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Inteligentno omrežje (IN) - Aplikacijski del inteligentnega omrežja (INAP) - Nabor zmognosti 2 (CS2) - 3. del: Zgradba preskuġalnega niza in namen preskuġanja (TSS&TP) - Specifikacija za funkcijo preklapljanja storitev (SSF) - 1. podpoglavje: Osnovni nabor zmognosti CS-1, vkljuļ no s komponentami CS-2

Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2); Part 3: Test Suite Structure and Test Purposes (TSS&TP) specification for Service Switching Function (SSF); Sub-part 1: Basic capability set of CS-1 including CS-2 complements

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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 3, sub-part 1 of a multi-part EN covering the Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2), as identified below:

Part 1: "Protocol specification";

Part 2: "Protocol Implementation Conformance Statement (PICS) proforma specification";

Part 3: "Test Suite Structure and Test Purposes (TSS&TP) specification for Service Switching Function (SSF)";

Sub-part 1: "Basic capability set of CS-1 including CS-2 complements";

Sub-part 2: "Call Party Handling (CPH)";

Sub-part 3: "Specialized Resource Functions (SRF)";

Part 4: "Abstract Test Suite (ATS) specification and Partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma for Service Switching Function (SSF)";

Part 5: "Distributed Functional Plane (DFP) [ITU-T Recommendation Q.1224 (1997), modified]".

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1 Scope

The present document provides the Test Suite Structure and Test Purposes (TSS&TP) for testing of the Service Switching Function (SSF) and the Specialized Resource Function (SRF) of the Intelligent Network Application Protocol (INAP) of Intelligent Network (IN) Capability Set 2 (CS2) according to EN 301 140-1 [1].

The present document relates to the basic capability set, which covers the CS-1 operations, plus the CS-2 additions related to these operations, mainly due to the test of the CS-2 additional parameters or functionalities.

The present document is completed by other parts constituting the CS-2 Core INAP specifications.

In the present version of the TP description included in tables, references to specification requirements and references to PICS in the "condition for selection" are not included, except to mention when it is a CS-2 addition.

ISO/IEC 9646-1 [3] and ISO/IEC 9646-2 [4] are used as the basis for the test 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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ETSI EN 301 140-1 (V1.3): "Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2); Part 1: Protocol specification".

[2] ETSI EN 301 140-4 (V1.1): "Intelligent Network (IN); Intelligent Network Application Protocol (INAP); Capability Set 2 (CS2); Part 4: Abstract Test Suite (ATS) specification and Partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma for Service Switching Function (SSF)".

[3] ISO/IEC 9646-1: "Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[4] ISO/IEC 9646-2: "Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 2: Abstract test suite specification".

[5] ETSI ETS 300 374-1: "Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1); Core Intelligent Network Application Protocol (INAP); Part 1: Protocol specification".

3 Definitions and abbreviations

3.1 Definitions

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

- terms defined in EN 301 140-1 [1];
- terms defined in ISO/IEC 9646-1 [3] and in ISO/IEC 9646-2 [4].

In particular, the following terms defined in ISO/IEC 9646-1 [3] apply:

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

3.2 Abbreviations

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

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

4 Test Purpose generalities

4.1 Introduction

A TP is defined for one or several conformance requirements to be tested. 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 301 140-1 [1].

4.4 Method used for developing TPs

4.4.1 Use of MSCs generated by the SDL model of Core INAP CS-2

The SDL model of INAP CS-2 is specified with object oriented SDL (SDL'92) and specifies the behaviour of the SSF. The CS-2 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 annex A of EN 301 140-1 [1].

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).

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. The clear separation of CS-1 and CS-2 in the SDL model makes it possible to use it for both CS-1 and CS-2 test case development.

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 follows:

Table 1a

	(TP name, also corresponding test case name)
Test Purpose:	
Requirement Ref:	
Selection Cond:	
Test preamble:	
Test description	
Pass criteria:	
Test postamble	

In addition to the TP name and a reference to the specification requirement, the table contains a short title of the test purpose, the condition to select and run this test case (expression in terms of PICS references), the name of the test preamble, information on the test body including for instance details on parameters which do not appear in the companion MSC, the pass criteria for a successful test and the name of the test postamble.

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

Capability tests (CA)

Capability testing provides a limited testing to ascertain the capabilities stated in the PICS can be observed.

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).

4.5.3 Test purpose naming convention

The identifier of the TP is built according to the scheme in table 1b.

Table 1b: TP identifier naming convention scheme

Identifier:		**IN2_<i>_<sss>_<pp>_<cc>_<nn>**		
IN2		indicates IN Capability Set 1 and 2 (CS-1 being in CS-2)		
<i>	=	interface:	A	SSF-SCF interface
			B	SSF-SRF interface
			C	SCF-SCF interface
<sss>	=	common set	BASIC	Basic set for CS-1 complemented for CS-2
			CPH	Call Party Handling from Capability Set 2
			CTM	Cordless Terminal Portability from Capability Set 2
<pp>	=	procedure name like		
			SF	ServiceFiltering
<cc>	=	test category:		
			CA	Capability tests
			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: **IN2_A_BASIC_SF_BV_02**

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 CS-2 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).

The state names and their abbreviations used are:

Null

1 Party	1P
Originating Set-up	OS
Terminating Set-up	TS
Terminating 1 Party Set-up	T1P
Stable 1 Party	S1P
Stable 2 Party	S2P
Transfer (no. of passive legs)	TF(x)
On Hold (no. of passive legs)	OH(x)
Stable MultiParty (no. of passive legs)	S(x)P

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_OH2_OH3.

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

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

The list of the parameters for the Core INAP protocol is given in reference ETS 300 374-1 [5].

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 TCAP:

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

TC_BeginReq (DialogueID, OriginatingAddress);

TC_ContinueReq (DialogueID, OriginatingAddress);

TC_EndReq (DialogueID, Termination);

TC_AbortReq (DialogueID).

TCAP primitives from TCAP to SCF:

TC_InvokeInd (InvokeID, DialogueID, Class, OperationCode, 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).

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.

The list of the informative parameters, for which a value is to be assigned in particular for the execution of a test suite, is included in the PIXIT proforma. See reference EN 301 140-4 [2].

Annex B and Annex C of the present document contain a copy of the PIXIT proforma parameter tables of respectively the Core INAP and the TCAP protocols. These proforma tables are filled up and contain the parameter values used for the definition of the MSCs and TPs.

The preamble T_OS (and all preambles and test cases which use this preamble) contains reference to an ASP Mgt_SetTriggerTable. This does not exist in the protocol, but in the SDL model it identifies which Trigger Detection points need to be set before commencing the test case.

5 Functional configurations under test

5.1 SSF basic functions

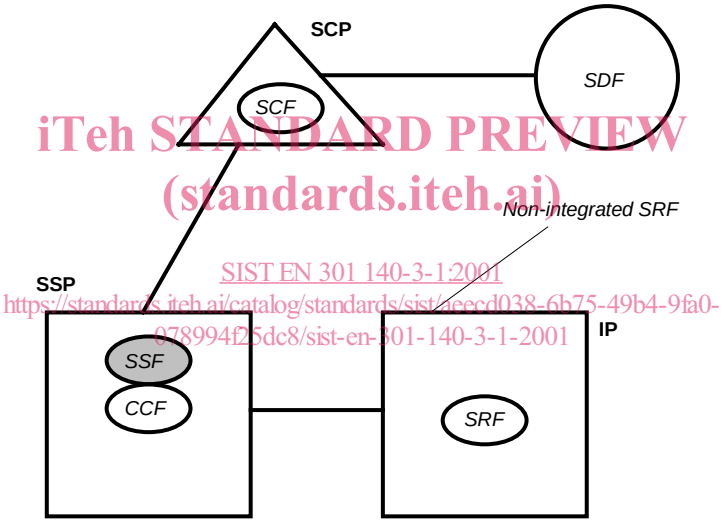
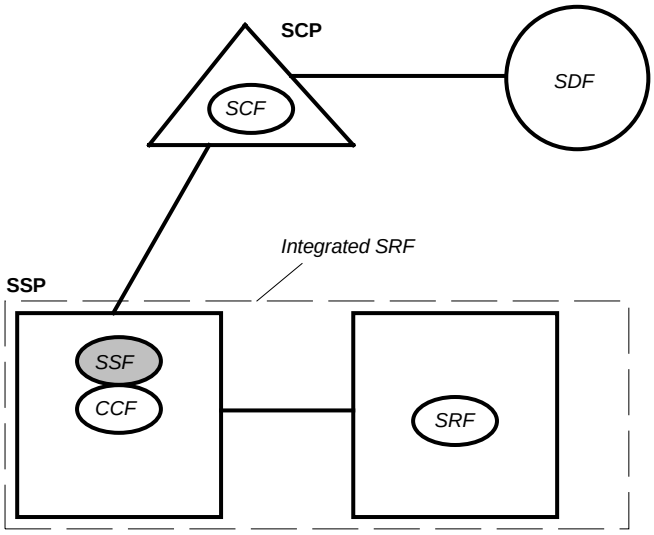


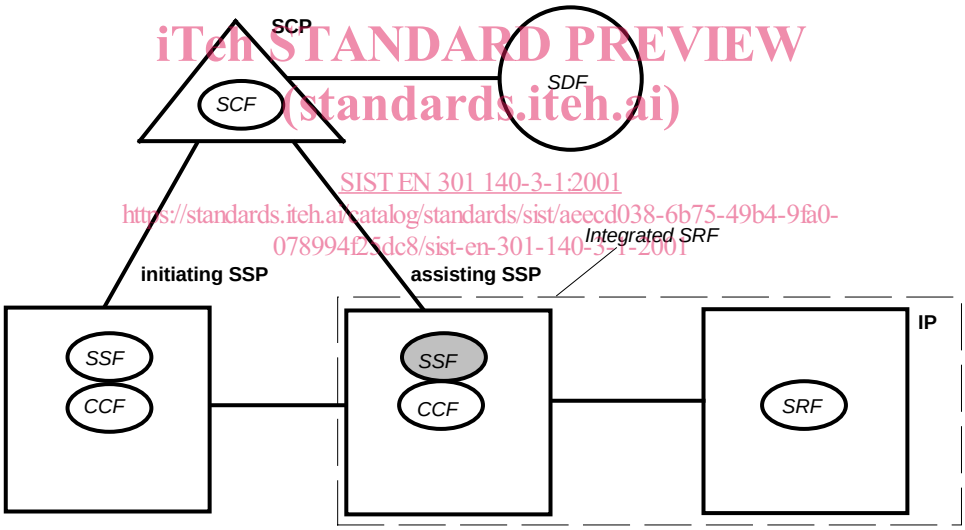
Figure 1: Configuration 1: IUT= SSF (non-integrated with SRF)



SCP with single SSP

Figure 2: Configuration 2: IUT= SSF (integrated with SRF)

5.2 SSF additional functions



SSP Assist/Hand-off (assisting SSP with relay)

Figure 3: Configuration 3: IUT= SSF of assisting SSP (integrated SRF)