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8][]Hʼbc˙ca fYÿ́Ý˙n˙]bh́Y[f]fÚb]a]˙ghcf]h̕Ua]˙f́G8 B́Ë˙DfYg_i ýÚb́́Ý˙g_`UXbcgh]́ dfc[fÚa]f`́/]j Y[Ú_ca i b]_UV́́́g_Y[Ú˙j a Ygb]_Ú fD7 ±Ľg]gh́Ya Ú˙9i fc!́G8 B˙Ë˙(˙"XY˙. GdYV̄V́Ź_UV́́Ú˙UVghfU_hbY[Ú˙dfYg_i ýÚ˙bY[Ú˙b]nÚ˙f5 ́HǴĽnÚ˙ca fYÿb]˙Xcghcdcj b]́ df]dca c Y_`fB5 : ́Ł

Integrated Services Digital Network (ISDN); Conformance testing for the Euro-ISDN Programming Communication Interface (PCI); Part 4: Abstract Test Suite (ATS) specification for the Network Access Facility (NAF)

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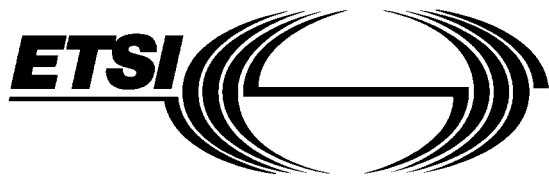
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Foreword

The fourth part 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it can be converted into an ETS, have its life extended for a further two years, be replaced by a new version, or be withdrawn.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 fourth part of a 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)".

Announcement date	
Date of adoption of this I-ETS:	6 March 1998
Date of latest announcement of this I-ETS (doa):	30 June 1998

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 ATS 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] to [6] and ETS 300 406 [10].

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.**

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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 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.

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1   Scope

Part 4 of this I-ETS contains the Abstract Test Suite (ATS) for the Network Access Facility (NAF). The test method used is described in detail and diagrams explaining the test method are presented. The reasons for choosing this 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).

2   Normative references

Part 4 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 part of 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 9646-1 (1991): "Information Technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[3]   ISO/IEC 9646-2 (1991): "Information Technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract Test Suite specification".

[4]   ISO/IEC 9646-3 (1992): "Information Technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN)".

[5]   ISO/IEC 9646-5 (1994): "Information Technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 5: Requirements on test laboratories and clients for the conformance assessment process".

[6]   ISO/IEC DIS 9646-7 (1991): "Information Technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statement".

[7]   ETS 300 697-3: "Integrated Services Digital Network (ISDN); Conformance testing for the Euro-ISDN Programming Communication (PCI); Part 3: Test Suite Structure and Test Purposes (TSS&TP) for the Network Access Facility (NAF)".

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

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

[10]   ETS 300 406 (1995): "Methods for Testing and Specification (MTS); Protocol and profile conformance testing specifications Standardization Methodology".

[11]   CCITT Recommendation T.70 (1998): "Network-independent basic transport service for the telematic services".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this I-ETS all definitions in ISO/IEC 9646, parts 1, 2, 3, 5 and 7 ([2] to [6]) and its amendments and draft amendments, and in ETS 300 325 [1] apply.

PCI Implementation Conformance Statement (PCI ICS) proforma: A document, in the form of a questionnaire, which when completed for a PCI implementation becomes the PCI ICS (see ISO/IEC DIS 9646-7 [6]).

PCI ICS: A statement made by the supplier of a PCI, stating which capabilities have been implemented for a given PCI (see ISO/IEC DIS 9646-7 [6]).

3.2 Abbreviations

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

ASP	Abstract Service Primitive
ATS	Abstract Test Suite
CP	Co-ordination Point
ICS	Implementation Conformance Statement
IE	Information Element
ISDN	Integrated Services Digital Network
IUT	Implementation Under Test
IXIT	Implementation eXtra Information for Testing
MTC	Master Test Component
MTS	Methods for Testing and Specification
NAF	Network Access Facility
N/A	Not Applicable
OSI	Open Systems Interconnection
PCI	Programming Communication Interface
PCO	Point of Control and Observation
PCTR	Protocol Conformance Test Report
PDU	Protocol Data Unit
PTC	Parallel Test Component
PUF	Programming communication interface User Facility
SCS	System Conformance Statement
SUT	System Under Test
TC	Test Case
TCV	Test Case Variable
TP	Test Purpose
TSS	Test Suite Structure
TSS&TP	Test Suite Structure & Test Purposes
TSV	Test Suite Variable
TTCN	Tree and Tabular Combined Notation

4 Status

This ATS uses concurrent TTCN and has been edited using the ITEX tool, version 2.2. Since this tool contains bugs in the concurrent parts, parts of the test suite have not been parsed.

5 General constraints for testing and applicable test method

5.1 Testing Model

ETS 300 325 [1] is an interface standard and not a protocol standard. ISO/IEC 9646-1 [2] explicitly states that it applies only to protocols of the OSI stack. This means that ISO/IEC 9646, [2] to [6] could not be used directly for testing the NAF. Due to historical reasons, the solution for the NAF is not the same as for the PUF. In particular, the PCI messages and the Exchange Mechanism testing are not treated separately. The messages of the standard mapped onto Protocol Data Unit (PDUs) and the Exchange Mechanism functions are mapped onto Abstract Service Primitives (ASPs) for PCI messages testing AND for Exchange Mechanism testing.

5.2 Test method for PCI messages and Exchange Mechanism

Both the upper and the lower interfaces of the NAF with a tester placed at each interface can be controlled and observed:

-	the lower interface of the NAF is the ISDN network interface (D-channel and B-channel). Although this interface is not really a part of the I-ETS (it is not the Euro-ISDN PCI), it was chosen to observe it to check that the NAF provides really the service. Moreover, the mapping between PCI messages and network PDUs are well defined in the ETS 300 325 [1].

	There are 2 PCOs at this lower interface. PCO_D at which test events are Euro-ISDN protocol Layer 3 PDUs, and PCO_B at which test events are user protocol PDUs.

-	the upper service boundary is its PCI interface with the PUF. There is one PCO (PCO_U) at this interface, at which the test events are ASPs (Exchange Mechanism functions).

A test co-ordination procedure shall be necessary to co-ordinate between the Upper and the Lower Testers. The nature of the interfaces and the use of a co-ordination procedure means that a distributed test method (see ISO/IEC 9646-2 [3] is the most suitable test method for testing the NAF. Using this method, all of the test suite execution can be automated. Concurrent TTCN was required in order to develop the ATS because there are three Points of Control and Observation (PCOs) which need to be controlled simultaneously, i.e. the one at the upper boundary and two at the lower boundary for the D-channel and the B-channel.

5.3 Testing configuration

Figure 1 describes the testing configuration used throughout this ATS:

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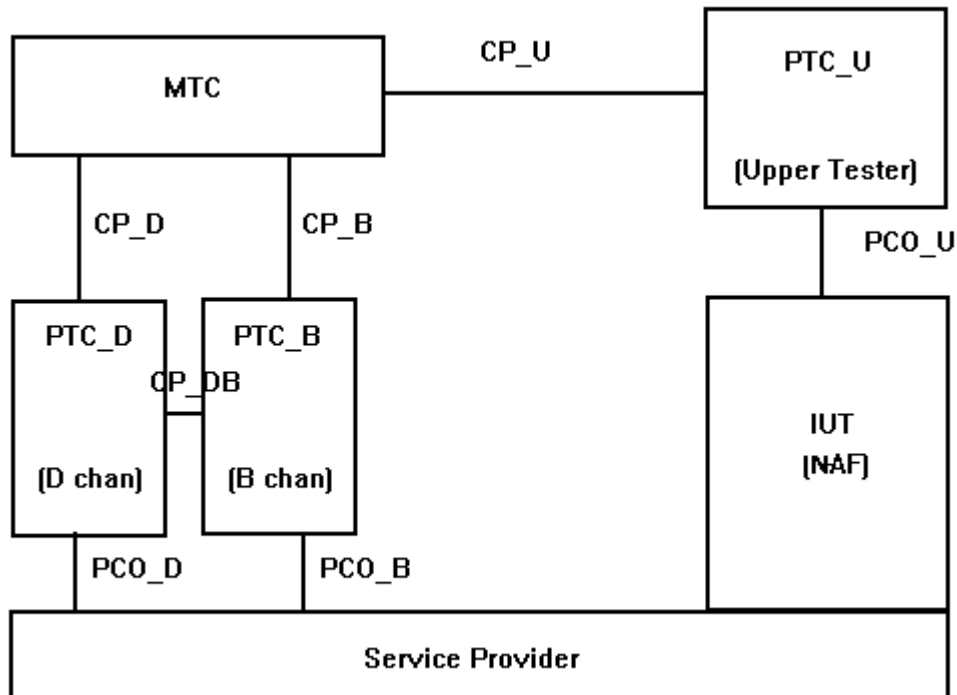(standards.iteh.ai)

Figure 1: NAF test configuration using distributed test method

- Main Test Component (MTC);
- Parallel Test Component (PTC) (Upper, D-channel, B-channel);
- Implementation Under Test) (IUT) is the NAF under test;
- Co-ordination Point (CP) (between the PTCs and the PTCs and the MTC);
- Service Provider is the ISDN network access; it carries ISDN Layer 3 PDUs exchanged between the IUT and the D-channel part of the Lower Tester and ISDN B-channel PDUs exchanged between the IUT and the B-channel part of the Lower Tester;
- PCO-U is the PCO between the IUT, the Upper Tester (test events are ASPs: Exchange Mechanism functions and PDUs are PCI messages);
- PCO-D is the PCO between the IUT the D-channel emulator (test events are Euro-ISDN Layer 3 PDUs);
- PCO-B is the PCO between the IUT the B-channel emulator (test events are user connection Layer 3 PDUs).

The tester consists of a Main Test Component (MTC) which is responsible for:

- creating and terminating all Parallel Test Components (PTCs) within the test system;
- co-ordination between the PTCs involved in a test case;
- receipt of preliminary results from PTCs;
- computing the Test verdict.

and three PTCs:

- PTC-U, which corresponds to an Upper Tester playing the role of PCI User Facility (PUF) responsible for creating and destroying Network Connection Objects (NCOs);
- PTC_D, which corresponds to a Lower Tester playing the role of ISDN D-channel;
- PTC_B, which corresponds to a second Lower Tester playing the role of ISDN B-channel.

5.4 Mapping of PCI concepts into TTCN terms

Some terms within PCI have been mapped onto terms used within TTCN.

5.4.1 Exchange Mechanism functions

The functions used within the Exchange Mechanism correspond to the Abstract Service Primitives (ASPs) as defined in ISO/IEC 9646-3 [4].

Each function of the Exchange Mechanism used within ISDN PCI has been translated into an exchange of Abstract Service Primitives of the kind ASP_Req / ASP_Cnf. The reason why two ASPs are used for each Exchange Mechanism function is because in ETS 300 325 [1] the Exchange Mechanism functions are described as functions which are called with parameters and which return values. The returned values are passed in ASP_Cnf. e.g. the use of the Exchange Mechanism function PciRegister is done in this ATS the following way:

- PTC_U sending an ASP of the type *PciRegister_Req*;
- PTC_U receiving an ASP of the type *PciRegister_Cnf*.

The fact that these functions depend on the operating system, brought some problems to the definition of these ASPs. The following solution is used:

- each ASP_Req/ASP_Cnf type declaration contains all of the parameter fields corresponding to all the input/output parameters that are needed in UNIX, DOS and Windows operating systems;

- there is a different ASP constraint for each underlying operating system. Therefore:

  - three ASPs constraints of the type *PciRegister_Req* are defined, *PR_DOSReq*, *PR_UNIXReq* and *PR_WinReq*, one to be used with DOS, and one with UNIX and one with Windows;

  - three ASPs constraints of the type *PciRegister_Cnf* are defined, *PR_DOSCnf*, *PR_UNIXCnf* and *PR_WinCnf*, one to be used with DOS, and one with UNIX and one with Windows.

All of these ASP constraints shall be parameterized according to the input/output values that vary for each of the operating systems in ETS 300 325 [1].

5.4.2 ISDN PCI messages

The PCI messages are translated into PDUs. The PDU parameters correspond to the PCI message parameters.

The way these PCI messages are sent and received from the NAF is never by a simple send or receive event at the associated PCO, in this case PCO_U. The PDUs shall always be carried inside the ASPs corresponding to the relevant exchange function, PciPutMessage or PciGetMessage. When a PDU is to be sent to the NAF, it shall be stored in one of the parameters of the PciPutMessage ASP. In order to reduce the complexity of the test case behaviour description by making the use of the exchange functions more transparent, test steps corresponding to the exchange functions shall be defined.

6 ATS naming conventions

The naming conventions described here have been chosen to ensure easy understanding of the ATS. As far as possible, the names reflect their role in the ATS. When a name is used to represent an item from ETS 300 325 [1], then the name shall be taken directly from ETS 300 325 [1] and usually prefixed with the relevant prefix. Where an identifier is made up of one or more words, the words shall each start with a capital letter.

- **Test suite variables** start with TSV_.

  EXAMPLE 1:   TSV_MaxNCOCount.