Information technology — Text and office systems — Office Document Architecture (ODA) and interchange format — Technical Report on ISO 8613 implementation testing — Part 2: Framework for abstract test cases
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.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 10183-2, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, Information technology, Subcommittee SC 18, Document processing and related communication.

ISO/IEC TR 10183 consists of the following parts, under the general title Information technology Text and office systems Office Document Architecture (ODA) and interchange format — Technical Report on ISO 8613 implementation testing:

- Part 1: Testing methodology
- Part 2: Framework for abstract test cases
Information technology — Text and office systems — Office Document Architecture (ODA) and interchange format — Technical Report on ISO 8613 implementation testing —

Part 2: Framework for abstract test cases

1 Scope

The purpose of ISO/IEC TR 10183 is to define a testing methodology and provide a framework for specifying abstract test cases for ISO 8613 implementation testing, the overall objective being the provision of a suitable base for testing the interworking capability of ODA implementations.

Such testing will assist in the analysis of an implementation's ability to interwork in an environment of implementations of ISO 8613 and implementations of International Standardized Profiles (ISPs) based on ISO 8613. ISPs are standardized document application profiles that have been internationally harmonized. As such they represent agreed stabilized subsets of ISO 8613 designed for the interworking of ODA systems at different levels of functionality.

In ISO 8613 the term "conformance" refers to the conformance of a data stream to the rules specified in ISO 8613. This includes the conformance of a data stream to a document application profile based on ISO 8613. Conformance testing methodology as defined in Annex G of ISO 8613-1 covers the analysis of data streams without regard to the capabilities of implementations to generate or receive conforming data streams. To achieve an environment of interworking ODA systems, it is necessary to have a testing methodology that can verify implementation support for ISO 8613 and DAP's at the semantic level as well as the data stream or syntax level.

Hence, implementation testing is additional testing that supplements the conformance testing of data streams. It increases the probability that different implementations of ISO 8613 and ISPs are able to interwork. Implementation testing is based on the concept of measuring an implementation's ability to generate or receive a representative set of documents. If an implementation can exhibit this capability, then it is more likely to interwork successfully with other verified implementations exchanging a wider range of documents.

The implementation testing methodology introduces the requirement for abstract test cases as well as procedures for their use in the generation and reception testing of implementations.

In establishing a framework for implementation testing, a conceptual model of ODA systems has been developed to describe, in an abstract sense, the multitude of configurations and limitations of real ODA systems.

The methodology contained in ISO/IEC TR 10183 caters for the testing of implementations of ISP's based on ISO 8613. The methodology may also be used for testing other Document Application Profiles based on ISO 8613.

This part of ISO TR 10183
- specifies a framework for the development of abstract test cases;
- specifies a test case notation used to specify abstract test cases;
- gives examples of abstract test cases.

ISO/IEC TR 10183 does not cover the testing of user interfaces in an ODA based system. Any suitable system interface
is only used as a point of control and observation to verify that ODA document transformations associated with the various ODA processes have been carried out as claimed by an implementor.

Abstract test cases created from the specifications in this part of ISO/IEC TR 10183 should be used in the definition of executable test suites and data streams for testing implementations of ISO 8613 and implementations of International Standardized Profiles based on ISO 8613.

Where appropriate, concepts and terminology described in ISO/IEC 9646 have been used. In some cases, definitions and concepts have been adapted to cater for the fact that ODA is not an OSI protocol.

2 References

The following documents are referenced within ISO/IEC TR 10183 and provide additional background information.


2 Definitions

The definitions of ISO 8613 apply to ISO/IEC TR 10183. Some terms from ISO 9646 are also used where there is an equivalence of meaning. Additionally, the definitions given in ISO/IEC TR 10183-1 also apply.
4 Abbreviations

The abbreviations given in ISO/IEC TR 10183-1 apply. Additionally, the following abbreviations are used.

DAP: Document Application Profile.
ISP: International Standardized Profile.
IUT: Implementation Under Test.
PCO: Point of Control and Observation.
Pc: Process component.
Sc: System interface component.
Ic: Interchange component.
GSS: Generating Support Statement.
RSS: Receiving Support Statement.
DUT: Document Under Test
TCS: Test Case Specification (used in generation testing)
TDS: Test Data Stream (used in reception testing)
FDAR: A local representation of a formatted form (FDA) ODA document
PDAR: A local representation of a processable form (PDA) ODA document
FPDAR: A local representation of a formatted processable form (FPDA) ODA document
ATCN: Abstract Test Case Notation
TCID: Test case Identifier
TCP: Test Case Purpose

5 Framework for the development of abstract test cases

This clause presents the framework for the development of abstract test cases for generation and reception testing. The structure of abstract test cases is described in 5.1 and the design of generation and reception test cases is described in 5.2. Examples of test cases are contained in Annexes A and B.

5.1 Structure of abstract test cases

Every abstract test case has a Test Case Identifier (TCID), a Test Case Purpose (TCP) and a test case body. The TCP is a description of the objective that the test case is designed to achieve. The test case body contains a specification, written in the Abstract Test Case Notation (ATCN), for a set of ODA functional elements that are necessary to achieve the TCP and assign verdicts to the possible outcomes. In the case of reception testing, the test case body may also contain a test case script that can be used to aid analysis of a document and help in determination of the test case verdict.
A Document Under Test (DUT), used in generation testing, or a Test Data Stream (TDS), used in reception testing, may contain one or more test cases.

The requirements for ODA test cases are that they be configurable to different DAPs and different Implementations under Test (IUTs). This can be achieved by having test cases which are feature based and which contain the minimal amount of DAP dependent information. These constraints impact on the structure of the test case specification.

The test case specification part of the test case body consists of one or more constituent specifications for one or more ODA structures. The test case specification contains only the information necessary to express the purpose of the test case. One or more test case specifications do not necessarily represent a complete document specification since not all constituents, attributes and values are present. However, any DUT or TDS resulting from the compilation of one or more abstract test cases must be a conforming ODA document.

5.1 Relationships between constituents in a test case

The constituent specifications in a test case result in constituents that are connected in a less constraining fashion than in ODA. Two types of relationship describe the possible connections: the hierarchical relationship and the logical-layout relationship.

The hierarchical relationship is used to identify particular descendants of a constituent. It allows the definition of a hierarchy of constituents without having to specify all the constituents in a document structure. A constituent's descendant can be defined as being either a subordinate or an immediate subordinate. The order of appearance of descendants in relation to the sequential order can also be specified by the hierarchical relationship.

The logical-layout relationship is used to constrain a particular logical constituent and its subordinates to be laid out in a particular layout constituent and its subordinates. This type of relationship allows the guidance of the layout of the logical objects defined in the test case specification without having to specify layout directives which are DAP dependent or a complete document.

5.1.2 Preconditions

There is some ambiguity in allowing missing attributes and attribute values in the test case. This ambiguity occurs when a DUT or TDS is derived for the test case and can result in attributes and attribute values being in conflict with the purpose of the test case. It is necessary to prohibit the occurrence of such attributes and attribute values in any DUT or TDS containing the test case. This can be achieved using preconditions. A precondition is a constraint on the presence and values of attributes of particular constituents in any TDS derived for the test case. The constraint can apply to the subordinates of a particular constituent specified in the test case, to the objects which are superior (at any hierarchical level) to a particular constituent specified in the test case, or to the constituents hierarchically situated between two particular constituents belonging to the same ODA structure in the test case.

5.1.3 Attribute value range

In a test case, attribute values must be expressed in a way that allows them to be as unconstrained as possible so that they can be configurable to different DAPs. Attribute values can be specified in an unconstrained way by providing a range of possible values instead of a single value (provided more than one value is possible in the test case). The specification of a range of values in the test case is done in a similar way to the specification of DAPs using the Document Application Profile Proforma Notation in Annex F of ISO 8613-1.

5.1.4 Constituent names

It is often necessary to restrict a constituent specification in a test case to be of a particular type. Normally, in ODA, the type of a constituent is determined by a combination of attributes. In order to facilitate the specification of such a
constraint in the test case, a constraint, called a 'constituent type constraint', is introduced. This type of constraint allows the type of a constituent to be constrained without having to set particular attribute values (which might restrict the test case being configurable to different DAPs).

DAPs assign semantics to the constituents of the possible documents allowed. The constituents represent the allowed structural elements such as objects and object classes in a document for instance paragraphs, sections and columns, each having allowed properties such as indentation, numbering and size. It is also necessary to assign similar semantics to the constituents in a test case. This can be achieved by similarly associating the constituents, specified in a test case, with names identifying their basic functionality (e.g. paragraphs, sections and columns). Since the test cases need to be DAP configurable, the constituent names should represent general elements applicable to different DAPs.

5.1.5 Constraints

It is necessary to ensure that test cases provide a predictable outcome. When implementation testing involves the analysis of a view transformation, the test cases also need to consider an predictable result in the analysis of, for example, the imaged DUT containing the test case. Three types of constraint are necessary to achieve such predictability:

- constraints on the visibility of a layout object;
- constraints on the size of content and
- constraints on the available area of a layout object.

These constraints cannot be realized without knowledge of the DAP and must be expressed in a generic manner to allow the test cases to be DAP configurable. These three constraints are described in more detail in the following clauses.

5.1.5.1 Constraints on visibility

The visibility of layout objects is necessary when testing certain features such as 'New Pageset'. Visibility is necessary to ensure that particular content is laid out in particular layout objects. For example, in the case of the layout directive 'New Pageset' applied to some logical objects, it will be necessary to confirm that the content associated with one or more basic logical objects has been laid out in a new pageset. In order to verify this, it is necessary to observe the occurrence of the new pageset in the DUT. The way a layout object can be made visible may vary from DAP to DAP. In test cases, layout objects are designated visible by assigning the characteristic 'VISIBLE' to their constituent. This allows the specification of the visibility constraint in a generic manner and defers the decision on how to realize the constraint to a later phase when the DAP information is used.

5.1.5.2 Constraints on content

The testing of certain features requires the use of content information of specific sizes. In some cases, the content is used to view the dimensions of a layout object in the DUT. In other cases, the content is used to assess the layout process for a given feature in a particular context. The context must be such that the occurrence of the feature produces a predictable effect in the DUT. For example, consider the situation when a TDS for a processable document is being used to test the layout support of a receiving IUT through an imaged DUT. And consider that the TDS contains a test case for the feature that requires two logical objects to be contained in the same layout object. The recipient's layout process could be tested in such a context by defining three basic logical objects in the test case, the last two being those for which 'Same Layout Object' applies. The content associated with the basic logical objects must be designed in such a way that they do not fit together in the body of one page. It is not possible to achieve this using fixed pieces of content since the available area in the page body, which is DAP dependent, is not known when the generic test case is designed. It is therefore necessary to bind the relative size of the content portions associated with the basic logical objects to the available area of the page body and leave the generation
of the actual pieces of content and hence their size to a later stage when the available area is determined. This type of content is termed relative content. In the example, the desired effect can be obtained using relative content by defining three basic logical objects with content occupying respectively one third, one third and one half of the page body’s available area. The constraint on the size of the content associated with the basic logical objects ought to force the layout process to generate a new page since the three pieces of content together exceed the page body’s available area.

5.1.5.3 Constraints on available area

It is necessary to have a mechanism that effectively determines the size of the available area within particular layout objects. Such control is required in order to ensure that content associated with particular basic logical objects can be laid out in layout objects which were designed, in a given test case, to receive them. It is also necessary for test cases with raster or geometric graphics content to make sure that the available area of the associated layout object is of sufficient size to allow observation of the visible content. In the example in 5.1.5.2, where it was required to ensure that some logical content could be laid out in a layout object, there was no need to define constraints on the available area of the layout object since the relative content could be used. However, there are situations where it is more appropriate to use fixed pieces of content. The use of fixed content allows the incorporation of readable text in imaged DUTs. The readable text can be used as a guide during analysis and determination of the verdict of the test case. When fixed content is specified, there is no link between the size of the content and the size of the receiving layout object’s available area, and therefore no guarantee that the content can be laid out in the layout object. It is therefore necessary to include a restriction on the layout object’s available area to ensure that the content can actually be laid out in the object. A constraint on the available area of a layout object in a test case specification consists of a minimum and/or maximum size for the horizontal and/or vertical directions of the area.

5.2 Design of abstract test cases

The design of test cases for generation testing and for reception testing is different since the former must create a document specification language which is understandable by an implementor/operator of the IUTs proprietary system. Reception testing must cater for the analysis of DUTs to determine the verdict of test cases. 5.2.1 and 5.2.2 describe the design of generation and reception test cases.

5.2.1 Generation test case design

In generation testing, each test case includes a feature name and a feature description. The feature name is expressed in document processing terms (e.g. paragraph, footnote, column) used in clauses 6 of DAPs defined in accordance with the Document Application Profile Proforma Notation in ISO 8613-1. The feature description expresses the feature in the abstract test case notation (see clause 7) using ODA constituents and attribute specifications. In the case where a feature can be described using different combinations of ODA functional elements, a set of descriptions can be associated with the feature.

Examples of feature descriptions are contained in Annex A. The examples include test case feature descriptions for 'Paragraph with text and graphic' (A.2) and 'Page with header or footer frame' (A.3).

5.2.2 Reception Test Case Design

A reception test case can be viewed as a constraint on a TDS. The notation used to express the constraint is similar to the one used for generation test cases. However, some functionality is added to the notation to cater for the specific requirements of reception testing.

The reception test cases can be divided in three categories:

- Test cases which check that the IUT can receive and interpret the semantics of attributes and attribute values correctly. The semantics of attributes are specified in ISO 8613;
- Test cases which check that the IUT can receive and correctly process combinations of attributes which affect each other. The result of such interactions between attributes is also specified in ISO 8613;
- Test cases which check that the IUT follows the ISO 8613 defaulting mechanism correctly.

Hence, reception test cases check that the IUT can process test data streams in accordance with the semantics of the ODA architectural model.

In reception testing, the results of the tests are determined from analysis of the DUTs provided by the IUT. Each test case in a TDS must result in a predictable outcome in a DUT. In the design of such test cases effects on the layout process need to be anticipated and controlled to some extent.

5.2.2.1 Algorithm for designing a reception test case

When designing a reception test case for a particular ODA requirement, the first step is to determine an environment suitable for the test case. A test case environment is a collection of constituents and attributes, organized in such a manner that, following reception of the associated TDS, the effect of the test case is predictable in a DUT produced by the IUT.

The second step involves representing the test environment in the test case notation. The test case must also express any necessary conditions needed to make the test environment valid. Each condition can identify disallowed attributes or attribute values for certain parts of the document if their inclusion would cause a conflict with the purpose of the test case.

The third optional step consists of writing a script indicating how to determine the verdict from DUT analysis. Scripts should indicate how to determine the verdict of a test case in a way that is, as far as possible, independent of the DUT representation. Because of the differences of equipment and applications, scripts should be written in general and flexible terms stating only the minimum requirements necessary to satisfy the purpose of the test cases.

Some further principles should be followed when designing reception test cases:
- A reception test case should not specify a complete document or document structure. The test case specification should only include what is needed to test the purpose and should be as general as the requirement will allow. For instance, a test case for the binding reference 'B_REF (SUP (CURR_OBJ))' ("binding name") should specify that the binding "binding name" be in any superior object but rather in any superior of an object. This approach allows the test case to be more flexible.
- Scripts should indicate how to determine the verdict of a test case in a way that is, as far as possible, independent of the DUT representation. Expected results should be described in a relative manner by comparison rather than in absolute terms. In the case where the results must be described in an absolute manner, the script should specify a range of acceptable values rather than precise measures. This tolerance margin is necessary because of equipment precision differences and DAP tolerances. For example, when assessing a DUT containing a test case for the attribute "Position", the script might state "Object B is below and to the left of Object A" rather than "Object B is positioned at 200, 500".

6 Abstract Test Case Proforma

This clause defines a proforma for ODA abstract test cases. The objectives of the proforma and notation are:
- to allow the specification of non-ambiguous implementation testing abstract test cases;
- to allow the configuration of abstract test cases to different DAPs;
- to provide test cases which are both human-readable and machine-processable.

The test case proforma consists of up to four sections:
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