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Standard**

**ISO/IEC/IEEE
15026-1**

**Systems and software
engineering — Systems and
software assurance —**

**Part 1:
Vocabulary and concepts**

*Ingénierie des systèmes et du logiciel — Assurance des systèmes
et du logiciel —*

Partie 1: Vocabulaire et concepts

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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 document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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This document 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 15026-1:2019), which has been technically revised.

The main changes are as follows:

- definitions of terms introduced in other parts of the ISO/IEC/IEEE 15026 series have been added or modified;
- definitions of terms whose definitions were sourced from ISO/IEC 15288 and ISO/IEC/IEEE 24774 have been updated.

A list of all parts in the ISO/IEC/IEEE 15026 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

Software and systems assurance and closely related fields share concepts but have different vocabularies and perspectives. This document provides an unambiguous use of vocabulary for systems and software assurance and a unifying set of underlying concepts across these various fields. It provides a basis for elaboration, discussion and recording agreement and rationale regarding concepts and the vocabulary used uniformly across the ISO/IEC/IEEE 15026 series.

[Clause 4](#) covers basic concepts such as assurance, stakeholders, systems and products, property, uncertainty and confidence, conditions and initial events, and consequence. [Clause 5](#) covers some issues of which users of ISO/IEC/IEEE 15026-2, ISO/IEC/IEEE 15026-3 and ISO/IEC/IEEE 15026-4 should be initially aware ([5.2](#)). [Clause 6](#), [Clause 7](#) and [Clause 8](#) cover concepts relevant to users of ISO/IEC/IEEE 15026-2, ISO/IEC/IEEE 15026-3 and ISO/IEC/IEEE 15026-4, respectively; also, users of one of these parts can benefit from the clauses for other parts.

The essential concepts introduced by the ISO/IEC/IEEE 15026 series are the claims in an assurance case and the support of claims in terms of argument and evidence. These claims are in the context of assurance for properties of systems and software within life cycle processes for the system or software product.

Potential users of the ISO/IEC/IEEE 15026 series are developers and maintainers of assurance cases and those who wish to develop, sustain, evaluate or acquire a system that possesses requirements for specific properties in such a way as to be more certain of those properties and their requirements. The ISO/IEC/IEEE 15026 series uses concepts and vocabulary consistent with ISO/IEC/IEEE 12207 and ISO/IEC/IEEE 15288 and generally consistent with the standards on Systems and software Quality Requirements and Evaluation (SQuaRE) developed by JTC 1/SC 7, but the concepts and vocabulary provided by the ISO/IEC/IEEE 15026 series can differ from those to which the potential user is accustomed. This document attempts to clarify these differences.

The ISO/IEC/IEEE 15026 series is made up of the following parts.

- ISO/IEC/IEEE 15026-1 explains concepts and terms as a basis for all parts of the ISO/IEC/IEEE 15026 series.
- ISO/IEC/IEEE 15026-2 includes requirements on the structure of the assurance case.
- ISO/IEC/IEEE 15026-3 relates integrity levels to the assurance case and includes requirements for their use with and without an assurance case.
- ISO/IEC/IEEE 15026-4 provides guidance and recommendations for assurance of a selected claim about the system-of-interest by achieving the claim and showing the achievement. The guidance and recommendations are given in a system assurance process view on top of ISO/IEC/IEEE 15288 and a software assurance process view on top of ISO/IEC/IEEE 12207.

The assurance case is relevant to a greater or lesser extent in all parts of the ISO/IEC/IEEE 15026 series, although ISO/IEC/IEEE 15026-4 discusses achieving the claim and showing the achievement of the claim whether or not such “showing” is contained in an artefact specifically called an “assurance case”.

ISO/IEC/IEEE 15026-2 concentrates on the contents and structure of the assurance case. ISO/IEC/IEEE 15026-3 relates integrity levels and assurance cases by describing how integrity levels and assurance cases can work together, especially in the definition of specifications for integrity levels or by using integrity levels within a portion of an assurance case. This relationship is governed by the degree of risk and dependencies in the system.

ISO/IEC/IEEE 15026-4 includes assurance-related guidance and recommendations for activities across the life cycle processes including activities that extend beyond those directly related to an assurance case, e.g. project planning for assurance-related considerations.

Systems and software engineering — Systems and software assurance —

Part 1: Vocabulary and concepts

1 Scope

This document defines assurance-related terms and establishes an organized set of concepts to form a basis for shared understanding in the field of assurance. It benefits users of ISO/IEC/IEEE 15026-2, ISO/IEC/IEEE 15026-3 and ISO/IEC/IEEE 15026-4.

Vocabulary and concepts for assurance of a service being operated and managed on an ongoing basis is not covered in this document.

While essential to assurance practice, details regarding exactly how to measure, demonstrate or analyse particular properties are not covered.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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 Terms related to assurance

3.1.1

assurance

grounds for justified confidence that a *claim* ([3.1.10](#)) has been or will be achieved

Note 1 to entry: By definition, assurance is about a claim.

Note 2 to entry: The claim can be a conjunction of more than one claim.

3.1.2**assurance argument**

artefact that links tangible *evidence* (3.1.15) and assumptions to provide a convincing and valid argument of a *claim* (3.1.10) under a given context

Note 1 to entry: An assurance argument provides the reasoning that connects the evidence (and assumptions) to the claim. It explains 'why' the evidence supports the claim and how the evidence is relevant.

Note 2 to entry: An argument is valid only if all of its premises being true implies that its conclusion is true.

3.1.3**assurance case**

auditable artefact that provides a convincing and sound argument for a *claim* (3.1.10) on the basis of tangible *evidence* (3.1.15) under a given context

Note 1 to entry: Premises of an argument are propositions, and all propositions are either true or false.

Note 2 to entry: An argument is sound only if it is valid and contains only true premises.

Note 3 to entry: An argument is not sound if it is valid but contains some false premises.

3.1.4**assurance case report**

auditable artefact that provides the *claim* (3.1.10) of an *assurance case* (3.1.3) and a complete index of the argument and *evidence* (3.1.15) of the assurance case such that the assurance case of interest can be assembled from the index

Note 1 to entry: An assurance case report is mapped to the report field. An assurance case report is an introduction to the assurance case. Its content varies from one case to another. For simple assurance cases, a report can be superfluous. For larger or more complex assurance cases the report can include a *system* (3.2.8) description, some of the argument and its supporting evidence e.g. the higher-level arguments and their supporting evidence.

Note 2 to entry: Assurance case reports are often issued as periodic updates to the assurance case at pre-agreed points such as at the end of a life cycle stage. They report on results of assurance activities done so far, an assessment of overall progress and a review of assurance activities' performance. Assurance case reports can be used at decision gates for stage exit/entry by suppliers and for project monitoring by acquirers.

3.1.5**assurance claim**

claim (3.1.10) for which *assurance* (3.1.1) is considered

3.1.6**assurance information**

information including a *claim* (3.1.10) about a *system* (3.2.8), *evidence* (3.1.15) supporting the claim, an argument showing how the evidence supports the achievement of the claim, and the context for these items

Note 1 to entry: The sub-claims included in the argument of assurance information can be about the life cycle of the *system-of-interest* (3.2.10) when, for example, the top-level claim implies continuous achievement of some *property* (3.1.17).

Note 2 to entry: ISO/IEC/IEEE 15026-2 specifies *assurance cases* (3.1.3) that documents assurance information.

3.1.7**assurance objective**

purpose of achievement of the *assurance claim* (3.1.5)

Note 1 to entry: Assurance objectives determine the required degree of *integrity level* (3.3.1) and permissible uncertainty in the *assurance information* (3.1.6).

3.1.8 attribute

inherent *property* ([3.1.17](#)) or characteristic of an entity that can be distinguished quantitatively or qualitatively by human or automated means

Note 1 to entry: ISO 9000 distinguishes two types of attributes: a permanent characteristic existing inherently in something; and an assigned characteristic of a *product* ([3.2.6](#)), *process* ([3.2.4](#)), or *system* ([3.2.8](#)) (e.g. the price of a product, the owner of a product).

[SOURCE: ISO/IEC/IEEE 29148:2018, 3.1.2]

3.1.9 basic assumption

assumption in a collection of *claims* ([3.1.10](#)) shared by *assurance cases* ([3.1.3](#)) in a specific field

Note 1 to entry: Such a collection corresponds to a set of axioms in formal system in logic.

3.1.10 claim

true-false statement about the limitations on the values of an unambiguously defined *property* ([3.1.17](#)) and limitations on the uncertainty of the property's values falling within these limitations during the claim's duration of applicability under stated *conditions* ([3.1.11](#)).

Note 1 to entry: The unambiguously defined property is called the claim's property.

Note 2 to entry: Uncertainties may also be associated with the duration of applicability and the stated conditions.

Note 3 to entry: A claim potentially contains the following:

- property of the *system-of-interest* ([3.2.10](#));
- limitations on the value of the property associated with the claim (e.g. on its range);
- limitations on the uncertainty of the property value meeting its limitations;
- limitations on duration of claim's applicability;
- duration-related uncertainty;
- limitations on conditions associated with the claim;
- condition-related uncertainty.

Note 4 to entry: The term “limitations” is used to fit the many situations that can exist. Values can be a single value or multiple single values, a range of values or multiple ranges of values, and can be multi-dimensional. The boundaries of these limitations are sometimes not sharp, e.g., they can involve probability distributions and can be incremental.

3.1.11 condition

measurable qualitative or quantitative *attribute* ([3.1.8](#)) that is stipulated for a *requirement* ([3.2.7](#)) and that indicates a circumstance or event under which a requirement applies

[SOURCE: ISO/IEC/IEEE 29148:2018, 3.1.6]

3.1.12 constraint

externally imposed limitation on the *system* ([3.2.8](#)), its design, or implementation or on the *process* ([3.2.4](#)) used to develop or modify a system

Note 1 to entry: A constraint is a factor that is imposed on the solution by force or compulsion and may limit or modify the design.

[SOURCE: ISO/IEC/IEEE 29148:2018, 3.1.7]

3.1.13

critical property

property (3.1.17) that is agreed by primary stakeholders as having serious *consequence* (3.4.3)

3.1.14

dependability

<of an item> ability to perform as and when required

Note 1 to entry: Dependability includes availability, reliability, recoverability, maintainability, and maintenance support performance, and, in some cases, other characteristics such as durability, safety and security.

Note 2 to entry: Dependability is used as a collective term for the time-related quality characteristics of an item.

[SOURCE: IEC 60050-192:2015, 192-01-22]

3.1.15

evidence

data referred to by an argument that validates the given claim

Note 1 to entry: Evidence can include result of tests, inspections, simulations, audits.

Note 2 to entry: The role of the evidence is to support a demonstrable argument that the claim is valid.

3.1.16

inference

reasoning step that derives a *claim* (3.1.10) from a list of claims (premises) under a specified context

Note 1 to entry: The claim derived by inference is the conclusion, and the supported claims from which the inference derives the conclusion are the premises.

Note 2 to entry: There are special inferences called obvious inferences. See 5.3.4 EXAMPLE 2.

3.1.17

property

attribute (3.1.8) of things

3.1.18

type

set of values, elements or items

3.1.19

undeveloped argument

placeholder argument to be replaced by a concrete argument

3.2 Terms related to system life cycles

3.2.1

approval authority

person (or persons) or *organization* (3.2.3) (or organizations), or both, responsible for approving activities, artefacts and other aspects of the *system* (3.2.8) during its life cycle

Note 1 to entry: The approval authority may include multiple entities, e.g. individuals or organizations. These can include different entities with either different levels of approval or different areas of interest, or both.

Note 2 to entry: In two-party situations, the approval authority often rests with the acquirer. In regulatory situations, the approval authority may be a third party such as a governmental organization or its agent. In other situations, for example, the purchase of off-the-shelf *products* (3.2.6) developed by a single-party, the independence of the approval authority can be a relevant issue to the acquirer.

3.2.2

design authority

person or *organization* (3.2.3) that is responsible for the design of the *product* (3.2.6)

3.2.3

organization

person or group of people that has its own functions with responsibilities, authorities, and relationships to achieve its objectives

EXAMPLE Company, corporation, firm, enterprise, manufacturer, institution, charity, sole trader, association, or parts or combination thereof.

[SOURCE: ISO/IEC/IEEE 15288:2023, 3.25]

3.2.4

process

set of interrelated or interacting activities that transforms inputs into outputs

[SOURCE: ISO/IEC/IEEE 15288:2023, 3.27]

3.2.5

process view

description of how a specified purpose and set of outcomes can be achieved by employing the activities and tasks of existing *processes* ([3.2.4](#))

[SOURCE: ISO/IEC/IEEE 24774:2021, 3.15]

3.2.6

product

output of an *organization* ([3.2.3](#)) that can be produced without any transaction taking place between the organization and the customer

Note 1 to entry: The dominant element of a product is that it is generally tangible.

[SOURCE: ISO 9000:2015, 3.7.6, modified — Notes 1 and 3 to entry have been removed.]

3.2.7

requirement

statement which translates or expresses a need and its associated constraints and *conditions* ([3.1.11](#))

Note 1 to entry: Requirements exist at different levels in the *system* ([3.2.8](#)) structure.

Note 2 to entry: A requirement is an expression of one or more particular needs in a very specific, precise and unambiguous manner.

Note 3 to entry: A requirement always relates to a system, software or service, or other item of interest.

[SOURCE: ISO/IEC/IEEE 29148:2018, 3.1.19]

3.2.8

system

arrangement of parts or elements that together exhibit a stated behaviour or meaning that the individual constituents do not

Note 1 to entry: A system is sometimes considered as a *product* ([3.2.6](#)) or as the services it provides.

Note 2 to entry: In practice, the interpretation of its meaning is frequently clarified by the use of an associative noun, e.g. aircraft system. Alternatively, the word "system" is substituted simply by a context-dependent synonym (e.g. aircraft), though this potentially obscures a system principles perspective.

Note 3 to entry: A complete system includes all of the associated equipment, facilities, material, computer programs, firmware, technical documentation, services and personnel required for operations and support to the degree necessary for self-sufficient use in its intended environment.

[SOURCE: ISO/IEC/IEEE 15288:2023, 3.46]