

INTERNATIONAL STANDARD

ISO/IEC 9646-4

Second edition
1994-12-15

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

Part 4: Test realization

<https://standards.iso.org/standards/catalog/standards/sist/d12a593e-1eea-4c34-bb2e-70ca49c12ab7/iso-iec-9646-4:1994>

Technologies de l'information — Interconnexion de systèmes ouverts —
Cadre général et méthodologie des tests de conformité OSI —

Partie 4: Réalisation des tests



Reference number
ISO/IEC 9646-4:1994(E)

Contents

	Page
Foreword	iii
Introduction	iv
1 Scope	1
2 Normative references	1
3 Definitions	2
4 Abbreviations	2
5 Test realization overview	2
5.1 Introduction	2
5.2 Means of Testing composition	3
5.3 Means of Testing (MOT) functionality	3
5.4 Selected and parameterized test suites	3
5.5 The Parameterized Executable Test Suites (PETS)	3
6 Requirements concerning test realization	3
6.1 Introduction	3
6.2 Requirements concerning the Means of Testing	4
6.3 Requirements concerning Executable Test Suite (ETS) derivation	5
6.4 Requirements concerning conformance log	5
6.5 Requirements on the progression of the IXIT proforma(s)	6
6.6 Requirements concerning other documentation	6
7 Compliance	7

Annex

A Additional Guidance on test realisation	8
A.1 Additional guidance on the Means of Testing (MOT)	8
A.2 Additional guidance on the Executable Test Suite (ETS) derivation process	10
A.3 Additional guidance on conformance log	11
A.4 Additional guidance on documentation	12

© ISO/IEC 1994

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

ISO/IEC Copyright Office • Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

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 9646-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee 21, *Open Systems Interconnection, data management and open distributed processing*.

This second edition cancels and replaces the first edition (ISO/IEC 9646-4:1991) 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
- 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

Annex A of this part of ISO/IEC 9646 is for information only.

Introduction

ISO/IEC 9646-1 and ISO/IEC 9646-2 define a general methodology for testing the conformance of implementations to OSI protocol specifications and/or transfer syntaxes issued as International Standards or ITU-T Recommendations; these parts also put requirements on the production of OSI conformance testing specifications and Abstract Test Suites (ATS) specifications.

ISO/IEC 9646-3 defines a standardized test notation, the Tree and Tabular Combined Notation (TTCN), for the specification of an ATS.

Once OSI conformance testing specifications and ATSS in compliance with ISO/IEC 9646-2 are available, the test results obtained by different test laboratories should be comparable, if they base their test operations on the same reference ATS specification.

ISO/IEC 9646-5 puts requirements on the conformance assessment process, so that test results can be compared with those of other test laboratories, and can have a wide acceptance.

This part of ISO/IEC 9646 concentrates on the intermediate stage, namely, test realization. Before the test preparation can begin, a Means of Testing (MOT) the Implementation Under Test (IUT) has to be made available.

Test realizers are those organizations which take responsibility for providing such an MOT.

ISO/IEC 9646-6 defines a general methodology for specifying the requirements for the production of Profile Test Specification (PTS) for conformance testing against profiles.

ISO/IEC 9646-7 defines how to express and document the conformance of systems to base specifications and profiles, using Implementation Conformance Statements (ICS) based on standardized ICS proformas and profile Requirements Lists (RLs).

This part of ISO/IEC 9646 places requirements on test realization, to ensure that the execution of test cases reflects the behaviour specified in the reference ATS specification. In this way, the purpose of the ATS is achieved.

This part of ISO/IEC 9646 is also to be published by ITU as ITU-T Recommendation X.293.

Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 4: Test realisation

1 Scope

This part of ISO/IEC 9646 specifies requirements and gives guidance concerning the realization of a Means of Testing (MOT), in conformance with a reference Abstract Test Suite (ATS) specification, specified in compliance with ISO/IEC 9646-2. This part of ISO/IEC 9646 is applicable to producing MOTs for testing a single protocol, multiple protocols or a profile.

NOTE - This implies the use of ATSs as defined in ISO/IEC 9646-1. However, within this part, the term ATS also applies to the additional Abstract Test Cases designed for testing a specific profile, and included in the Profile Specific Test Specification (PSTS).

These requirements are limited to those aspects of an MOT which can be mapped on to the abstract testing functions defined in ISO/IEC 9646-1, or which are essential to a proper use of the ATS. Such aspects might include a facility to produce conformance log, or the progression of the Implementation Extra Information for Testing (IXIT) proformas. Further implementation details of test systems and Upper Testers are outside the scope of this part of ISO/IEC 9646.

Acceptance, validation and installation of MOT are outside the scope of this part of ISO/IEC 9646.

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 IEC and ISO maintain registers of currently valid International Standards.

ISO 7498: 1984, *Information technology - Open Systems Interconnection - Basic reference model*.
(See also ITU-T Recommendation X.200).

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 -¹⁾).

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 -¹⁾).

ISO/IEC 9646-3: 1992, *Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN)*.
(See also ITU-T Recommendation X.292 (1993).

ISO/IEC 9646-3 Amd: -¹⁾ *Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation - Amendment 1: TTCN extensions*.

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 -¹⁾).

ISO/IEC 9646-6: 1994, *Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 6: Protocol profile testing specification*.
(See also ITU-T Recommendation X.295 -¹⁾).

1. To be published

ISO/IEC 9646-7: - ¹⁾, *Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements*. 3Definitions
(See also ITU-T Recommendation X.296 -¹⁾).

3 Definitions

For the purposes of this part of ISO/IEC 9646, all the definitions given in ISO/IEC 9646-1 apply. In addition, the definition of 'TTCN coordination point' is given in ISO/IEC 9646-3.

4 Abbreviations

For the purpose of this part of ISO/IEC 9646, the following abbreviations given in ISO/IEC 9646-1 apply:

ASP:	abstract service primitive.
ATM:	abstract test method.
ATS:	abstract test suite.
BIT:	basic interconnection tests.
ETS:	executable test suite.
ICS:	implementation conformance statement.
IUT:	implementation under test.
IXIT:	implementation extra information for testing.
LT:	lower tester.
LTCF:	lower tester control function.
MOT:	means of testing IUTs.
MPyT:	multi-party testing.
OSI:	open systems interconnection.
PATS:	parameterized abstract test suite.
PCO:	point of control and observation.
PDU:	protocol data unit.
PETS:	parameterized executable test suite.
PSTS:	profile specific test specification.
PTS:	profile test specification.
SATS:	selected abstract test suite.
SETS:	selected executable test suite.
SPyT:	single-party testing.
SUT:	system under test.
TCP:	test coordination procedures.
TM-PDU:	test management PDU.
TMP:	test management protocol.
TTCN:	tree and tabular combined notation.
UT:	upper tester.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/d12a593e-1eea-4c34-bb2e-19ca49c104bf/iso-iec-9646-4-1994>

ISO/IEC 9646-4:1994
<https://standards.iteh.ai/catalog/standards/sist/d12a593e-1eea-4c34-bb2e-19ca49c104bf/iso-iec-9646-4-1994>

5 Test realization overview

5.1 Introduction

Test realization is the process of producing a Means of Testing (MOT) for testing the conformance of IUTs to OSI protocol specification, based on a conformance testing specification and its Abstract Test Suite (ATS).

5.2 Means of Testing composition

An MOT is a combination of equipment and procedures that can perform

- a) the derivation of test cases,
- b) the selection of test cases,
- c) the parameterization of test cases,
- d) the execution of test cases and
- e) the production of a conformance log.

With respect to a conformance assessment for a base protocol specification, the MOT provides a realization of an ATS for that protocol, in conformance with a reference ATS specification.

With respect to a conformance assessment for a profile, the MOT provides a realization of each ATS, including the additional abstract test cases, if any, in conformance with the Profile Test Specification Summary (PTS-Summary).

5.3 Means of Testing (MOT) functionality

In the derivation process, the abstract test cases of the ATS are converted into executable test cases forming an Executable Test Suite (ETS).

The selection process for a base specification begins with the complete ATS. The inappropriate test cases for the IUT are deselected according to the provisions of the Implementation Conformance Statement (ICS) and the Implementation Extra Information for Testing (IXIT).

In the case of profile testing, the selection process begins with the list of test cases applicable to the profile, which is part of the Profile Specific Test Specification (PSTS). The inappropriate test cases for the IUT are deselected, according to the provisions of the profile ICS and profile IXIT.

In the parameterization process, the parameters in the selected test cases are given appropriate values, according to the provisions of the appropriate IXIT (and possibly of the ICSs).

The MOT is then used in the conformance assessment process for an IUT, executing the test cases in a test campaign, resulting in the production of a conformance log.

5.4 Selected and parameterized test suites

Intermediate forms of test suites may or may not be created, depending upon when the derivation process occurs.

Such intermediate forms are known as

- a) SATS: Selected Abstract Test Suites;
- b) SETS: Selected Executable Test Suites;
- c) PATS: Parameterized Abstract Test Suites;
- d) PETS: Parameterized Executable Test Suites.

5.5 The Parameterized Executable Test Suites (PETS)

Among these various forms, only the ATSs are necessarily tangible.

Some MOT may generate the PETS automatically from the relevant ATS (given the ICS and IXIT) at the moment the test cases are actually run. Such an MOT does not exhibit an ETS, nor a SETS, nor a PETS, in a tangible form.

Nevertheless, what is executed is always a Parameterized Executable Test Suite.

6 Requirements concerning test realization

6.1 Introduction

The requirements concerning test realization address

- a) the MOT as a whole;
- b) the derivation process, from abstract to executable test cases;
- c) facilities for producing a conformance log;
- d) progression of the IXIT proforma;

e) production of other documents.

6.2 Requirements concerning the Means of Testing

6.2.1 General functions

An MOT shall be provided for a single ATS, which complies with ISO/IEC 9646-2. The test realizer shall use only the version of the ATS specification which has the highest standardization status (*e.g.* DIS rather than CD).

The MOT shall provide

- a) a realization of the Lower Testers, and if the Multi-Party Testing (MPyT) context is used, a realization of the Lower Tester Control Function (LTCF);
- b) the specification of the Upper Tester, insofar as it is required by the test method;
- c) the realization of the Upper Tester for the Single Party Testing (SPyT) Local test method and any MPyT test method in which the Upper Tester is outside the SUT;
- d) optionally, the realization of the Upper Tester(s) for the SPyT Coordinated and Distributed test methods, if appropriate, or for MPyT test methods;
- e) the specification of the Test Coordination Procedures (TCPs) in accordance with the requirements specified in the reference ATS specification;
- f) the realization of the TCPs within the test system for the SPyT Local test method and any MPyT test method in which the Upper Tester is outside the SUT;
- g) the realization of the TMP within the SPyT Lower Tester(s) for the Coordinated test method and if appropriate, for MPyT test methods.

6.2.2 Test cases for execution

The MOT shall include either the executable test cases derived from the abstract test cases of the ATS, or a means of deriving them.

The MOT shall be realized in compliance with the semantics of the test notation chosen in the ATS.

The MOT shall provide a means of deselecting the inappropriate test cases for an IUT, and parameterizing the selected test cases (whether they are at the abstract level or at the executable level), as indicated in 5.3.

The requirements for the selection process are expressed in ISO/IEC 9646-5, subclause 7.3.

The requirements for the parameterization process are expressed in ISO/IEC 9646-5, subclause 7.4.

6.2.3 Selection of the Basic Interconnection Tests

The MOT shall provide a facility for selecting the capability or behaviour test cases mentioned in the list of Basic Interconnection Tests (BIT), if such a list is specified in the reference ATS, and shall provide a facility for running them initially altogether, before the capability and behaviour tests.

The MOT shall also provide a facility for omitting those test cases indicated in the BIT list from the set of test cases selected for the capability and behaviour tests.

6.2.4 Execution of Parameterized Executable Test Suites (PETS)

The MOT shall include the capability of executing the PETS which result from the derivation, selection and parameterization processes.

6.2.5 Conformance of a Means of Testing (MOT)

The test realizer shall provide a statement of conformance of the MOT to the reference ATS specification, indicating any subset of the ATS that is not supported (see 6.3.4).

The test realizer shall identify all restrictions for test execution required by the MOT beyond those stated in the reference ATS specification (*e.g.* limiting value ranges provided in the IXIT).

NOTE - The test realizer should note any requirements for a comprehensive testing service stated in the ATS specification. The test realizer may wish to develop an MOT for each of the required ATMs in order that a test laboratory may provide a comprehensive testing service.

6.2.6 Conformance log

The MOT shall provide a facility for generating a conformance log (see 6.4).

6.3 Requirements concerning Executable Test Suite (ETS) derivation

6.3.1 Introduction

Requirements in 6.3 shall apply to all ETSs, including SETS or PETS, whether tangible or not.

6.3.2 Conformance to the reference ATS specification

An ETS shall be derived from a single reference ATS specification.

For an ETS to conform to the reference ATS specification, it shall comply with the requirements stated in 6.3.3 to 6.3.5 below. It shall also conform to the requirements stated in the reference ATS specification itself, and in the other parts of the multi-part conformance testing standard, if applicable (e.g. TMP).

6.3.3 Correspondence between abstract and executable test cases

Each executable test case shall be the realization of a single abstract test case, and shall be selectable for execution on an individual basis.

All sequences of test events comprising an abstract test case shall be capable of being realized in the executable test case.

The test purpose and verdict assignments of each abstract test case shall be maintained in the corresponding executable test case.

The MOT shall not perform checking on the validity of Protocol Data Unit (PDU) parameters received from the IUT in addition to that which is defined in the abstract test case. Any further checking which the test system might be capable of performing is outside the scope of this standard and shall not contribute to the verdict assignment for each test case.

Test group relationships defined in the reference ATS specification shall be maintained in the ETS. Each test group composed of a named set of test cases in the ATS shall be represented in the ETS as a named set of executable test cases.

The ATS includes a mapping of the abstract test case(s) to the ICS proforma and partial IXIT proforma questions (see ISO/IEC 9646-2: 1994, clause 14). This mapping shall be maintained in the ETS.

6.3.4 Subsetting the Abstract Test Suite

The ETS derivation process generally results in the derivation of all abstract test cases of the ATS. However, it may be acceptable to derive an ETS for certain subsets of the ATS. If a subset is created, the exclusion of a set of test cases shall be consistent with the test selection process for an IUT, with respect to the mapping between the ICS proforma(s) (and IXIT proforma(s)) questions and the test cases in the ATS.

NOTE - This means that the test cases which are mandatory for all IUTs would always be included in the subset, but the test realizer can choose not to realize particular sets of test cases which are optional or conditional and therefore will not be required to test particular classes of IUTs.

Thus the subset of the ATS which is realized shall be equivalent to one or more of the potential SATS.

6.3.5 Derivation process independence

In the MOT, the derivation process shall lead to the same PETS being executed for a given IUT, regardless of when the derivation process occurs relative to the selection and parameterization processes.

NOTE - See A.2.1, figure A.1.

The application of the selection and parameterization processes for a particular IUT is the responsibility of the test laboratory, in the test preparation phase.

6.4 Requirements concerning conformance log

As stated in 6.2, the MOT shall provide a facility for generating a conformance log.

A conformance log is a human-readable record of information produced as a result of a test campaign, sufficient to record the observed test outcomes and verify the assignments of test verdicts.

This information combines the observations of the actual test events which occur when the PETS is run against an IUT, with information which relates those events to the abstract test cases concerned.

A conformance log may be used in the production of conformance test reports and in the resolution of disputes and queries which may arise during or as a result of the conformance assessment process.

A conformance log shall include

- a) a unique identification of the conformance log that includes time and date of the start of the execution of the PETS;
- b) an identification of the MOT, date of origin, version number, and ETS identification (if any);

- c) an indication of the start and of the end of each test case and, if the MPyT context is involved, which Lower Testers were started and stopped, including a unique reference to the abstract test case as specified in the ATS (*e.g.* TTCN test case reference or TTCN test case identifier);
- d) the PDUs sent by the Lower Tester(s) to the IUT, and received by the Lower Tester(s) from the IUT, including a record of the detailed information contained in the PDU parameters and user data;
- e) the abstract test events, as specified in the relevant abstract test case; these include all Abstract Service Primitives (ASPs) observed by the Lower Tester(s), all test events sent and received via the Test Coordination Procedures by the Lower Tester(s), including information to and from the Upper Tester(s), and an identification of the relevant points at which they occurred (*e.g.* Points of Control and Observation (PCOs) or TTCN Coordination Points);
- f) if the MPyT context is used, all test events sent and received by the LTCF, including an identification of the relevant points at which they occurred (*e.g.* TTCN Coordination points);
- g) all information regarding preliminary results;
- h) an indication of the result for each test case; this will be verdict assignment, abstract or executable test case error, or abnormal test case termination;
- i) a time stamp or ordering sequence for all test events logged by the Lower Tester in the order that they are observed;
- j) any additional information required by the ATS.

NOTE - An example of j) above is when an abstract test case written in TTCN specifies that preliminary result information (in the verdict column) or labels (in the label column) shall be recorded in the conformance log if the corresponding test event occurs.

A conformance log shall display all names, abbreviations and values, using the terminology and conventions defined in the protocol specification, abstract syntax (if any), encoding rules (if any), or ATS (with precedence given to the first two named).

The MOT shall have the ability to produce the conformance log on paper. It is also recommended that a machine-readable form of the conformance log be made available, with equivalent contents.

NOTE - See annex A, clause A.3, for guidance on the production of conformance logs.

6.5 Requirements on the progression of the IXIT proforma(s)

The partial IXIT proforma(s) shall be progressed to take into account the MOT. To achieve this, the test realizer shall augment the partial IXIT proforma(s) by adding those additional questions that need to be answered in order to prepare the MOT for a particular IUT.

The test realizer shall include in the augmented partial IXIT proforma(s) all the information concerning the realization of the ATS, which the client needs for completing the IXIT.

The test realizer should refer to ISO/IEC 9646-5, subclause 6.4.5 and produce the augmented partial IXIT proforma(s) in such a way as to facilitate the production of a complying IXIT proforma by the test laboratory.

The resulting augmented partial IXIT proforma(s) shall be provided to the test laboratory, in order that it can fulfil its requirements as specified in ISO/IEC 9646-5, subclause 6.4.5.

6.6 Requirements concerning other documentation

Documentation shall accompany the MOT, in order to enable the test laboratory to perform test operations in conformance with the reference ATS specification, and in compliance with ISO/IEC 9646-5 with respect to information to be provided to the client.

The documentation shall include

- a) identification of the MOT, date of origin, version number, and ETS identification (if any);
- b) name and version number of the International Standard or ITU-T Recommendation for the protocol specification (and the service definition if appropriate); name and version number of the reference ATS specification, together with lists of technical corrigenda to the protocol specification which have been taken into account;
- c) description of the MOT (see A.4.3 for guidance);
- d) specification of the TCPs and of the Upper Tester(s), as and when required by the reference ATS specification;
- e) the test cases, if any, which cannot be executed due to limitations in the MOT;

NOTE - Such limitations should be exceptions, and should occur only if particular abstract test cases could not feasibly be realized.

- f) description of those procedures for test execution which are to be performed by the test laboratory and/or the client, and which are specific to the MOT;

- g) statement of conformance to the reference ATS specification;
- h) statement of compliance with this part;
- i) guidance for interpreting the conformance log.

If test realizers detect errors in any of the abstract test cases or detect any abstract test case which addresses erroneous or ambiguous requirements in the relevant specification, then the test realizers shall identify those test cases in the documents accompanying the MOT.

NOTE - The test realizers should also forward defect reports which identify the problem(s) to the organization responsible for the maintenance of the relevant specification.

7 Compliance

An MOT complies with this part of ISO/IEC 9646 if and only if all the requirements stated in clause 6 are satisfied.

NOTE - The primary means of verifying that an MOT implements the four functions associated with test realization (*i.e.* derivation, selection, parameterization, execution) resides in the conformance log.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 9646-4:1994](https://standards.iteh.ai/catalog/standards/sist/d12a593e-1eea-4c34-bb2e-19ca49c104bf/iso-iec-9646-4-1994)

<https://standards.iteh.ai/catalog/standards/sist/d12a593e-1eea-4c34-bb2e-19ca49c104bf/iso-iec-9646-4-1994>