International Standards for Software Testing

At a high level

Overview

The world's largest technical professional organization dedicated to advancing technology for the benefit of humanity is the Institute of Electrical and Electronics Engineers, or the IEEE for short.

The IEEE has established a set of standards on the international level for software testing.

This presentation will cover an overview of their documentation and motivations of the actual document 29119.

Structure of 29119

IEEE 29119 Part 1: Concepts and Definitions

IEEE 29119 Part 2: Test Processes

IEEE 29119 Part 3: Test Documentation

IEEE 29119 Part 4: Test Techniques

IEEE 29119 Part 5: Keyword-Driven testing

I. Concepts and Definitions

This document establishes the vocabulary of which the whole series utilizes.

It contains definitions and concepts of software testing, and techniques as well.

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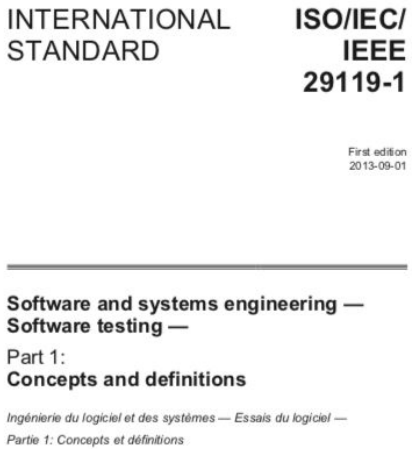


INTERNATIONAL STANDARD

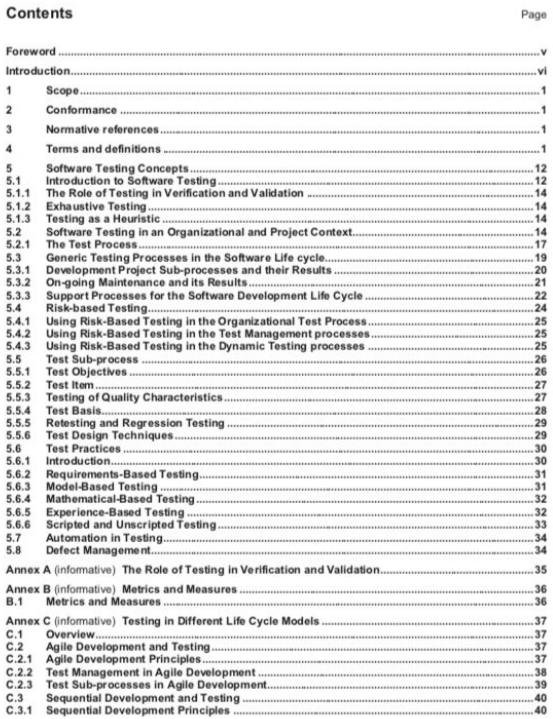
ISO/IEC/ IEEE 29119-1

First edition
2013-09-01

Software and systems engineering — Software testing —

Part 1:
Concepts and definitions

Ingénierie du logiciel et des systèmes — Essais du logiciel —
Partie 1: Concepts et définitions



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I. Concepts and Definitions

Despite being the introduction, it will also provide examples of its techniques and concepts.

It aims to be informative and to provide a starting point for the following sections.

Important to note that IEEE's standards aren't the same as Agile, so mapping Part 1 appropriately requires scrutiny and examinations.

Integrating Software Testing Standard ISO/IEC/IEEE 29119 to Agile Development

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Abstract - *The IEEE standard 29119 on Software and Systems Engineering - Software Testing which replaces an older standard of IEEE Std 829 and others is designed with the need of agile process in mind. It provides an explanation on Agile projects and some suggestions on integrating the standard to Agile process. Nevertheless, integrating the standard to Agile, still is not that straightforward and may need further elaboration. This paper addresses the following issues: the needs for a testing standard, the mechanism that integrates the testing standard to Agile, and on how to tailor the conformance to a proper level that involves the maturity levels of the Test Maturity Model Integration (TMMi). The paper concludes with a suggested tailored conformance plan that is suitable for a typical Agile Development.*

Keyword: IEEE Std 29119, Software Testing, conformance, Agile, TMMi

Though IEEE 29119 does not necessarily conflict with Agile, it is possible that full conformance to the standard, as defined in IEEE 29119, may be too cumbersome for proper Agile methodology. This produces a conundrum where extensive adherence to testing standards is required to be fully compliant with IEEE 29119, but in doing so would violate Agile principles. At the same time, it would not be sensible to completely forgo any testing standards in Agile. Some industry surveys estimate that testing comprises up to 30 to 50 percent of the total cost of development [5]. As a result, some testing standard is desired in order to properly exhibit the results of and to justify the expense invested in testing.

Though IEEE 29119 provides some leeway in this problem with the option of tailored conformance, the implementation of tailored conformance is arguably too loose. Tailored conformance in IEEE 29119 is defined to be completely dependent on a specific organization and/or project

II. Test Processes

INTERNATIONAL STANDARD

ISO/IEC/ IEEE 29119-2

First edition
2013-09-01

Software and systems engineering — Software testing —

Part 2:
Test processes

Ingénierie du logiciel et des systèmes — Essais du logiciel —
Partie 2: Processus des essais

The second part establishes a test process model.

The model includes process definitions according to organizational level and project types.

Its processes are intended to be used in combination with different development models.

II. Test Processes

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The main theme of the 29119 is mitigating risk.

Part 2 follows a risk-based approach towards testing.

Risk analysis is beneficial for strategizing and managing testing, as it allows testing to be prioritize.

III. Test Documentation

Part 3 features software test documentation.

It includes templates and work-products of the test process.

The templates also includes mapping to other standards for reference.

INTERNATIONAL STANDARD

ISO/IEC/ IEEE 29119-3

First edition
2013-09-01

Software and systems engineering — Software testing —

Part 3:
Test documentation

Ingénierie du logiciel et des systèmes — Essais du logiciel —
Partie 3: Documentation des essais

III. Test Documentation

The main documentation areas are:

Organizational Test Process

Test Management Process

Dynamic Test Process

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IV. Test Techniques

INTERNATIONAL STANDARD

ISO/IEC/ IEEE 29119-4

First edition
2015-12-01

Software·and·systems·engineering — Software testing —

Part 4:
Test techniques

Ingénierie du logiciel et des systèmes — Essais du logiciel —
Partie 4: Techniques d'essai

This part establishes definitions for designing tests.

It complements Part 2, Test Processes as well.

IV. Test Techniques

Contents

There are 3 main categories for Testing Techniques:

Specification-Based Testing

Structure-Based Testing

Experience-Based Testing

V. Keyword-Driven Testing

Part 5 tackles automated testing in the industry with specifications.

It is intended for test automation on the international scene.

INTERNATIONAL STANDARD

ISO/IEC/ IEEE 29119-5

First edition
2016-11-15

Software and systems engineering — Software testing —

Part 5:
Keyword-Driven Testing

Ingénierie du logiciel et des systèmes — Essais du logiciel —
Partie 5: Essais axés sur des mots-clés

References

All Documentation and Screenshots courtesy of IEEE 29119

https://www.softwaretestingstandard.org

https://en.wikipedia.org/wiki/ISO/IEC_29119

International Standards for Software QA

From a high level

Overview

The IEEE has also established a set of standards on the international level for software testing.

This presentation will cover an overview of their documentation of 730-2014.

Purpose

The purpose of the standard is to produce and collect information that gives confidence about an application's performance against requirements.

It wants to provide a consistent style while providing minimal requirements.

1.2 Purpose

The activities described in this standard are intended to enable the software project to use the SQA processes to produce and collect evidence that form the basis for giving a justified statement of confidence that the software product conforms to its established requirements. The purpose of this standard is to provide uniform, minimum acceptable requirements for SQA processes in support of a software project. In considering adoption of this standard, regulatory bodies should be aware that specific application of this standard may already be covered by one or more IEEE or ANSI (American National Standards Institute)

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[1] Information on normative references can be found in Clause 2.
[2] Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

Conformance

This contains language for customizing or recognizing multiple levels of conformance.

Depending on how many requirements are fulfilled, one can gauge their adoption of the standard.

1.5 Conformance

1.5.1 Conformance language conventions

The word *shall* is used to express a requirement, *should* to express a recommendation, and *may* to express alternative or optional methods of satisfying a requirement.

1.5.2 Conformance scope

Conformance to this standard is achieved by demonstrating that the requirements of Clause 5, indicated by the use of *shall*, are satisfied.

Conformance to this standard is a sufficient condition to meet the SQA outcomes enumerated in 7.2.3 of ISO/IEC/IEEE 12207:2008. The converse is not true—meeting all requirements of 7.2.3 of ISO/IEC/IEEE 12207:2008 is not sufficient for the SQA work and output to meet all requirements of this standard. Finally, conformance to this standard is not sufficient to meet other clauses of ISO/IEC/IEEE 12207:2008 or any other standard in whole or in part.

There are two ways that projects or organizations can claim conformance to the provisions of this standard: full conformance and tailored conformance as explained in 1.5.3 and 1.5.4 below.

1.5.3 Full conformance

Full conformance to this standard is achieved by demonstrating that all of the requirements of Clause 5 are satisfied, using the required outcomes as evidence.

Usage and Organization

1.7 Organization of this standard

This standard is organized into clauses and annexes:

- Clause 1 contains scope, purpose, and introductory material.
- Clause 2 identifies the normative references used in this standard.
- Clause 3 defines terms and acronyms used in this standard.
- Clause 4 describes the context for the SQA processes and SQA activities, and covers expectations for how this standard will be applied.
- Clause 5 specifies the SQA processes, activities, and tasks. Sixteen activities are identified in this clause and are grouped into three major areas: process implementation, product assurance, and process assurance. These activities implement the required outcomes for SQA specified by 7.2.3 of ISO/IEC/IEEE 12207:2008.
- Refer to Annex A for the mapping of the four required outcomes to the subclauses of this standard.
- Refer to Annex B for information about mapping between the SQA plan outlines in IEEE Std 730-2002[3,4] and IEEE Std 730-2014.
- Refer to Annex C for information about guidance for creating a Software Quality Assurance Plan (SQAP).
- Refer to Annex D for information about mapping between IEEE Std 730-2014 and ISO/IEC 15504-1:2004 [B34].[5]

IEEE recognizes not all activities aren't needed.

The intended use is during the lifecycle of the software.

The document is organized by clauses and annexes, adding more definitions for the standard.

QA and Requirements

Standard 730 establishes that quality covers the set of attributes the software needs to satisfy.

It targets the development process, conformance, and effectiveness of that QA process.

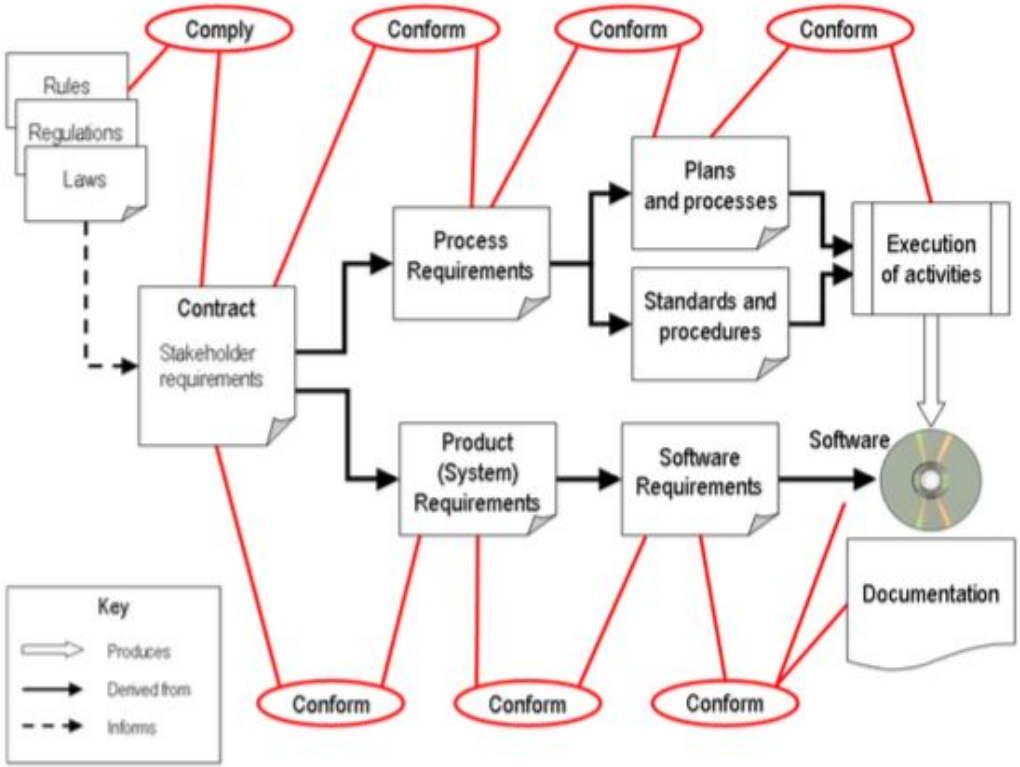
4.3 Software quality and relationship to requirements

Quality is the entire set of attributes that gives a software product the ability to satisfy expressed or implied stakeholder requirements. These stakeholder requirements become refined into software requirements, including functional requirements and performance attributes that specify how well the software performs the functional requirements.

The project determines that requirements satisfy criteria such as clarity and testability and that those requirements accurately represent stakeholder needs, wants, and expectations. This standard defines software quality as conformance to requirements that have been established by the project.

This standard defines the scope of SQA as: 1. Assessing the software development process; 2. Evaluating the conformance to software processes; and 3. Evaluating the effectiveness of the software processes. These processes include those that identify and establish the software requirements, develop the software product, and maintain the software product.

Activities



It also provides a model for mapping requirements to its activities.

For example, given the requirement contract, we can assess rules and regulations.

References

All Diagrams and Documentation courtesy of

IEEE Std 730-2014 (Revision of IEEE Std 730-2002)

International standards
For
verification and validation

From a high level

Overview

Verification and Validation is checking that a system meets requirements and purpose.

There is an international standard set forth by IEEE.

This presentation will cover an overview of IEEE's 1012 standard.

What is V&V?

V&V will be short for Verification and Validation.

It analyzes whether it satisfies the user and its purpose.

IEEE's 1012 examines the development products of a selected activity conform to its requirements.

1. Overview

1.1 Scope

This verification and validation (V&V) standard is a process standard that addresses all system and software life cycle processes including the Agreement, Organizational Project-Enabling, Project, Technical, Software Implementation, Software Support, and Software Reuse process groups. This standard is compatible with all life cycle models (e.g., system, software, and hardware); however, not all life cycle models use all of the processes listed in this standard.

V&V processes determine whether the development products of a given activity conform to the requirements of that activity and whether the product satisfies its intended use and user needs. This determination may include the analysis, evaluation, review, inspection, assessment, and testing of products and processes.

Verification vs Validation

Verification is more concerned with correctly building the product.

Validation is concerned with the product is satisfying the users.

V&V processes consist of the Verification Process and Validation Process. The Verification Process provides objective evidence for whether the products perform the following:

a) Conform to requirements (e.g., for correctness, completeness, consistency, and accuracy) for all activities during each life cycle process

b) Satisfy the standards, practices, and conventions during life cycle processes

c) Successfully complete each life cycle activity and satisfy all the criteria for initiating succeeding life cycle activities (i.e., builds the product correctly)

The Validation Process provides evidence for whether the products perform the following:

— Satisfy system requirements allocated to the products at the end of each life cycle activity

— Solve the right problem (e.g., correctly model physical laws, implement business rules, and use the proper system assumptions)

— Satisfy intended use and user needs in the operational environment (i.e., builds the correct product)

Items of Verification

Verification usually includes:

Unit Tests

Automated Testing

Items of Validation

Validation usually includes:

Acceptance Tests

Usability Tests

Items of Both

Both can use:

Regression Tests

System Tests

Beta Testing

Objectives of 1012

The IEEE wants to determine if the product satisfies purpose and user needs.

The document includes techniques for products and processes.

It should be performed in parallel of development, not at the end.

1.4 V&V objectives

V&V processes provide an objective assessment of products and processes throughout the life cycle. This assessment demonstrates whether the requirements are correct, complete, accurate, consistent, and testable. The V&V processes determine whether the products of a given activity conform to the requirements of that activity and whether the product satisfies its intended use and user needs. The determination includes assessment, analysis, evaluation, review, inspection, and testing of products and processes. V&V tasks shall be performed in parallel with all life cycle stages, not at their conclusion.

Objectives of 1012

The results of V&V provide the following benefits to the program:

- Facilitate early detection and correction of anomalies
- Enhance management insight into process and product risks
- Support the life cycle processes to assure conformance to program performance, schedule, and budget
- Provide an early assessment of performance
- Provide objective evidence of conformance to support a formal certification process
- Improve the products from the acquisition, supply, development, and maintenance processes
- Support process improvement activities

A theme of the results are pre-emptive measures. Early detection and assessment is valuable.

It considers not only performance, but budget as well.

1012 wants to support processes in certification and improvement.

Organization

The document is clarifies between Common and System tasks for V&V.

Both Software and Hardware development is covered as well.

1.5 Organization of the standard

This standard is organized into clauses (Clause 1 through Clause 12), tables (Table 1 through Table 3, and their respective subparts a–d), figures (Figure 1 and Figure 2, and their respective subparts a–d), and annexes (Annex A through Annex M). Clause 2 through Clause 12 and Table 1a through Table 1d and Table 2a through Table 2d provide the mandatory V&V requirements for this standard. Table 1a through Table 1d and Table 2a through Table 2d are the focal point of this standard, containing detailed V&V activity and task requirements. Table 1a through Table 1d and Table 2a through Table 2d are broken into four subtables:

— Common V&V tasks in Table 1a and Table 2a
— System V&V tasks in Table 1b and Table 2b
— Software V&V tasks in Table 1c and Table 2c
— Hardware V&V tasks in Table 1d and Table 2d

References

All documentation and screenshots courtesy of IEEE’s 1012-2012 standard.

https://en.wikipedia.org/wiki/Software_verification_and_validation