INTERNATIONAL STANDARD

ISO/IEC 9646-3

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Information technology — Open Systems Interconnection — Conformance testing methodology and framework —

Part 3:
The Tree and Tabular Combined Notation (TTCN)

Technologies de l'information — Interconnexion de systèmes ouverts — Essais de conformité — Méthodologie générale et procédures —

Partie 3: Notation combinée, arborescente et tabulaire (TTCN)

Reference number
ISO/IEC 9646-3:1998(E)

Contents

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 9646-3 was prepared by the Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 21, *Open systems interconnection, data management and open distributed processing*.

This second edition cancels and replaces the first edition (ISO/IEC 9646-3:1992), which has been technically revised.

ISO/IEC 9646 consists of the following parts, under the general title *Information technology - Open Systems Interconnection - Conformance testing methodology and framework*:

- *Part 1: General concepts*
- *Part 2: Abstract Test Suite specification*
- *Part 3: The Tree and Tabular Combined Notation (TTCN)*
- *Part 4: Test realization*
- *Part 5: Requirements on test laboratories and clients for the conformance assessment process*
- *Part 6: Protocol profile test specification*
- *Part 7: Implementation Conformance Statements*

Annexes A to E form an integral part of this part of ISO/IEC 9646. Annexes F, G and H are for information only.

Introduction

This part of ISO/IEC 9646, one of a multi-part International Standard defines a test notation, called the Tree and Tabular Combined Notation (TTCN), for use in the specification of OSI abstract conformance test suites.

In constructing a standardized 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 abstract test cases can be expressed in standardized test suites;

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 ISO/IEC 9646;

d) to provide a capability to use concurrency in the specification of abstract test cases, when appropriate, in both multi-party testing and single-party testing.

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 positions 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 canonnical 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.

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Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN)

1 Scope

1.1 This part of ISO/IEC 9646 defines an informal test notation, called the Tree and Tabular Combined Notation (TTCN), for OSI conformance test suites, which is independent of test methods, layers and protocols, and which reflects the abstract testing methodology defined in ISO/IEC 9646-1 and ISO/IEC 9646-2.

1.2 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.

1.3 This part of ISO/IEC 9646 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 part of ISO/IEC 9646, although those test cases may need to be included in a conformance test suite standard.

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

The specification of test cases in which more than one behaviour description is to be run in parallel is dealt with by the concurrency features (particularly involving the definition of Test Components and Test Component Configurations).

1.4 This part of ISO/IEC 9646 specifies requirements on what a test suite standard may specify about a conforming realization of the test suite, including the operational semantics of TTCN test suites.

1.5 This part of ISO/IEC 9646 applies to the specification of conformance test suites for OSI protocols in OSI layers 2 to 7, specifically including Abstract Syntax Notation One (ASN.1) based protocols. The following are outside the scope of this part of ISO/IEC 9646:

a) the specification of conformance test suites for Physical layer protocols;

b) the relationship between TTCN and formal description techniques;

c) the means of realization of executable test suites (ETS) from abstract test suites.

1.6 This part of ISO/IEC 9646 defines mechanisms for using concurrency in the specification of abstract test cases. Concurrency in TTCN is applicable to the specification of test cases:

a) in a multi-party testing context;

b) which handle multiplexing and demultiplexing in either a single-party or multi-party testing context;

c) which handle splitting and recombining in either a single-party or multi-party testing context;

d) in a single-party testing context when the complexity of the protocol or set of protocols handled by the IUT is such that concurrency can simplify the specification of the test case.

1.7 TTCN modules are defined to allow sharing of common TTCN specifications between test suites.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9646. 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 9646 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 646 : 1991, *Information technology - ISO 7-bit coded character set for information interchange.*

ISO/IEC 7498-1 : 1994, *Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model.*

(See also ITU-T Recommendation X.200 : 1994.)

ISO/IEC 8824-1: 1995, *Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

(See also ITU-T Recommendation X.680 : 1994.)

ISO/IEC 8824-1: 1995/Amd. 1: 1996, *Information Technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation - Amendment 1: Rules of extensibility.*

(See also ITU-T Recommendation X.680 Amendment 1 : 1995.)

ISO/IEC 8824-2: 1995, *Information technology - Abstract Syntax Notation One (ASN.1): Information object specification.*

(See also ITU-T Recommendation X.681 : 1994.)

ISO/IEC 8824-2: 1995/Amd. 1 : 1996, *Information technology - Abstract Syntax Notation One (ASN.1): Information object specification - Amendment 1: Rules of extensibility.*

(See also ITU-T Recommendation X.681 Amendment 1 : 1995.)

ISO/IEC 8824-3 : 1995, *Information technology - Abstract Syntax Notation One (ASN.1): Constraint specification.*

(See also ITU-T Recommendation X.682 : 1994.)

ISO/IEC 8824-4 : 1995, *Information technology - Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.*

(See also ITU-T Recommendation X.683 : 1994.)

ISO/IEC 8825-1 : 1995, *Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER).*

(See also ITU-T Recommendation X.690 : 1994.)

ISO/IEC 8825-2 : 1996, *Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER).*

(See also ITU-T Recommendation X.690 : 1995.)

ISO/IEC 9646-1 : 1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts.*

(See also ITU-T Recommendation X.290 : 1995)

ISO/IEC 9646-2 : 1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 2: Abstract test suite specification.*

(See also ITU-T Recommendation X.291 : 1995)

ISO/IEC 9646-4 : 1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 4: Test realization.*

(See also ITU-T Recommendation X.293 : 1995)

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.*

(See also ITU-T Recommendation X.294 : 1995)

ISO/IEC 9646-6 : 1994, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 6: Protocol profile test specification.*

(See also ITU-T Recommendation X.295 : 1995)

ISO/IEC 9646-7 : 1995, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements.*

(See also ITU-T Recommendation X.296 : 1995)

ISO/IEC 10646-1 : 1993, *Information technology - Multiple-Octet Coded Character Set (UCS): Architecture and basic multilingual plane.*

ISO/IEC 10731: 1994, *Information technology - Open Systems Interconnection - Basic Reference Model - Conventions for the definition of OSI Services.*

(See also ITU-T Recommendation X.210 : 1993.)

3 Definitions

3.1 Basic terms from ISO/IEC 9646-1

The following terms defined in ISO/IEC 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 test suite
h) coordinated test method
i) distributed test method
j) executable test case
k) executable test case error
l) executable test suite
m) fail verdict
n) idle testing state
o) implementation under test
p) inconclusive verdict
q) invalid test event
r) local test method
s) lower tester
t) means of testing
u) pass verdict
v) PICS proforma
w) PIXIT proforma
x) protocol implementation conformance statement
y) protocol implementation extra information for testing
z) point of control and observation
aa) remote test method
ab) stable testing state
ac) standardized abstract test suite
ad) static conformance requirements
ae) syntactically invalid test event
af) system under test
ag) test body
ah) test case
ai) test case error
aj) test coordination procedures