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Software and systems engineering — Software testing —

Part 4: Test techniques

Ingénierie du logiciel et des systèmes — Essais du logiciel —

Partie 4: Techniques d'essai

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO/IEC documents should be noted. This document was drafted in accordance with the rules given in the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

ISO/IEC/IEEE 29119-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information Technology*, Subcommittee SC 7, *Software and systems engineering*, in cooperation with the Systems and Software Engineering Standards Committee of the IEEE Computer Society, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

This second edition cancels and replaces the first edition (ISO/IEC/IEEE 29119-4:2015), which has been technically revised.

The main changes compared to the previous edition are as follows:

— The test techniques in this document are defined using a new form of the test design and implementation process from ISO/IEC/IEEE 29119-2. In the first version, this process was based on the use of test conditions. Feedback on use of the previous edition highlighted a problem with users' understanding of test conditions and their use for deriving test cases. This second edition has replaced the use of test conditions with test models. Annex H provides more detail on this change and the Introduction describes the new process.

A list of all parts in the ISO/IEC/IEEE 29119 series can be found on the ISO and IEC websites.

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Introduction

The purpose of this document is to provide an International Standard that defines software test design techniques (also known as test case design techniques or test methods) that can be used within the test design and implementation process that is defined in ISO/IEC/IEEE 29119-2. This document does not describe a process for test design and implementation. The intent is to describe a series of techniques that have wide acceptance in the software testing industry. This document is originally based on the British standard, BS 7925-2. Annex G provides a mapping from the requirements of BS 7925-2 to the clauses and subclauses of this document.

The test design techniques presented in this document can be used to derive test cases that, when executed, generate evidence that test item requirements have been met or that defects are present in a test item (i.e. that requirements have not been met). Risk-based testing can be used to determine the set of techniques that are applicable in specific situations (risk-based testing is covered in ISO/IEC/IEEE 29119-1 and ISO/IEC/IEEE 29119-2).

NOTE A "test item" is a work product that is being tested (see ISO/IEC/IEEE 29119-1).

EXAMPLE 1 "Test items" include systems, software items, objects, classes, requirements documents, design specifications, and user guides.

Each technique follows the test design and implementation process that is defined in ISO/IEC/IEEE 29119-2 and shown in Figure 1.

Of the activities in this process, this document provides guidance on how to implement the following activities in detail for each technique that is described:

— create test model (TD1);

— identify test coverage items (TD2);

— derive test cases (TD3).

A test model represents testable aspects of a test item, such as a function, transaction, feature, quality attribute, or structural element identified as a basis for testing. The test model reflects the required test completion criterion in the test strategy.

EXAMPLE 2 If a test completion criterion for state transition testing was identified that required coverage of all states then the test model would show the states the test item can be in.

Test coverage items are attributes of the test model that can be covered during testing. A single test model will typically be the basis for several test coverage items.

A test case is a set of preconditions, inputs (including actions, where applicable), and expected results, developed to determine whether or not the covered part of the test item has been implemented correctly.

Specific (normative) guidance on how to implement the create test procedures activity (TD4) in the test design and implementation process of ISO/IEC/IEEE 29119-2 is not included in Clauses 5 or 6 because the process is the same for all techniques.

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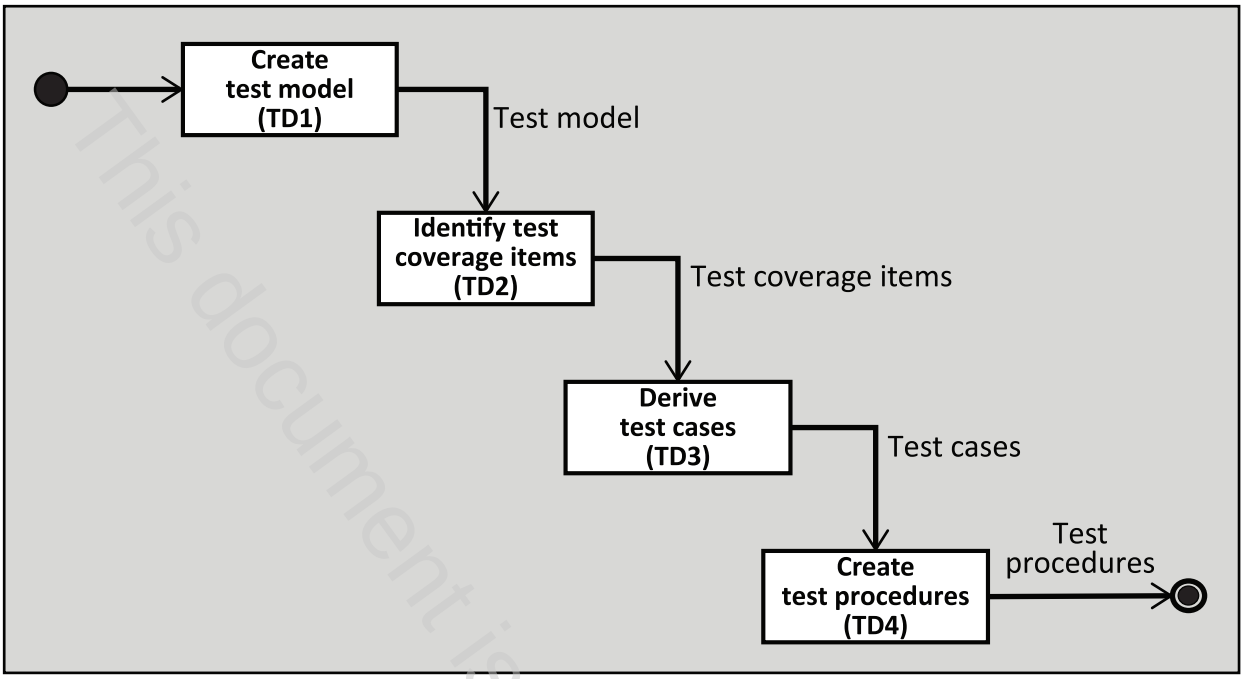

Figure 1 — ISO/IEC/IEEE 29119-2 test design and implementation process

ISO/IEC 25010 defines eight quality characteristics (including functional suitability) that can be used to identify types of testing that may be applicable for testing a specific test item. Annex A provides example mappings of test design techniques that apply to testing quality characteristics defined in ISO/IEC 25010.

Experience-based testing practices like exploratory testing and other test practices such as model-based testing are not defined in this document because this document only describes techniques for designing test cases. Test practices such as exploratory testing, which can use the test techniques defined in this document, are described in ISO/IEC/IEEE 29119-1.

Templates and examples of test documentation that are produced during the testing process are defined in ISO/IEC/IEEE 29119-3. The test techniques in this document do not describe how to document test cases (e.g. they do not include information or guidance on assigning unique identifiers, test case descriptions, priorities, traceability or pre-conditions to test cases). Information on how to document test cases can be found in ISO/IEC/IEEE 29119-3.

This document aims to provide stakeholders with the ability to design test cases for software testing in any organization.

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Software and systems engineering — Software testing —

Part 4: Test techniques

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1 Scope

This document defines test design techniques that can be used during the test design and implementation process that is defined in ISO/IEC/IEEE 29119-2.

Each technique follows the test design and implementation process that is defined in ISO/IEC/IEEE 29119-2 and shown in Figure 1. This document is intended for, but not limited to, testers, test managers, and developers, particularly those responsible for managing and implementing software testing.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC/IEEE 29119-2, *Software and systems engineering — Software testing — Part 2: Test processes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO, IEC and IEEE maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

— IEEE Standards Dictionary Online: available at https://ieeexplore.ieee.org/xpls/dictionary.jsp

NOTE For additional terms and definitions in the field of systems and software engineering, see ISO/IEC/IEEE 24765, which is published periodically as a "snapshot" of the SEVOCAB (Systems and software Engineering Vocabulary) database and is publicly accessible at https://www.computer.org/sevocab.

3.1
Backus-Naur Form
formal meta-language used for defining the syntax of a language in a textual format

3.2
base choice
base value
input parameter value used in 'base choice testing' that is normally selected based on being a representative or typical value for the parameter

3.3
boundary value analysis
specification-based *test case* (3.49) design technique based on exercising the boundaries of *equivalence partitions* (3.28)

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