INTERNATIONAL STANDARD

ISO/IEC 9646-6

First edition
1994-12-15

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

Part 6: Protocol profile test specification

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

Partie 6: Spécification de test pour les profils de protocoles

Reference number
ISO/IEC 9646-6:1994(E)

Contents

Annex

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 9646-6 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee 21, *Open Systems Interconnection, data management and open distributed processing*.

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 forms an integral part of this part of ISO/IEC 9646.

Introduction

This part of ISO/IEC 9646 provides OSI protocol profile testing methodology based on the protocol testing methodology specified in ISO/IEC 9646-2.

ISO/IEC 9646-1 defines terminology and introduces general concepts for both protocol and profile testing. ISO/IEC 9646-4 places requirements on test realization and ISO/IEC 9646-5 places requirements on the conformance assessment process, both of which are applicable to profile testing. ISO/IEC 9646-7 describes how profile requirements are documented in Implementation Conformance Statements (ICSs) and profile Requirements Lists (RLs).

A profile specification is a document containing one or more profiles. An International Standardized Profile (ISP) is an example of a standardized profile specification.

A profile is defined as the selection of one or more base specifications and the identification of the chosen classes, common subsets, options and parameters of those base specifications necessary for accomplishing a particular function. Profiles are defined to facilitate interworking between systems implementing the same profile.

A profile implementation is tested for conformance to the relevant profile specification in order to give confidence that interworking can be achieved, and to verify that the implementation conforms to the profile specification.

The meaning of conformance to a profile and the method of expressing profile conformance requirements are described in clause 6.

Profile testing principles, based on the methodology defined for the base protocol specifications, are described in clause 7.

The Profile Test Specification (PTS) is the complete set of documents needed to specify conformance testing for a profile. The PTS is based on the Abstract Test Suite (ATS) specifications of the protocols referenced by the profile. The PTS is described in clause 7.

The PTS-Summary provides, in a single document, references to all the elements of the PTS. The PTS-Summary is described in clause 8 and a template for a PTS-Summary is described in annex A.

The Profile Specific Test Specification (PSTS) contains any changes to the ATS specifications relevant to the base specifications and the additional test cases required for the profile testing. The PSTS is described in clause 9.

This part of ISO/IEC 9646 is also published by ITU as ITU-T Recommendation X.295, but not identical texts.

Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 6: Protocol profile test specification

1 Scope

This part of ISO/IEC 9646 specifies the requirements and provides guidance for the production of Profile Test Specifications (PTSs) for conformance testing of OSI protocol profiles. This part of ISO/IEC 9646 also specifies requirements concerning the expression of conformance requirements in protocol profile specifications.

This part of ISO/IEC 9646 is applicable to testing the conformance of a profile implementation to the static and dynamic conformance requirements of each protocol and any information objects included in the profile, by controlling and observing Protocol Data Unit (PDU) exchanges.

Testing requirements that go beyond conformance 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 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.*
(See also ITU-T Recommendation X.200 (1984)).

ISO/TR 8509: 1987, *Information processing systems - Open Systems Interconnection - Service conventions.*
(See also ITU-T Recommendation X.209 (1988)).

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: -[1], *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The Tree and Tabular Combined Notation (TTCN) - Amendment 1: TTCN extensions.*

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 [1]).

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]).

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ISO/IEC 9646-7: -[1], *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7:Implementation Conformance Statements*

(See also ITU-T Recommendation X.296 [1]).

ISO/IEC TR 10000-1:1990, *Information technology - Framework and Taxonomy of International Standardized Profiles. Part 1: Framework.*

ISO/IEC TR 10000-2:1990, *Information technology - Framework and Taxonomy of International Standardized Profiles. Part 2: Taxonomy.*

3 Definitions

For the purposes of this part of ISO/IEC 9646, all the definitions in ISO/IEC 9646-1 apply.

In addition, the following definition applies to this part:

component (of a profile): A component of a profile is a single protocol or a combination of one or more protocols with zero or more information objects upon which a profile is based and which are to be tested in combination.

4 Abbreviations

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

ATM: abstract test method
ATS: abstract test suite
ETS: executable test suite
ICS: implementation conformance statement
ISP: international standardized profile
IUT: implementation under test
IXIT: implementation extra information for testing
MOT: means of testing
OSI: open systems interconnection
PCTR: protocol conformance test report
PICS: protocol implementation conformance statement
PSTS: profile specific test specification
PTS: profile test specification
RL: requirements list
SCS: system conformance statement
SCTR: system conformance test report
SUT: system under test
TMP: test management protocol
TSS&TP: test suite structure and test purposes
XRL: profile IXIT requirements list

NOTE - The following abbreviations were defined for ISPs in ISO/IEC TR 10000-1 but are superseded in ISO/IEC 9646 by more general terms:

IPRL: ISP requirements list (general term is profile RL)
ISPICS: ISP implementation conformance statement (general term is profile ICS)
ISPIXIT: ISP implementation extra information for testing (general term is profile IXIT).

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5 Compliance

A protocol profile specification which complies with this part of ISO/IEC 9646 shall satisfy all the requirements stated in clause 6. A Profile Test Specification Summary (PTS-summary) which complies with this part of ISO/IEC 9646 shall satisfy all the requirements stated in clause 8 and annex A. All the referenced conformance testing specifications shall comply with ISO/IEC 9646-2.

A Profile Specific Test Specification (PSTS) which complies with this part of ISO/IEC 9646 shall satisfy all the requirements stated in clause 9 and shall be the only internationally harmonized PSTS for the given profile.

If a PTS-Summary in compliance with this part of ISO/IEC 9646, references a PSTS, the PSTS shall comply with this part of ISO/IEC 9646.

A Profile Test Specification (PTS) which complies with this part of ISO/IEC 9646 shall satisfy all the requirements stated in clause 10.

6 The meaning of conformance to a profile

6.1 Principles of profile contents and profile conformance

A profile makes explicit the relationships between a set of base specifications used together to accomplish a particular function, and may also specify particular details related to each base specification being used.

It follows that a profile:

a) shall restrict the choice of base specification options to the extent necessary to maximise the probability of interworking between systems implementing the profile; thus a profile may retain base specification options as options of the profile provided that they do not affect interworking;

b) shall not specify any requirements that would contradict or cause non conformance to the base specifications to which it refers;

c) may contain conformance requirements which are more specific and limited in scope than those of the base specifications to which it refers.

For example, when a feature is associated with an allowed parameter value range, the profile shall only adopt the same value range as that allowed by the base specification, or a subset of that range.

Therefore, conformance to that set of base specifications does not necessarily imply conformance to the profile. However, conformance to a profile implies by definition conformance to the set of base specifications which it references.

6.2 Profile conformance requirements

6.2.1 Introduction

The concepts of static conformance and dynamic conformance apply also to profiles.

6.2.2 Static conformance requirements clause

In order to ensure consistency between profiles and base specifications, the static conformance requirements of a profile shall be specified, where possible, by reference to the conformance requirements of the referenced base specifications.

There shall be a static conformance requirements clause in a profile, structured as follows:

a) an overview of the major subsets or implementation categories which provides an overall rationale for the more detailed selection of classes and options made in the profile;

b) the conformance requirements which relate to these subsets or implementation categories;

c) for each base specification selected in the profile, a reference to the base specification static conformance requirements and a specification of the choices made for the profile;

d) any additional static conformance requirements of the profile which involve interdependencies of related services and protocols.

For general guidance on conformance clauses, see ISO/IEC 9646-2, annex B, B.5.

6.2.3 Relationship between profile and base specification static conformance requirements

The static conformance requirements of an OSI protocol profile shall relate to the static conformance requirements in the base specifications as defined in ISO/IEC 9646-7.

6.2.4 Expression of profile static conformance requirements

Profile static conformance requirements are expressed in the profile Implementation Conformance Statement (ICS) proforma. See ISO/IEC 9646-7 for requirements and guidance regarding the specification of the profile ICS proforma.

6.2.5 Dynamic conformance requirements

Given the implementation choices stated in the profile ICS, the dynamic conformance requirements for a profile are, for the most part, specified by the referenced base specifications.

Hence, a profile shall specify dynamic conformance requirements by reference to those base specifications, together with any further constraining requirements necessary to fulfil the stated purposes of the profile.

Restrictions by a profile on dynamic conformance requirements of a base specification are exceptions, and shall only apply to transmission. Restrictions shall not apply to reception. Consequently, it is possible that receipt of an excluded option may cause the receiving system to operate outside the profile, but still in accordance with the base specification.

6.3 Expression of profile extra information for testing

Extra information for testing a profile is expressed in the profile IXIT. See ISO/IEC 9646-1, subclause 6.2.3 for the scope and the role of a profile IXIT proforma and profile IXIT and see ISO/IEC 9646-5, subclause 6.4.5 for more details.

7 General testing principles

7.1 Profile Test Specification (PTS)

The PTS is the set of all the conformance testing specifications needed to assess conformance to a profile.

The contents of a PTS are specified in a standardized document called a PTS-Summary. The PTS-Summary is a part of the PTS.

The PTS-Summary does not contain the full text of any conformance testing specification, but only contains references to them. The PTS-Summary references

1) base specifications;

2) specific material created for a profile or a family of related profiles, called a PSTS.

The users of the PTS are

a) the test realizers who develop Executable Test Suites (ETSs) for the profile;

b) the test laboratories which carry out the conformance assessment process of an implementation of a profile;

c) the clients of the test laboratories who need to know the specifications by which their profile implementations will be tested.

Profile specifiers may utilize the concept of a common profile or common subprofile, hereafter called a "common (sub)profile", to define a common part of a profile which can be used by one or more other profiles. A common (sub)profile may be incomplete in itself. An example of such a common (sub)profile is the Common Upper Layer Requirements profile containing the protocols: Session, Presentation and Association Control Service Element.

In the case of such profiles, the PTS-Summary for a complete profile may reference the PTS-Summary for a common (sub)profile, to allow the PTS of the common (sub)profile to be incorporated within the PTS of the referencing profile.

A common (sub)profile may reference another common (sub)profile.

7.2 Rules to develop the elements of a Profile Test Specification (PTS)

The PTS shall provide testing coverage for each conformance requirement of the profile.

The contents of a PTS are based on the existence of conformance testing specifications, each one containing a Test Suite Structure and Test Purposes (TSS&TP), a partial Implementation Extra Information for Testing (IXIT) proforma and one or more Abstract Test Suites (ATSs) plus Test Management Protocol (TMP) if any, applicable to a component of the profile (i.e. to one or more protocols and/or information objects). The PTS shall avoid duplication of the conformance testing specifications and shall only contain references to them.

If no conformance testing specification exists for some component of the profile, one shall be developed in compliance with ISO/IEC 9646-2, in the context of the profile and submitted to the relevant standardization organization, for standardization of the conformance testing specification for the relevant base specification(s) (albeit that the coverage provided by the ATS may be incomplete).

If a profile has profile specific conformance requirements, then test purposes and corresponding abstract test cases shall be created for these requirements.

7.3 Relationship with base specification testing

7.3.1 Introduction

The conformance testing specification for each component of a profile is ideally a subset of the one for the base specification(s), in the same way as the profile itself specifies a subset of the base specifications.

7.3.2 Options excluded by a profile

In some exceptional circumstances, a profile may include a requirement to exclude certain dynamic behaviour allowed in the base specification (i.e. prohibiting the use of an optional capability, or restricting value ranges of parameters, allowed in the base specification).

When designing conformance testing specifications to test such requirements, there shall be no provocative tests designed to deliberately make the implementation operate outside the profile; thus the Means of Testing (MOT) shall at all times stay within the limits of the profile. If the implementation exhibits out of profile behaviour which is detected when it is being tested within the profile, a fail verdict shall be recorded for that test case.

When testing a profile implementation, the values given to parameters may need to be adapted to fit profile requirements. All chosen parameter values shall be within the range allowed by the profile (to test the valid behaviour) or outside the range allowed by the base specification (to test the invalid behaviour).

7.3.3 Options out-of-scope of a profile

In some circumstances, a profile may specify that a certain capability or a certain parameter value is out-of-scope.

When testing a profile implementation, the presence of an out-of-scope parameter value may become a requirement in order to correctly encode the complete Protocol Data Unit (PDU) (e.g. if just one element of a sub-structure is out-of-scope). However the semantics behind such a parameter shall not be tested within the PTS for that profile.

An out-of-scope parameter which is not needed to correctly encode the PDU shall not be the subject of profile testing. An out-of-scope capability shall not be the subject of profile testing. There shall be no test cases that test the implementation with a value that is outside the range specified in the profile, but inside the range specified in the base specification. However, invalid behaviour test cases are needed to probe the Implementation Under Test's response to behaviour which is invalid with respect to the base specification.

7.3.4 Profile testing of the IUT as receiver

Systems may support more than one profile and may have the ability to correctly respond to PDUs which contain parameters which are either out-of-scope or excluded by the profile being tested. Therefore, when testing an Implementation Under Test (IUT) as a receiver, the MOT shall only exhibit "in profile" behaviour and shall not attempt to coerce the receiving IUT to operate outside the profile.

The test suite specifier shall only specify valid behaviour test cases that restrain their behaviour to that allowed within the profile. This applies to a parameter value range, where a profile limits the range allowed by the base specification.

The implementer should not need to modify the implementation to reject the values in the wider range if they are sent to it. Also the implementer should have the possibility to constrain the implementation to the profile specification, thus rejecting values in the wider range. So the behaviour of profile implementations for values in the wider range cannot be uniquely defined.

7.3.5 Profile testing of the IUT as Sender

During connection negotiation, the MOT shall at all times act as a system having implemented the profile and be prepared to negotiate all the options available in the base specification.

Systems vary in their ability to be specifically configured for profile testing and may, upon connection establishment, offer options outside the scope of the profile. However, as the MOT is required to behave as an implementation of the profile, those options are either ignored or negotiated away. The resulting dialogue is therefore "in-profile".

For IUT originated protocol requests and responses, where the Upper Tester has control over the parameter values used in the dialogue, the Upper Tester shall not expect the implementation to reject or "tailor" parameter values that are outside the range allowed by the profile, but inside the range allowed by the base specification.

For IUT originated protocol requests and responses, where a given parameter is categorized as out-of-scope in the profile, and where the Upper Tester neither specifies the values for it, nor is able to negotiate the non-use of this parameter for the connection, the Lower Tester shall ignore the arrival of this parameter.