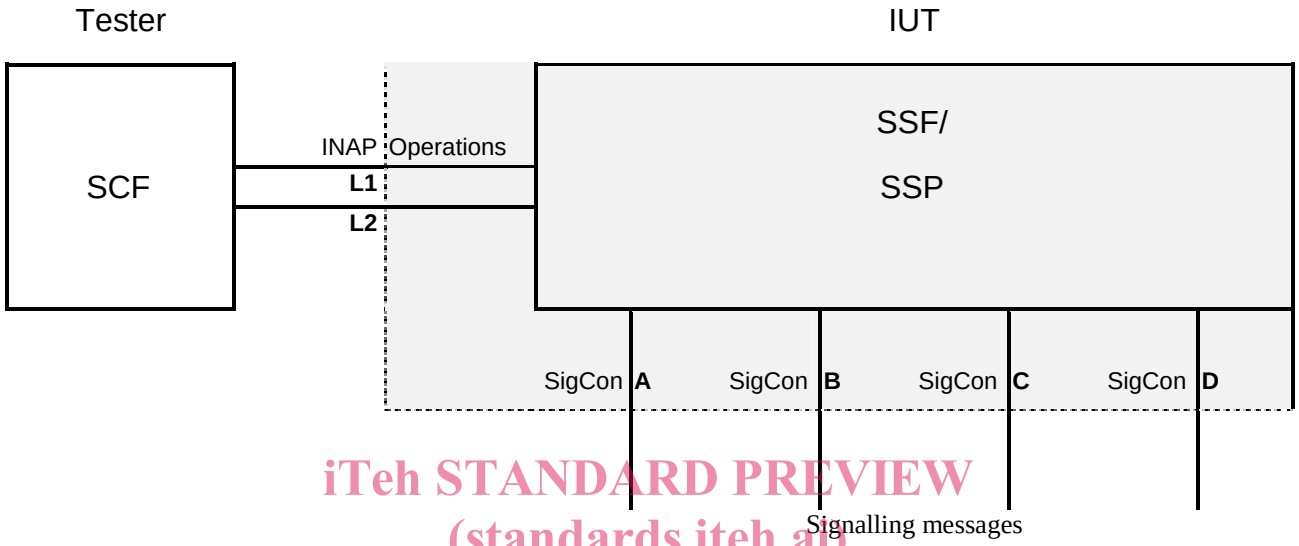

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Figure 1: Test configuration for the CPH Test Purposes

This test configuration covers a single SCP and a single SSP, where the SCP is simulated by the tester and the SSF is the implementation under test (IUT).

INAP PDUs (operations) are exchanged between the tester and the IUT across the interface named **L1** (or L2 etc.), which corresponds to a PCO in the TTCN-like notation used for the description of the test behaviour (see clause 6.4.2). INAP PDUs are embedded in TCAP messages as described in clause 10 of EN 301 931-1 [1] and clause 15 of EN 301 931-2 [2].

When call-related operations are tested, signalling messages are exchanged between the tester and the IUT, where the signalling terminations in the IUT are named SigCon A to SigCon D. Depending on the implementation, the signalling messages can be messages of the DSS1 protocol, ISUP protocol or another protocol (see e.g. clause 6.2.2.1 of EN 301 931-2 [2]). To be independent of any particular signalling protocol, **Abstract Signalling Primitives** are used in the test descriptions instead of signalling messages. For the definition of the Abstract Signalling Primitives see clause 6.2.2.2 of EN 301 931-2 [2].

NOTE: Test configurations including SRF entities are defined in EN 301 933-3 [6].