INTERNATIONAL STANDARD

ISO/IEC 8882-1

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Information technology — Telecommunications and information exchange between systems — X.25 DTE conformance testing —

Part 1: General principles

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Test de conformité X.25 DTE —

Partie 1: Principes généraux

Reference number
ISO/IEC 8882-1:1993(E)

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 8882-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Sub-Committee SC 6, *Telecommunications and information exchange between systems*.

ISO/IEC 8882 consists of the following parts, under the general title *Information technology — Telecommunications and information exchange between systems — X.25 DTE conformance testing*:

— *Part 1: General principles*

— *Part 2: Data link layer conformance test suite*

— *Part 3: Packet level conformance test suite*

Annex A forms an integral part of ISO/IEC 8882.

Introduction

ISO/IEC 8882 specifies a set of tests to evaluate Data Terminal Equipment (DTE) conformance to International Standards ISO 7776 or ISO/IEC 8208, or both. ISO 7776 and ISO/IEC 8208 allow for a DTE to interface with a Data Circuit-Terminating Equipment (DCE) conforming to CCITT Recommendation X.25 (1980,1984) or to another DTE conforming to ISO 7776 or ISO/IEC 8208 or both. The implementations of ISO 7776 and ISO/IEC 8208 are tested independently.

CCITT Recommendations X.25(1980) and X.25(1984) are written from the perspective of a DCE and therefore do not explicitly specify the DTE operation. However, recommended operation of DTEs is included by implication because of the need to communicate with X.25 DCEs. Tests within ISO/IEC 8882–2 and ISO/IEC 8882–3 pertaining to X.25 (1980, 1984) are based on the DTE operational characteristics implied by CCITT X.25.

This part of ISO/IEC 8882 specifies the framework in which the other parts of ISO/IEC 8882 may be understood and the principles to be applied. The notation used in ISO/IEC 8882–2 and ISO/IEC 8882–3 is TTCN as defined in ISO/IEC 9646-3.

ISO/IEC 8882–2 presents the Data Link Layer aspects for evaluating conformance to ISO 7776 while ISO/IEC 8882–3 presents the Packet Layer aspects for evaluating conformance to ISO/IEC 8208

The conformance tests are designed for use by

— *test evaluators (responsible for analysing results and determining whether conformance has been achieved);*

— test suite designers or implementors (for determining what tests are required and what results can and should be anticipated by the test device); and

— users implementing ISO 7776 or ISO/IEC 8208 or DTEs interfacing to DCEs that implement CCITT X.25 (1980 or 1984) (for determining the functionality required of their implementations to be considered in conformance).

Information technology — Telecommunications and information exchange between systems — X.25 DTE conformance testing —

Part 1: General principles

1 Scope

ISO/IEC 8882 defines the testing of a DTE operating at the Data Link Layer and at the Packet Layer when accessing, by means of a dedicated path connection, switched or permanent, a public or private packet-switched network conforming to CCITT Recommendation X.25 or another DTE conforming to ISO 7776 and ISO/IEC 8208.

The tests will test the conformance of an implementation by observing its external behaviour. The conformance tests will not test the DTE performance characteristics, the diagnostic and maintenance functions, the correctness of the protocol itself, or DTE internal implementation, or the full capabilities as stated in the PICS.

This part of ISO/IEC 8882

— provides a general introduction;

— refers to those applicable International Standards;

— defines terms applicable to X.25–DTE conformance testing;

— states the test case derivation and description; and

— states the test methodology.

ISO/IEC 8882–1 contains no statement of conformance. Specific statements of conformance are given in ISO/IEC 8882–2 and ISO/IEC 8882–3.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 8882. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 8882 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7498 : 1984, *Information processing systems — Open Systems Interconnection — Basic Reference Model.*

ISO 7776 : 1986, *Information processing systems — Data communications — High-level data link control procedures — Description of the X.25 LAPB-compatible DTE data link procedures.*

ISO/IEC 8208 : 1990, *Information technology — Data communications — X.25 Packet Layer Protocol for Data Terminal Equipment.*

ISO/IEC 8882-2 : 1992, *Information technology — Telecommunications and information exchange between systems — X.25 DTE conformance testing — Part 2: Data link layer conformance test suite.*

ISO/IEC 8882-3 : 1991, *Information technology — Telecommunications and information exchange between systems — X.25 DTE conformance testing — Part 3: Packet layer conformance test suite.*

ISO/IEC 9646–1 : 1991, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts. (See also CCITT Recommendation X.291 (1991)).*

ISO/IEC 9646–2 : 1991, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 2: Abstract test suite specification. (See also CCITT Recommendation X.291 (1991)).*

ISO/IEC 9646–3 : 1992, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 3: The Tree and Tabular Combined Notation (TTCN).*

CCITT Recommendation X.25 (1980), *Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode on Public Data Networks.*

CCITT Recommendation X.25 (1984), *Interface between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks by Dedicated Circuit.*

3 Definitions

3.1 Reference model definitions

This part of ISO/IEC 8882 makes use of the following term defined in ISO 7498:

(N)-protocol-data-unit (N)-PDU

3.2 Conformance testing definitions

This part of ISO/IEC 8882 makes use of the following terms defined in ISO/IEC 9646–1:

a) Abstract Test Case

b) Conformance Test Suite

c) Conformance Testing

d) Implementation Under Test

e) Inopportune PDU

f) Lower Tester

g) Protocol Implementation Conformance Statement

h) Protocol Implementation eXtra Information for Testing

i) Remote Single Layer Test Method

j) System Under Test

k) Test Group

l) Test Step

m) Test Suite

3.3 X.25 DTE conformance testing definitions

For the purpose of this part of ISO/IEC 8882 the following definitions apply:

3.3.1 improper PDU: The (N)-PDU whose syntax does not conform to the format specifications of ISO 7776 or ISO/IEC 8208 or CCITT X.25.

3.3.2 proper PDU: The (N)-PDU whose syntax conforms to the format specification of CCITT X.25, ISO 7776 or ISO/IEC 8208 and is acceptable to the state or phase of the interface.

3.3.3 tester: Refer to Lower Tester.

3.3.4 test case: Refer to Abstract Test Case.

3.3.5 test selection: Test selection is the process of choosing test cases according to the specific criteria based on the IUT's PICS and PIXIT in order to constitute a conformance test suite for the IUT.

3.3.6 test subgroup: A set of test cases that share a common characteristic, such as testing for proper, improper, or inopportune PDUs. A test subgroup is the smallest testable set of test cases that can be selected.

3.3.7 sub-function: A subset of the PDUs and functional capabilities of the protocol level above the IUT that are needed to allow data transfer testing to be accomplished.

4 Abbreviations

The following abbreviations are used in this part of ISO/IEC 8882:

DCE Data Circuit-Terminating Equipment

DTE Data Terminal Equipment

DXE DTE or DCE

IUT Implementation Under Test

PDU Protocol Data Unit

PICS Protocol Implementation Conformance Statement

PIXIT Protocol Implementation eXtra Information for Testing

RS Remote Single Layer

SUT System Under Test

TPDU Transport Protocol Data Unit

TTCN Tree and Tabular Combined Notation

5 Test notation

The test notation used in ISO/IEC 8882–2 and ISO/IEC 8882–3 is TTCN as defined in the DIS version of ISO/IEC 9646–3. This version of ISO/IEC 9646–3 is contained in annex A. ISO/IEC 8882–2 and ISO/IEC 8882–3 contain an annex describing the differences between the DIS version of TTCN used and the version of TTCN defined in ISO/IEC 9646–3.

6 Test suite structure

The test suite structure used in ISO/IEC 8882–2 and ISO/IEC 8882–3 is defined in ISO/IEC 9646–2 and is illustrated below.

Test Suite Structure

Test Group

Test Subgroup 1 (Proper PDUs)
Test Case No.101
Test Case No.102
.
.
.
Test Case No.1nn

Test Subgroup 2 (Improper PDUs)
Test Case No.201
Test Case No.202
.
.
.
Test Case No.2nn

Test Subgroup 3 (Inopportune PDUs)
Test Case No.301
Test Case No.302
.
.
.
Test Case No.3nn

7 Testing methodology

The testing methodology is based on the OSI Conformance Testing Methodology and Framework. The test method used is the Remote Single layer (RS) method. To employ the RS method effectively, the concept of using sub-functions of higher layer protocols is introduced. Sub-functions are a subset of the PDUs and functional capabilities of the protocol layer above the IUT that are needed to allow data transfer testing to be accomplished. The required properties of the sub-functions used are:

a) That the number and sequence of data-PDUs received from the IUT after receiving a data-PDU from the tester is predictable, and that the number received from the IUT is greater than zero.

b) That the reactions of the IUT upon receipt of these data-PDUs are known.

c) That the sub-function allows either the tester or IUT to initiate transmission of the data-PDUs.

d) That the sub-function allows for the exchange of data-PDUs by the layer under test with minimal interference from other functions of the protocol layer(s) above the IUT (e.g., PDU retransmission, error recovery, etc.).

Examples of data transfer configurations are shown for the Data Link Layer and the Packet Layer in figures 1 and 2 respectively.

NOTE — The requirements on underlying protocols are specified in ISO/IEC 8208, clause 3.

7.1 Test principles

The testing of the Data Link and the Packet Layer protocols is done separately. The data link layer is normally tested first since the packet layer requires the correct operation of the data link layer. The RS method is the selected test method since it cannot be assumed that a tester will be able to test completely each level as a separate entity. The RS method requires that the tester shall recognize and respond to a PDU received from the higher level protocols. The specific PDUs which shall be accepted are defined in ISO/IEC 8882–2 and ISO/IEC 8882–3.

7.2 Data transfer

The sub-function chosen by the IUT provider should create an alternating exchange of data-PDUs between the IUT and the tester. This exchange will be repeated until the sequence numbers of the layer under test have been rotated. The sub-function chosen shall be defined in the PIXIT of the IUT, and shall include the sequence and contents of the user data fields required for the test. Two examples of the use of a sub-function to accomplish data transfer testing are shown in figures 3 and 4.

A more detailed explanation of data transfer testing is provided in ISO/IEC 8882–2 and ISO/IEC 8882–3. These explanations also address the data transfer testing of send-only and receive-only IUTs.

It is recognized that an IUT provider may not be able to accomplish data transfer testing by this means. In such instances the data transfer tests are deselected.

7.3 Other user data fields

When necessary, the content of user data fields in other than data-PDUs shall be provided to the tester by the owner of the IUT in order to execute successfully the conformance test suite. In this case, the IUT requires the tester to transmit user data fields in accordance with higher level protocols which are operating above the IUT. For example, user data fields of call set-up, clearing, and interrupt packets of the Packet Layer may be affected.

The content of such user data fields shall be provided by the IUT owner in the PIXIT.

Sub-function of Packet Layer	Sub-function of Other Protocol(s)
Data Link Layer (layer under test)	

Figure 1 — Data Link Layer Data Transfer Configuration

Sub-function of OSI Protocol(s)		Sub-function of non-OSI Protocol(s)
Packet Layer (layer under test)		
Data Link Layer Note	LAN Protocol(s) Note	Other Protocol(s) Note

Figure 2 — Packet Layer Data Transfer Configuration

7.4 Testing configuration

The SUT is connected to the tester, point-to-point, when participating in active testing. The points of observation and control for each test sequence are within the tester.

ISO/IEC 8882–2 and ISO/IEC 8882–3 include PIXIT proformas which, when completed, describe the dynamic conformance test environment.

7.5 Operational consideration

Testing is done in a controlled environment. It is not the intent of this document to define the operational characteristics of test devices used to achieve DTE Conformance Testing. However, it is highly desirable that the device be capable of segregating IUT test activity from normal operation of underlying layers. At a minimum, the tester should be capable of distinguishing between I-frame retransmission at the data link layer (due to T1 expiration) and a packet layer retransmission. Some recommended functions of the tester include:

a) Detection of failures of the physical layer.

b) The ability to respond transparently to timeout conditions at the data link layer.

c) Timely data link layer acknowledgement (to avoid retransmissions) when performing packet layer testing.

d) In the instance where an I-frame is retransmitted, the tester should properly acknowledge the frame and not pass it on to the packet layer. The tester shall be sensitive to failures

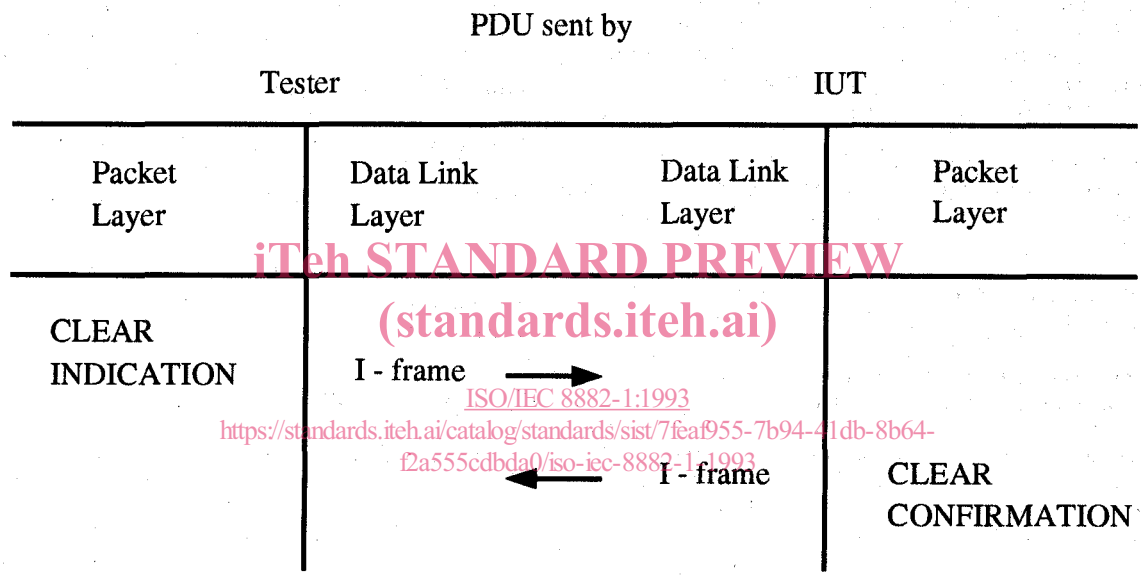

Figure 3 — Example of the use of a Packet Layer Sub-function

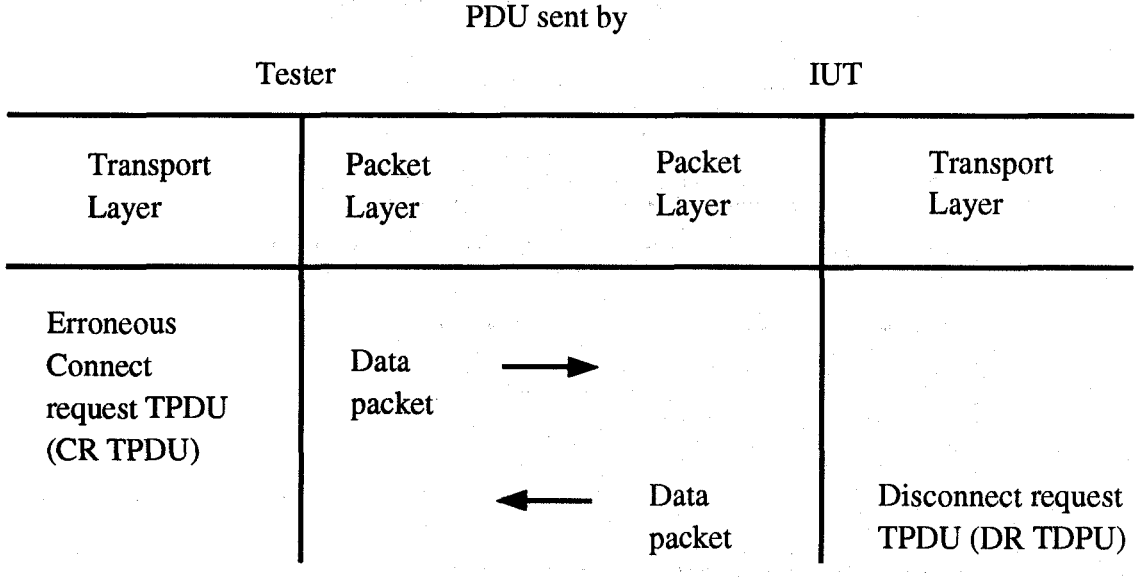

Figure 4 — Example of the use of a Transport Layer Sub-function directly over ISO/IEC 8208 (i.e. OSI Network Layer)

that interfere with the tests, and when such a condition is detected, the tester should abort the test.

e) The tester shall recognise the possibility of receiving unexpected PDUs which do not affect the results of the test case. These specific PDUs for each layer are defined in ISO/IEC 8882-2 and ISO/IEC 8882-3. In addition, other unexpected PDUs may be received which do affect the results of a test case. These PDUs will require further analysis and potentially, re-execution of the test case. Receipt of such PDUs may be due to interference from sources outside the realm of the X.25 environment (e.g. the IUT operating system, IUT operator).

7.6 DTE initiated actions

Generally the tester forces the IUT to transmit a particular PDU. However, in order to execute some test groups, it is required that the IUT initiate the transmission of particular PDUs. When a DTE-initiated action is required, it is specified in the appropriate test group. Direct control of such actions may not be feasible for the IUT owner. In such instances these tests are deselected.

7.7 Timing considerations

There are two types of timing considerations which should be taken into account — timing considerations for the tester and timing considerations for the SUT.

a) Tester Considerations: The tester shall allow for the time required by the IUT to progress from one test case to the next. This timing consideration should be accomodated for in the test preamble.

   For example, the time required by the IUT to initiate a CALL REQUEST after completing a CALL CLEARING operation, and the time required by the IUT to re-establish the data link after completing a disconnect operation. The precise timing requirements of the IUT shall be specified in the PIXIT, as defined in ISO/IEC 8882-2 and ISO/IEC 8882-3.

b) SUT Considerations: Where the protocol standard identifies a need for timers, values for those timers shall be those stated in the PIXIT.

7.8 Optional facility testing

Full testing of optional facilities is not possible because

a) optional facilities may be managed by levels above X.25; and

b) multiple combinations of optional facilities may be required depending on the applications running above X.25.

Optional facilities are tested individually. Where the IUT cannot support this method of testing these tests are deselected.

7.9 Transient states

It is recognized that for those IUTs that process PDUs sequentially, certain states are not realizable. Specifically, the testing of the IUT during the DXE defined states (for example, for the packet layer, r3 — Restart Indication, p3 — Incoming Call, p7 — Clear Indication, and d3 — Reset indication) may result in the testing of some other states (p1 — Ready, p4 — Data Transfer, d1 — Flow Control Ready). For example, to test the response to an error packet (inopportune or improper packet) in the DXE Restart Indication (r3) state, the tester will send a Restart Indication, immediately followed by the error packet. The tester expects the IUT to discard the error packet and then send a Restart Request in response to the error packet. However, the IUT generally responds immediately to the Restart Indication with a Restart Confirmation and processes the next packet from the packet level state r1. When these states are not observable in the IUT, transient test cases are deselected. The specific handling of transient state testing is described in ISO/IEC 8882-2 and ISO/IEC 8882-3.

8 Structure of other parts of ISO/IEC 8882

In order to ensure consistency between ISO/IEC 8882-2 and ISO/IEC 8882-3 the following items shall be included in those standards.

a) A PIXIT pro forma

b) A statement of Acceptable Unexpected responses.

c) A statement of Tester Timing Considerations.

d) PICS and PIXIT based abstract test selection rules.

e) A definition of the test cases.

f) A statement of conformance.

g) An annex describing the differences between the version of TTCN used and the version of TTCN defined in ISO/IEC 9646-3.

Annex A
(informative)

DIS level text for ISO/IEC 9646 - Part 3
The Tree and Tabular Combined Notation (TTCN)

Important - This Annex contains an extract from the DIS text of ISO/IEC 9646-3. The clause, figure and table numbering has been changed to align with the numbering in this standard. Example and proforma numbering is unchanged from the original text. References to the annexes in the original text have been placed in braces; for example "{Annex A}". All errors contained in the original text which were subsequently corrected in the published International Standard are also present here.

Introduction

This Part of the multi-part 'standard/recommendation' (hereafter abbreviated to 'standard*') defines a test notation, called the Tree and Tabular Combined Notation (TTCN), for use in the specification of 'OSI or related CCITT X.series or T.series' (hereafter abbreviated to 'OSI*') generic and abstract conformance test suites.

In constructing a generic or abstract test suite, a test notation is used to describe abstract test cases. The test notation can be an informal notation (without formally defined semantics) or a formal description technique (FDT). TTCN is an informal notation with clearly defined, but not formally defined, semantics.

TTCN is designed to meet the following objectives:

a) to provide a notation in which generic and abstract test cases can be expressed in test suite standards*;

b) to provide a notation which is independent of test methods, layers and protocols;

c) to provide a notation which reflects the abstract testing methodology defined in this multi-part standard*.

In the abstract testing methodology a test suite is looked upon as a hierarchy ranging from the complete test suite, through test groups, test cases and test steps, down to test events. TTCN provides a naming structure to reflect the position of test cases in this hierarchy. It also provides the means of structuring test cases as a hierarchy of test steps culminating in test events. In TTCN the basic test events are sending and receiving Abstract Service Primitives (ASPs), Protocol Data Units (PDUs) and timer events.

Two forms of the notation are provided: a human-readable tabular form, called TTCN.GR, for use in OSI* conformance test suite standards; and a machine-processable form, called TTCN.MP, for use in representing TTCN in a canonical form within computer systems and as the syntax to be used when transferring TTCN test cases between different computer systems. The two forms are semantically equivalent.

A.1 Scope

This Part of the multi-part standard* defines an informal test notation, called TTCN, for OSI* conformance test suites, which is independent of test methods, layers and protocols, and which reflects the abstract testing methodology defined in Parts 1 and 2 of this multi-part standard*.

It also specifies requirements and provides guidance for using TTCN in the specification of system-independent conformance test suites for one or more OSI* standards*. It specifies two forms of the notation: one, a human-readable form, applicable to the production of conformance test suite standards* for OSI* protocols; and the other, a machine-processable form, applicable to processing within and between computer systems.

This Part of this multi-part standard* applies to the specification of conformance test cases which can be expressed abstractly in terms of control and observation of protocol data units and abstract service primitives. Nevertheless, for some protocols, test cases may be needed which cannot be expressed in these terms. The specification of such test cases is outside the scope of this standard*, although those test cases may need to be included in a conformance test suite standard*.

NOTE 1 - For example, some static conformance requirements related to an application service may require testing techniques which are specific to that particular application.

This Part of this multi-part standard* applies to the specification of conformance test suites for OSI* protocols in OSI layers 2 to 7, specifically including ASN.1 based protocols. The specification of conformance test suites for multi-peer or Physical layer protocols is outside the scope of this standard*.

The relation between TTCN and formal description techniques is outside the scope of this standard*.

The specification of test cases in which more than one behaviour description is to be run concurrently, is outside the scope of this standard*.

NOTE 2 - Use of parallel trees and synchronization between them is expected to be covered by an Addendum to this standard*.

Although this Part of this multi-part standard* specifies requirements on abstract test suites written in TTCN, including their operational semantics, the means of realization of executable test suites from abstract test suites is outside the scope of this Part. Nevertheless, this Part specifies requirements on what a test suite standard* may specify about a conforming realization of the test suite.

NOTE 3 - ISO 9646-4 specifies requirements concerning test realization including ETS derivation.

A.2 Normative References

ISO 9646-1, *Information Processing Systems - Open Systems Interconnection - OSI Conformance Testing Methodology and Framework. - Part 1: General Concepts.* (See also CCITT Recommendation X.290)

ISO 9646-2, *Information Processing Systems - Open Systems Interconnection - OSI Conformance Testing Methodology and Framework. - Part 2: Abstract Test Suite Specification.* (See also CCITT Recommendation X.290)

ISO 646, *Information Processing Systems - Open Systems Interconnection - ISO 7-bit Coded Character Set for Information Exchange*

ISO 8824 (1989), *Information Processing Systems - Open Systems Interconnection - Abstract Syntax Notation One (ASN.1).* (See also CCITT Recommendation X.208)

ISO 8825 (1989), *Information Processing Systems - Open Systems Interconnection - Basic Encoding Rules for ASN.1.* (See also CCITT Recommendation X.209)

NOTE - These versions of ASN.1 include ASN.1 Extensions Addenda.

ISO 7498-1 , *Information Processing Systems - Open Systems Interconnection - Basic Reference Model.* (See also CCITT Recommendation X.200)

ISO TR 8509 , *Information Processing Systems - Open Systems Interconnection -Service Conventions.* (See also CCITT Recommendation X.210)

A.3 Definitions

A.3.1 Basic Terms from ISO 9646-1

The following terms defined in ISO 9646-1 apply:

a) abstract service primitive
b) abstract testing methodology
c) abstract test case
d) abstract test method
e) abstract test suite
f) conformance log
g) conformance statement
h) conformance testing
i) conformance test suite
j) coordinated test method
k) distributed test method
l) embedded testing
m) executable test case
n) executable test suite
o) external test methods
p) fail verdict
q) foreseen outcome
r) generic test case
s) generic test suite
t) implementation under test

u) inconclusive verdict
v) inopportune test event
w) local test methods
x) lower tester
y) multi-layer testing
z) pass verdict
aa) PICS proforma
ab) PIXIT proforma
ac) point of control and observation
ad) protocol data unit
ae) protocol implementation
af) real tester
ag) remote test method
ah) syntactically invalid test event
ai) system under test
aj) test case
ak) test coordination procedures
al) test event
am) test group
an) test management protocol
ao) test outcome
ap) test purpose
aq) test realizer
ar) test step
as) test suite
at) unforeseen outcome
au) upper tester
av) valid test event
aw) verdict

A.3.2 Terms from ISO 7498-1

The following terms defined in ISO 7498-1 apply:

a) (N)-layer
b) (N)-protocol
c) (N)-protocol control information
d) (N)-protocol data unit
e) (N)-service
f) (N)-service access point
g) (N)-user data transfer syntax

A.3.3 Terms from ISO TR 8509

The following terms defined in ISO TR 8509 apply:

a) service primitive
b) service provider
c) service user

A.3.4 Terms from ISO 8825

The following term defined in ISO 8825 applies:

encoding

A.3.5 Terms from ISO 8824

The following terms defined in ISO 8824 apply:

a) NumericString
b) PrintableString
c) TeletexString
d) VideotexString
e) VisibleString
f) IA5String
g) GraphicString
h) GeneralString

A.3.6 TTCN Specific Terms

For the purposes of this standard* the following definitions apply:

A.3.6.1 Abbreviation identifier: A name for an abbreviation, which identifies its definition.

A.3.6.2 Attach statement: A TTCN statement which attaches a sub-tree to a calling tree.

A.3.6.3 Base constraint: Specifies a set of default values for each and every field in an ASP or PDU type declaration.

A.3.6.4 Behaviour line: An entry in a dynamic behaviour table representing a test event or other TTCN statement together with associated label, verdict, constraints reference and comment information as applicable.

A.3.6.5 Behaviour tree: A specification of a set of sequences of test events, and other TTCN statements.

A.3.6.6 Blank entry: In a modified multiple constraint a blank entry in a constraint parameter or field denotes that a constraint value is to be inherited.

A.3.6.7 Calling tree: The behaviour tree to which a sub-tree is attached.

A.3.6.8 Constraints part: That component of a TTCN test suite concerned with the specification of the values of ASP parameters and parameter groups and PDU fields and field groups.

A.3.6.9 Constraints reference: A reference to a constraint, given in a behaviour line.

A.3.6.10 Decode expression: A specification of the decoding of PDUs embedded in ASPs or other PDUs.

A.3.6.11 Default behaviour: The events, and other TTCN statements, which may occur at any level of the associated tree, and which are indicated in the default behaviour proforma.

A.3.6.12 Defaults library: The set of the default behaviours in a test suite.

A.3.6.13 Defaults reference: A structured name which specifies the location of the default in the defaults library.

A.3.6.14 Dotted identifier: An identifier, consisting of a base constraint identifier concatenated with one or more modified constraint identifiers, separated by dots.

A.3.6.15 Encode expression: A specification of the encoding of PDUs embedded in ASPs or other PDUs.

A.3.6.16 Field groups: A collection of one or more PDU fields which may occur in more than one PDU type declaration and which is defined in a separate declaration.

A.3.6.17 Implicit send event: A mechanism used in Remote methods for specifying that the IUT should be made to initiate a particular PDU or ASP.

A.3.6.18 Inheritance: The means by which constraint values specified for a base constraint are passed to a modified constraint.

A.3.6.19 Local tree: A behaviour tree defined in the same proforma as its calling tree.

A.3.6.20 Modified constraint: A subsequent constraint defined for an ASP or a PDU that already has a Base constraint, and which makes modifications on that Base constraint.

A.3.6.21 Multiple constraint: Declaration of a set of constraints for an ASP or PDU of a given type arranged in a single table.

A.3.6.22 Operational semantics: Semantics explaining the execution of a TTCN behaviour tree.

A.3.6.23 Otherwise event: The TTCN mechanism for dealing with unforeseen events in a controlled way.

A.3.6.24 Parameter groups: A collection of one or more ASP parameters which may occur in more than one ASP type declaration and which is defined in a separate declaration.

A.3.6.25 Pseudo-event: A pseudo-event is a TTCN expression or Timer operation appearing in the behaviour description.

A.3.6.26 Receive event: The receipt of an ASP or PDU at a named or implied PCO.

A.3.6.27 Root tree: The main behaviour tree of a test case, occurring at the level of entry into the test case.

A.3.6.28 Send event: The sending of an ASP or PDU to a named or implied PCO.

A.3.6.29 Set of alternatives: TTCN statements coded at the same level of indentation and belonging to the same predecessor node. They represent the possible events, pseudo-events and constructs which are to be considered at the relevant point in the execution of the test case.

A.3.6.30 Single constraint: Declaration of a constraint for a single ASP or PDU of a given type arranged in a single table.

A.3.6.31 Snapshot semantics: A semantic model to minimize the effect of timing on the execution of a test case, defined in terms of 'snapshots' of the test environment, during which the environment is effectively frozen for a prescribed period.

A.3.6.32 Static chaining: The linking from the declaration of an ASP parameter or PDU field to the declaration of another ASP or PDU.

A.3.6.33 Static semantics: Semantic rules that restrict the usage of the TTCN syntax.

A.3.6.34 Sub-tree: An identifiable part of a behaviour tree which can be separated, then attached and executed at various places in that (or some other) behaviour tree.

A.3.6.35 Test case identifier: A short name for the test case.

A.3.6.36 Test case reference: A full name for the test case behaviour description, which defines its conceptual location in the test suite structure.

A.3.6.37 Test case variable: One of a set of variables declared globally to the test suite, but whose value is retained only for the execution of a single test case.

A.3.6.38 Test step library: The set of the test step dynamic behaviour descriptions in the test suite.

A.3.6.39 Test step objective: An informal statement of what the test step is meant to accomplish.

A.3.6.40 Test Suite constant: One of a set of constants, *not* derived from the PICS or PIXIT, which will remain constant throughout the test suite.

A.3.6.41 Test suite parameter: One of a set of constants derived from the PICS or PIXIT which globally parameterize a test suite.

A.3.6.42 Test suite variable: One of a set of variables declared globally to the test suite, and which retain their values between test cases.

A.3.6.43 Timeout event: An event which is used within a behaviour tree to check for expiration of a specified timer.

A.3.6.44 Tree attachment: The method of indicating that a behaviour tree specified elsewhere (either at a different point in the current proforma, or as a test step in the test step library) is to be included in the current behaviour tree.

A.3.6.45 Tree header: That which prefixes a local behaviour tree. The header contains a tree identifier, and a specification of any parameters and their types used in the tree.

A.3.6.46 Tree identifier: A name identifying a local behaviour tree.

A.3.6.47 Tree indentation: A method of indicating the tree structure of a behaviour description. It is reflected in the behaviour description by indentation of text.

A.3.6.48 Tree leaf: The TTCN statement in a behaviour tree or sub-tree which has no specified subsequent behaviour.

A.3.6.49 Tree node: A single TTCN statement.

A.3.6.50 Tree notation: The notation used in TTCN to represent test cases as trees.

A.3.6.51 TTCN abbreviation: A method of indicating a textual substitution to be performed in a dynamic behaviour table.

A.3.6.52 TTCN statement: A TTCN statement is an event, a pseudo-event or construct which is specified in a behaviour description.

A.3.6.53 Unforeseen test event: A test event which has not been identified as a possible outcome in the test suite. It is normally handled using the OTHERWISE event.

A.3.6.54 Unqualified send event: A send event that does not have a Boolean expression or EncodedAs expression on the same statement line.

A.4 Abbreviations

A.4.1 Abbreviations Defined in ISO 9646-1

For the purposes of this Part of ISO 9646, the following abbreviations defined in clause 4 of ISO 9646-1 apply:

ASP : abstract service primitive
OSI : open systems interconnection
OSI* : OSI related CCITT X.series or T.series
PCO : point of control and observation
PDU : protocol data unit
PICS : protocol implementation conformance statement