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Digitalno omreģje z integriranimi storitvami (ISDN) ï Preskuģanje skladnosti programirljivega komunikacijskega vmesnika (PCI) sistema Euro-ISDN ï 1. del: Zgradba preskuģalnega niza in nameni preskuģanja (TSS&TP) ï Specifikacija uporabniģkih pripomoļ kov vmesnika PCI (PUF)

Integrated Services Digital Network (ISDN); Conformance testing for the Euro-ISDN Programming Communication Interface (PCI); Part 1: Test Suite Structure and Test Purposes (TSS&TP) specification for the PCI User Facility (PUF)

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Integrated Services Digital Network (ISDN); Conformance testing for the Euro-ISDN Programming Communication Interface (PCI); Part 1: Test Suite Structure and Test Purposes (TSS&TP) specification for the PCI User Facility (PUF)

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
Internet: secretariat@etsi.fr - http://www.etsi.fr - http://www.etsi.org

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

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Foreword

Part 1 of this Interim European Telecommunication Standard (I-ETS) has been produced by the Terminal Equipment (TE) Technical Committee of the European Telecommunications Standards Institute (ETSI).

An ETSI standard may be given I-ETS status either because it is regarded as a provisional solution ahead of a more advanced standard, or because it is immature and requires a "trial period". The life of an I-ETS is limited to three years after which it can be converted into an ETS, have its life extended for a further two years, be replaced by a new version, or be withdrawn.

This is the first part of an I-ETS which comprises four parts:

"Integrated Services Digital Network (ISDN); Conformance testing for the Euro-ISDN Programming Communication Interface (PCI):

Part 1: "Test Suite Structure and Test Purposes (TSS&TP) for the PCI User Facility (PUF);

Part 2: "Abstract Test Suite (ATS) for the PCI User Facility (PUF);

Part 3: "Test Suite Structure and Test Purposes (TSS&TP) for the Network Access Facility (NAF);

Part 4: "Abstract Test Suite (ATS) for the Network Access Facility (NAF)".

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Introduction

I-ETS 300 697, Parts 1 to 4 comprises the Test Suite Structure and Test Purposes (TSS&TP) and the Abstract Test Suites (ATS) to ETS 300 325 [1]. The Euro-ISDN PCI is a PCI which provides access to the Euro-ISDN. The basic model of the ISDN PCI consists of two entities, a service user called the PCI User Facility (PUF) and a service provider called the Network Access Facility (NAF). For the purposes of conformance testing, the PUF and the NAF are treated separately. This is because the PUF manufacturer and the NAF manufacturer may be completely different and their testing needs should be treated separately. Each Part is tested to ensure that they each meet the conformance requirements of the I-ETS and to increase their probability of inter-operating. This is the reason why a separate TSS&TP and a separate Abstract Test Suite has been produced for both the PCI User Facility (PUF) and the Network Access Facility (NAF).

All parts have been produced according to ISO/IEC 9646 [2] and ETS 300 406 [6].

As stated above, this I-ETS is structured in four parts:

- **part 1 contains the TSS&TP for the PUF;**
- part 2 contains the ATS for the PUF;
- part 3 contains the TSS&TP for the NAF;
- part 4 contains the ATS for the NAF.

Part 1 (TSS&TP for the PUF) contains all Test Purposes (TPs) for the PUF (PCI messages). It describes what is covered by the TPs for the PUF and what areas of the I-ETS are not covered. The Test Suite Structure (TSS) is described and the convention followed in naming the TPs is described. A list of basic interconnection tests is given.

Part 2 (ATS for the PUF) contains the Abstract Test Suite (ATS) for the PUF (PCI messages). The test method used is described in detail and diagrams explaining the test method are presented. The reasons for choosing the test method are also given. The ATS is written in Tree and Tabular Combined Notation (TTCN) and the TTCN is contained in annex A. Annex B contains the Protocol Conformance Test Report (PCTR), annex C contains the Implementation eXtra Information for Testing (IXIT) and annex D contains an Implementation Conformance Statement (ICS).

Part 3 (TSS&TP for the NAF) contains all TPs for the NAF (PCI messages and Exchange Mechanism). It describes what is covered by the TPs for the NAF and what areas of the I-ETS are not covered. The TSS is described and the TPs are given. A list of basic interconnection tests is given.

Part 4 (ATS for the NAF) contains the ATS for the NAF (PCI messages and Exchange Mechanism). The test method used is described in detail and a diagram explaining the test method is given. The reasons for choosing that test method is also given. The ATS is written in concurrent TTCN and the TTCN is contained in annex A. Annex B contains the PCTR, annex C contains the IXIT and annex D contains an ICS.

NOTE: The ICS in annexes D of Part 2 and Part 4 are informative as ETS 300 325 [1] already contains an ICS. However, the ICS in ETS 300 325 [1] is not adequate for these ATSs and should, eventually, be replaced by annexes D of Part 2 and Part 4 of this I-ETS.

1 Scope

Part 1 of this I-ETS contains the Test Suite Structure and the Test Purposes (TSS&TP) of the conformance testing to ETS 300 325 [1] for a PUF. It indicates the choices of coverage which have been made, makes some remarks about the testability of a PUF, describes the TSS in a general way and contains all TPs, structured in accordance with the TSS.

2 Normative references

Part 1 of this I-ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this I-ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 325 (1994): "Integrated Services Digital Network (ISDN); Programming Communication Interface (PCI) for Euro-ISDN".

[2] ISO/IEC 9646 (1994): "Information technology - Open Systems Interconnection - Conformance Testing Methodology and Framework".

[3] ISO/IEC 8208 (1990): "Information technology; Data communications; X.25 Packet Layer Protocol for Data Terminal Equipment".

[4] ETS 300 080 (1992): "Integrated Services Digital Network (ISDN); ISDN lower layer protocols for telematic terminals".

[5] ETS 300 102-1: "Integrated Services Digital network (ISDN); User-network interface layer 3; Specifications for basic call control".

[6] ETS 300 406 (1995): "Methods for Testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardisation methodology".

3 Abbreviations

For the purposes of this I-ETS the following abbreviations apply:

AD	Administration Plane
AOC-D	Advice Of Charge During call
AOC-E	Advice Of Charge at the End of call
ATS	Abstract Test Suite
BV	Valid behaviour
CA	Capability tests
Ci	Control Plane state i
CLIR	Calling Line Identification Restriction
CO	Control Plane
DA	Data transfer
DDI	Direct Dialling In
DI	Disconnection
ED	Exchange Mechanism (DOS)
ED	Expedited Data
EU	Exchange Mechanism (Unix)
EW	Exchange Mechanism (Windows)
IC	Incoming Call establishment
ICS	Implementation Conformance Statement
ISDN	Integrated Services Digital Network
IUT	Implementation Under Test
IV	Invalid behaviour
IXIT	Implementation eXtra Information for Testing
NAF	Network Access Facility
NC	NAF co-ordination
NCO	Network Connection Object

NCOID	NCO Identifier
NMA	Network layer Message Access
NUi	User Plane state i in case of NAF co-ordination
OC	Outgoing Call establishment
OP	Optional
PC	PUF co-ordination
PCI	Programming Communication Interface
PCTR	Protocol Conformance Test Report
PP	Euro-ISDN PCI PUF
PUF	PCI User Facility
PUi	User Plane state i in case of PUF co-ordination
RE	Reset
TE	Terminal Equipment
TMA	Transparent Message Access
TP	Test Purpose
TSS	Test Suite Structure
TSS&TP	Test Suite Structure & Test Purposes
TTCN	Tree and Tabular Combined Notation
US	User Plane

4 Coverage

In this first version, only the most important parts of ETS 300 325 [1] are covered and other parts have been ignored. These parts are described below. Moreover, the final test campaign should be limited to a duration of one day. This implies that some choices were necessary which are outlined below.

4.1 What is covered?

All mandatory conformance requirements in ETS 300 325 [1] are covered, except the Exchange Mechanism. The purposes cover the following parts of the ETS:

- Administration Plane (class 1);
- Control Plane (class 1);
- User Plane (ISO/IEC 8208 [3], ETS 300 080 [4], ITU-T Recommendation T.70, NULL, ETS 300 325 [1]: Transparent Message Access (TMA).

The TPs do not cover the following parts of ETS 300 325 [1]:

- Exchange Mechanism;
- Administration Plane (classes 2, 3);
- Control Plane (classes 2, 3, 4, 5, 6).

4.2 Choices for coverage

Because of the nature of conformance testing, everything cannot be fully tested. In addition, because of the limitation on the time required for execution of the test suite, further choices have been made.

All messages and all mandatory parameters for the elements of the ETS 300 325 [1] listed above, are tested. Some of the optional functions are tested, i.e. in the Exchange Mechanism.

Not all optional parameters have been tested in all of the messages where they are optional, instead a representative sample has been tested where use of the parameter is most likely to occur, e.g. the Facility parameter which deals with charging information is tested in the CConnectReq message and not in the CAlertReq message.

In addition, the optional Control Plane parameters are tested in the context of the use of supplementary services, if possible. Also more testing is performed in the PUF to NAF direction than in the direction from NAF to PUF because the behaviour of the PUF at the interface can be observed and assigned final verdicts. All parameters relevant for covered parts of ETS 300 325 [1], described in the previous subclause, are tested at least once.

4.3 Invalid behaviour coverage

Although the behaviour of the PUF on receiving messages which are invalid e.g. mandatory parameter missing, is not specified in ETS 300 325 [1], a limited number of tests are included in order to check the operation of the PUF. Because ETS 300 325 [1] does not specify how the PUF shall react to such messages, the verdicts from these tests may only be INCONCLUSIVE or PASS. This topic is further explained in a later clause.

5 Testability of the PUF

The lower interface of the PUF is defined in ETS 300 325 [1], i.e. it is the interface with a NAF, therefore behaviour at this interface can be both controlled and observed without any difficulty. Since PUFs are application specific, they may vary a lot in their actual implementation. The upper interface of the PUF is not specified in ETS 300 325 [1] and is a high level interface, e.g. a human interface. The nature of this interface makes testing of the PUF difficult because of the problems observing and controlling the behaviour of the PUF here.

Control

Where control of the upper interface is necessary in order to initiate some action, the means of control shall be stated in the IXIT in answer to a specific question. The control shall be by means of an implicit send statement in the test case. Control shall be necessary when the PUF is the initiator of some action, e.g. to initiate a user connection the IXIT asks: how does the IUT send a U3ConnectReq message in order to initiate an outgoing user connection?

Observation

Where observation of the upper interface is necessary in order to assign a verdict, the behaviour which should be observed is stated in the IXIT in answer to a specific question, e.g. how does the IUT react on receiving a CConnectCnf message in state 1? In such a case, behaviour at the lower interface cannot be used to assign the verdict because nothing observable occurs here (e.g. an internal change of NCO state is not observable). This verdict shall be assigned by the test suite operator. If the observation is not that specified in the IXIT, then the only possible verdict shall be an INCONCLUSIVE verdict, as a FAIL verdict cannot be assigned because the PUF has not failed to meet what is stated in ETS 300 325 [1].

Although it may not be normal practice to rely on observations at such an upper interface, this was the only way found to test many of the messages of the PUF, in particular when the PUF is receiving incoming messages. Sometimes where no specific observation at the upper interface can be made the IXIT answer could be "IUT does not react", this might mean that the IUT has not crashed for example. A simple mechanism shall be provided to de-select all test cases relying on observation at the upper interface where such de-selection is deemed necessary. These test cases might be optional conformance requirements. The corresponding TPs are marked by the key word "OP" (optional).

However, in most cases, even if the result of a received message is not immediately observable at the lower interface, it is implicitly tested in TPs which deal with other messages. For example, the result of an ACreateNCOCnf message is implicitly tested in Control and User Plane groups: if the IUT is able to manage these planes, this means that it understood the Network Connection Object IDentifier (NCOID) parameter of the previous ACreateNCOCnf. In the same way, if the capability tests for the User Plane (in PUF co-ordination case), pass in case of an outgoing call, this means that the transition to the active state in the Control Plane succeeded. When a "OP" TP is in fact covered by a TP concerning another message, this shall be indicated. This may be used as another criterion to de-select it.

6 PUF basic interconnection tests

There is no basic interconnection test group in the TSS. However, a list of basic interconnection tests is provided here. These tests may be executed on the IUT prior to execution of the test suite in order to give the IUT implementor confidence that the IUT can perform certain basic tasks. The tests have been chosen to check that the IUT can perform simple tasks on each of the three planes, i.e. create a Network Connection Object (NCO), set up a D-channel and transfer data on the B-channel. Some operations from the Exchange Mechanism are specifically included and other operations from the Exchange Mechanism are exercised in the other test cases.

PCI Message	Test case identifier
ACreateNCOReq	TP411006
ACreateNCOReq	TP411008
CConnectRsp	TP511103
CConnectReq	TP511201
CConnectCnf	TP511204
CDisconnectReq	TP511301
CDisconnectRsp	TP511305
U3ConnectInd	TP611101
U3ConnectReq	TP611201
U3DisconnectReq	TP611302
U3DataReq	TP611401
U3DataInd	TP611402
U1DataReq	TP611410
U1DataInd	TP611411

7 Test Suite Structure (TSS)

7.1 Presentation

The test suite is structured as a tree in accordance with ISO/IEC 9646 [2]. There are two main reasons for structuring the test suite as a tree. Firstly, so that part of the tree can be selected for testing, e.g. the capability tests and secondly, to be able to see clearly the type of coverage of the base standard that is provided by the test suite.

The first level of the tree is the identifier of the ETS, Euro-ISDN PCI, PUF.

The second level represents the major divisions of the ETS, i.e. the Exchange Mechanism and the three planes.

The third level represents the nature of the tests to be performed, capability tests which show a basic capability of the ETS to operate, i.e. a message containing mandatory parameters only, valid behaviour tests where some additional features are tested, i.e. optional parameters, and invalid behaviour tests where the response of the Implementation Under Test (IUT) to invalid behaviour by the tester is checked.

The fourth level represents the class of the messages.

The fifth level represents the functionality of the ETS covered by the test and is relevant only to the Control and User Planes.

The TSS is now detailed. For each branch a two/four character identifier is given as a number which shall be used to generate unique identifiers for the TPs.

First level: it is the identifier of the ETS.

Euro-ISDN PCI PUF (PP)

Second level: it represents the major divisions of the ETS, the Exchange Mechanism and the three planes:

- Exchange Mechanism (Windows) (EW) (1) **Not covered**;
- Exchange Mechanism (DOS) (ED) (2) **Not covered**;
- Exchange Mechanism (Unix) (EU) (3) **Not covered**;
- Administration Plane (AD) (4);
- Control Plane (CO) (5);
- User Plane (US) (6).

Third level: the nature of the tests to be performed:

capability tests (CA) (1);