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Systems and software engineering — Life cycle profiles for very small entities (VSEs) —

Part 5-1-2: Software engineering guidelines for the generic Basic profile

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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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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.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

This first edition replaces the ISO/IEC TR 29110-5-1-2:2011, which has been technically revised.

The main changes are as follows:

— Many task statements have been reworded to facilitate their understanding.

— Conditional tasks have been added to develop optional work products (e.g. operation guide) that have been requested by a customer. This notation replaces the 'Optional' notation [e.g. *(optional)] used in the TR that caused ambiguities.

— Terms have been added to Clause 3 such that this document is self-contained.

— A few terms have been modified to align this document with the updated version of standards such as the ISO/IEC/IEEE 12207 and the ISO/IEC/IEEE 15289.

— Texts have been added for giving additional information intended to assist the understanding or use of the text of the document.

— Annex A has been added to describe a process, which can be added to the software Basic profile, to enable VSEs to support the software product which they developed.

— Annex B has been added to describe a set of tasks which can be added to the software Basic profile for VSEs with the aim to better support software testing.

— Annex C has been added to describe a set of tasks, which can be added to the software Basic profile, to enable VSEs to add accessibility tasks to the software implementation process.

— Annex D has been added to describe a set of tasks which can be added to the Basic profile to integrate security related tasks.

A list of all parts in the ISO/IEC 29110 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

0.1 Introduction to the ISO/IEC 29110 series

For the purpose of the ISO/IEC 29110 series, a very small entity VSE is an enterprise, organization (e.g. government agency, non-profit organization), department or project having up to 25 people. Many VSEs develop and/or maintain systems and the software components used in those systems, either as independent products or incorporated into the larger system. Due to this, a recognition of VSEs as suppliers of high-quality products is required.

VSEs around the world are creating valuable products and services. According to the World Bank, small and medium enterprises (SMEs) account for about 90 % of enterprises worldwide. According to the Organisation for Economic Co-operation and Development (OECD), SMEs represent 99 % of all businesses and generate about 60 % of employment. Almost one person out of three is employed in a micro firm with less than 10 employees. The European Union reports that micro firms, with fewer than 10 persons, account for 93,5 % of all enterprises and small firms, with 10 to 49 employees, account for 5,5 % of all enterprises. The challenge facing OECD governments is to provide a business environment that supports the competitiveness of this large heterogeneous business population and that promotes a vibrant entrepreneurial culture.

From studies and surveys conducted, it is clear that the majority of International Standards do not address the needs of VSEs. Implementation of and conformity with these standards is difficult, if not impossible.

Consequently, VSEs have no, or very limited, ways to be recognized as entities that produce quality systems/system elements including software in their domain. Therefore, VSEs are excluded from some economic activities.

It has been found that VSEs find it difficult to relate International Standards to their business needs and to justify the effort required to apply standards to their business practices. Most VSEs can neither afford the resources, in terms of number of employees, expertise, budget and time, nor do they see a net benefit in establishing over-complex systems or software life cycle processes. To address some of these difficulties, a set of guidelines has been developed based on a set of VSE characteristics. The guidelines are based on subsets of appropriate standards processes, activities, tasks, and outcomes, referred to as Profiles. The purpose of a profile is to define a subset of International Standards relevant to the VSEs' context; for example, processes, activities, tasks, and outcomes of ISO/IEC/IEEE 12207 for software; and processes, activities, tasks, and outcomes of ISO/IEC/IEEE 15288 for systems; and information products (documentation) of ISO/IEC/IEEE 15289 for software and systems.

VSEs can achieve recognition through implementing a profile and by being audited against ISO/IEC 29110 specifications.

The ISO/IEC 29110 series can be applied at any phase of system or software development within a life cycle. The ISO/IEC 29110 series is intended to be used by VSEs that do not have experience or expertise in adapting/tailoring ISO/IEC/IEEE 12207 or ISO/IEC/IEEE 15288 standards to the needs of a specific project. VSEs that have expertise in adapting/tailoring ISO/IEC/IEEE 12207 or ISO/IEC/IEEE 15288 are encouraged to use those standards instead of the ISO/IEC 29110 series.

The ISO/IEC 29110 series is intended to be used with any life cycle, such as waterfall, iterative, incremental, evolutionary or agile.

Systems, in the context of the ISO/IEC 29110 series, are typically composed of hardware and software components.

The ISO/IEC 29110 series, targeted by audience, has been developed to improve system or software and/or service quality, and process performance. Figure 1 describes the ISO/IEC 29110 series and positions the parts within the framework of reference.

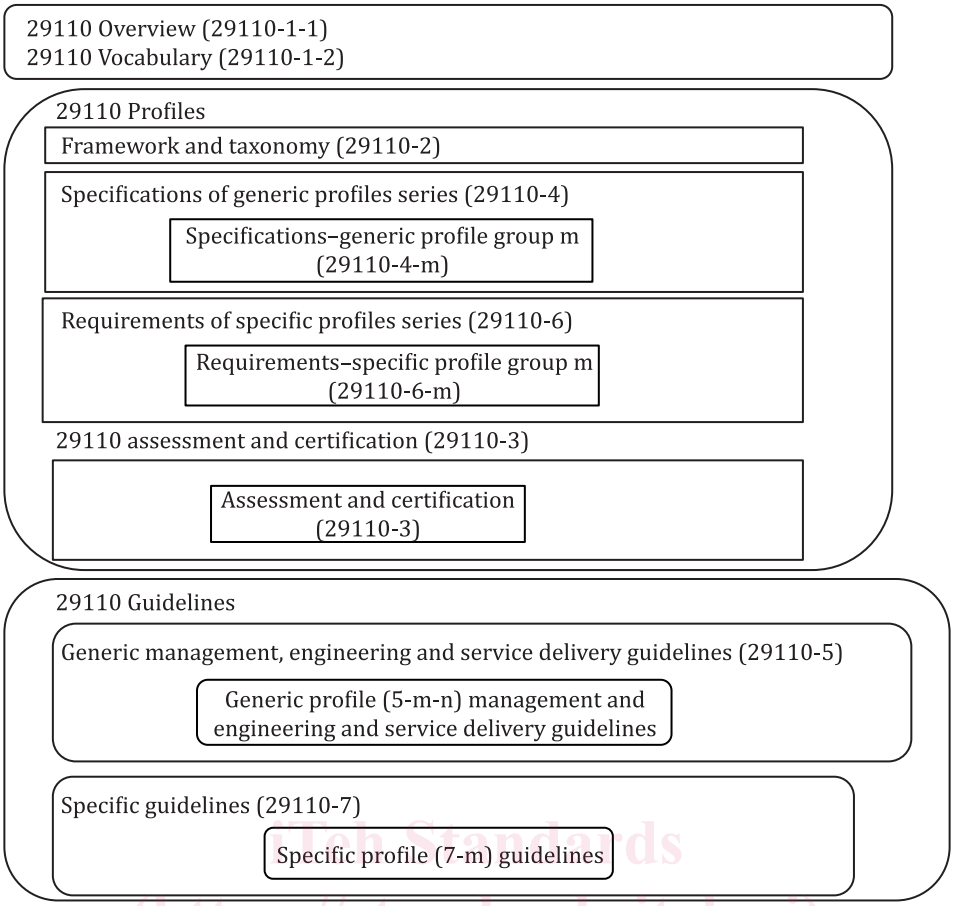

Figure 1 — The ISO/IEC 29110 series

ISO/IEC 29110-1-1 introduces processes, life cycle and standardization concepts, the taxonomy (catalogue) of ISO/IEC 29110 profiles and the ISO/IEC 29110 series. ISO/IEC 29110-1-1 also introduces the characteristics and needs of a VSE, and clarifies the rationale for specific profiles, documents, standards and guidelines. ISO/IEC 29110-1-2 defines the terms common to the ISO/IEC 29110 series. ISO/IEC 29110-1-1 and ISO/IEC 29110-1-2 are targeted at VSEs and their customers, assessors, standards producers, tool vendors and methodology vendors.

ISO/IEC 29110-2 introduces the concepts for systems and software engineering profiles for VSEs. It establishes the logic behind the definition and application of profiles. For standardized profiles, it specifies the elements common to all profiles (structure, requirements, conformity, and assessment). For domain-specific profiles (profiles that are not standardized and developed outside of the ISO process), it provides general guidance adapted from the definition of standardized profiles. ISO/IEC 29110-2 is targeted at profile producers, tool vendors and methodology vendors.

ISO/IEC 29110-3 defines certification schemes, assessment guidelines and compliance requirements for process capability assessment, conformity assessments, and self-assessments for process improvements. ISO/IEC 29110-3 also contains information that can be useful to developers of certification and assessment methods and developers of certification and assessment tools. ISO/IEC 29110-3 is addressed to people who have direct involvement with the assessment process, for example, the auditor, certification and accreditation bodies and the sponsor of the audit, who need guidance on ensuring that the requirements for performing an audit have been met. ISO/IEC 29110-3 is targeted at VSEs and their customers, assessors, accreditation bodies.

ISO/IEC 29110-4 provides the specifications for all generic profiles of the Generic profile group that are based on subsets of appropriate standards elements. ISO/IEC 29110-4 is targeted at VSEs, customers, standards producers, tool vendors and methodology vendors.

ISO/IEC TR 29110-5 provides a management, engineering and service delivery guidelines for profiles of the Generic profile group. ISO/IEC 29110-5 is targeted at VSEs and their customers.

ISO/IEC 29110-6 provides the specifications for Specific profiles that are based on subsets of appropriate standards elements. ISO/IEC 29110-6 is targeted at VSEs, customers, standards producers, tool vendors and methodology vendors.

ISO/IEC 29110-7 provides a guideline for each profile of the specific profile group. ISO/IEC 29110-7 is targeted at VSEs and their customers.

If a new profile is needed, ISO/IEC 29110-4, ISO/IEC 29110-6, ISO/IEC 29110-7 or ISO/IEC 29110-5, or all, can be developed with minimal impact to existing documents.

Since a VSE may be an enterprise, a project or a department of an organization, a customer of a VSE can be internal or external to the organization.

0.2 Introduction to this document

This document is the second software profile of a four-profile software engineering roadmap (i.e. Entry, Basic, Intermediate and Advanced).

This document is intended to be used by VSEs to support the software product which they developed.

This document is intended to be used by VSEs to add accessibility tasks to the software implementation process.

This document is intended to be used with any processes, techniques and methods that enhance the VSE's customer satisfaction and productivity.

The life cycle processes described in the ISO/IEC 29110 series are not intended to preclude or discourage their use by organizations larger than VSEs.

Using this document, a VSE can obtain the following benefits:

— an agreed set of project requirements and expected work products is delivered to the customer;

— a disciplined management process that provides project visibility and corrective actions of project problems and deviations is performed;

— a systematic software implementation process that satisfies customer needs and ensures quality work products is followed.

VSEs that develop systems that have software components are invited to use the systems engineering Basic profile guideline of the ISO/IEC 29110 series (i.e. ISO/IEC 29110-5-6-2).

In this document, Annex A describes a process, which can be added to the Basic profile, to enable a VSE to support the software product which they developed. Annex B adds a set of tasks, one role and several work products to the software Basic profile for a VSE with the aim to better support software testing. Annex C describes a set of additional tasks for a VSE that should add accessibility to a software product. Annex D integrates security-related tasks and work products in the Basic profile for software engineering. Annex E describes the deployment packages for the software Basic profile.

Conformity requirements for implementations of this document can be found in ISO/IEC 29110-4-1.

Systems and software engineering — Life cycle profiles for very small entities (VSEs) —

Part 5-1-2:
Software engineering guidelines for the generic Basic profile

1 Scope

This document provides management and engineering guidelines to the software Basic profile specified in ISO/IEC 29110-4-1 through project management and software implementation processes.

This document applies to VSEs that do not develop safety-critical software.

This document applies for software development projects, which can fulfil an external or internal agreement.

This document is applicable to VSEs developing a single product by a single work team.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC 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/

3.1
acceptance testing
testing (3.47) conducted to determine whether a system satisfies its acceptance criteria and to enable the *customer* (3.10) to determine whether to accept the system

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.34]

3.2
accessibility
extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use

3.3
activity
set of cohesive *tasks* (3.41) of a *process* (3.18)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.3]

3.4
adaptive strategies
techniques that people with disabilities use to improve interaction with the web

EXAMPLE Increasing the font size in a common browser.

[SOURCE: W3C Web Accessibility Initiative – Planning and Policies – Involving Users]

3.5
agreement
mutual acknowledgement of terms and conditions under which a working relationship is conducted

EXAMPLE Contract, memorandum of agreement.

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.5]

3.6
assistive technology
equipment, product system, hardware, software or service that is used to increase, maintain or improve capabilities of individuals

Note 1 to entry: Assistive technology is an umbrella term that is broader than assistive products.

Note 2 to entry: Assistive technology can include assistive services, and professional services needed for assessment, recommendation and provision.

[SOURCE: ISO/IEC GUIDE 71:2014, 2.16]

3.7
baseline
formally approved version of a configuration item, regardless of media, formally designated and fixed at a specific time during the configuration item's life cycle

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.11]

3.8
Basic profile
profile (3.21) targeted at *VSEs* (3.52) developing a single product by a single work team

[SOURCE: ISO/IEC 29110-1-2:2024, 4.14]

3.9
conditional task
task (3.37) that can be mandatory under some specified condition(s), can be optional under other specified conditions, and can be out of scope or not applicable under other specified conditions

Note 1 to entry: These are to be observed if the specified condition(s) apply.

3.10
customer
person or organization that could or does receive a product or a service that is intended for or required by this person or organization

EXAMPLE Consumer, client, end-user, retailer, receiver of product or service from an internal *process* (3.18), beneficiary and purchaser.

Note 1 to entry: A customer can be internal or external to the organization.

[SOURCE: ISO 9000:2015, 3.2.4]

3.11
defect
imperfection or deficiency in a *work product* (3.53) where that work product does not meet its *requirements* (3.26) or specifications and needs to be either repaired or replaced

[SOURCE: IEEE 1044:2009]

3.12
deployment package
DP
set of artefacts developed to facilitate the implementation of a set of practices, of the selected framework, in a *very small entity* (3.52)

[SOURCE: ISO/IEC 29110-1-2:2024, 3.35]

3.13
expected result
observable predicted behaviour of the *test item* (3.43) under specified conditions based on its specification or another source

[SOURCE: ISO/IEC/IEEE 29119-1:2022, 3.35]

3.14
generic profile group
profile (3.21) group applicable to *VSEs (very small entities)* (3.52) that do not develop safety-critical systems or *software products* (3.32) and have typical situational factors

[SOURCE: ISO/IEC 29110-1-2:2024, 4.28]

3.15
incident
unplanned interruption to a service, a reduction in the quality of a service or an event that has not yet impacted the service to the *customer* (3.10) or user

[SOURCE: ISO/IEC 20000-10:2018, 3.2.5]

3.16
integration testing
testing (3.47) in which software components, hardware components, or both are combined and tested to evaluate the interaction among them

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.2034, modified — Note 1 to entry has been removed.]

3.17
persona
representation of a type of user that includes a concise summary of the characteristics and the behaviour of the user that is most informative to the design or illustrative of specific user *requirements* (3.26)

[SOURCE: ISO/IEC 25063:2014, modified — Note 1 to entry has been removed.]

3.18
process
set of interrelated or interacting *activities* (3.3) that transforms inputs into outputs

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.33]

3.19
process purpose
high-level objective of performing the *process* (3.18) and the likely outcomes of effective implementation of the process

[SOURCE: ISO/IEC/IEEE 24774:2021, 3.12]

3.20
process outcome
observable result of the successful achievement of the *process* (3.18)

[SOURCE: ISO/IEC/IEEE 24774:2021, 3.11]

3.21
profile
subset of appropriate standards' *processes* (3.18) and their outcomes, *activities* (3.3) and *tasks* (3.37) combined to accomplish a particular function

Note 1 to entry: The base standards used to develop profiles for *VSEs* (3.52) are the ISO/IEC/IEEE 12207, the ISO/IEC/IEEE 15288 and the ISO/IEC/IEEE 15289

[SOURCE: ISO/IEC 29110-1-2:2024, 3.70]

3.22
project
endeavour with defined start and finish dates undertaken to create a product or service in accordance with specified resources and *requirements* (3.26)

Note 1 to entry: A project is sometimes viewed as a unique *process* (3.18) comprising coordinated and controlled *activities* (3.3) and composed of activities from the technical management processes and technical processes defined in this document.

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.37]

3.23
report
information item that describes the results of *activities* (3.3) such as investigations, observations, assessments, or tests

[SOURCE: ISO/IEC/IEEE 15289:2019, 3.1.22]

3.24
review
process (3.18) or meeting during which a *work product* (3.53), or set of work products, is presented to *project* (3.22) personnel, managers, users, *customers* (3.10), or other interested parties for comment or approval

[SOURCE: ISO/IEC 29110-1-2:2024, 4.51]

3.25
risk
effect of uncertainty on objectives

Note 1 to entry: An effect is a deviation from the expected — positive and/or negative.

Note 2 to entry: Objectives can have different aspects (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, *project* (3.22), product and *process* (3.18)).

Note 3 to entry: Risk is often characterized by reference to potential events and consequences, or a combination of these.

Note 4 to entry: Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence.

Note 5 to entry: Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood.

[SOURCE: ISO 31073:2022, 3.1.1]

3.26
requirement
statement that translates or expresses a need and its associated constraints and conditions

Note 1 to entry: A constraint is externally imposed limitation on the software, its design, or implementation or on the *process* (3.18) used to develop or modify a software.

Note 2 to entry: A condition is a measurable qualitative or quantitative attribute that is stipulated for a requirement and that indicates a circumstance or event under which a requirement applies.

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.44, modified — Notes to entry have been added.]

3.27
safety-critical software
software whose failure or malfunction can result in death or serious injury to people, loss of or severe damage to equipment or property, or damage to the natural environment

3.28
security
protection against intentional subversion or forced failure, containing a composite of four attributes: confidentiality, integrity, availability, and accountability, plus aspects of a fifth, usability, all of which have the related issue of their assurance

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.49]

3.29
security control
safeguard or countermeasure prescribed for an information system or an organization, designed to protect the confidentiality, integrity, and availability of its information and to meet a set of defined *security* (3.28) *requirements* (3.26)

[SOURCE: IEEE 7002:2022, 3, IEEE dictionary]

3.30
service level agreement
SLA
documented *agreement* (3.5) between the organization and the *customer* (3.10) that identifies services and their agreed performance

Note 1 to entry: A service level agreement can also be established between the organization and an external supplier, an internal supplier or a customer acting as supplier.

Note 2 to entry: A service level agreement can be included in a contract or another type of documented agreement.

[SOURCE: ISO/IEC 20000-10:2018, 3.2.20]

3.31
small and medium enterprise
SME
enterprise with less than 250 persons employed

[SOURCE: ISO/IEC 29110-1-2:2024, 3.92]

3.32
software product
set of computer programs, procedures, and possibly associated documentation and data

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.54, modified — Note 1 to entry has been removed.]

3.33
software support
continued provision of services and material necessary for the use and improvement of an implemented system

3.34
stakeholder
individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.59, modified — EXAMPLE and note 1 to entry have been removed.]

3.35
system testing
testing (3.47) conducted on a complete, integrated system to evaluate the system's compliance with its specified *requirements* (3.26)

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.4122]

3.36
support manager
role responsible for production support in the *VSE* (3.52) who oversees *customer* (3.10) relationships and change management within production environments

3.37
task
required, recommended, or permissible action, intended to contribute to the achievement of one or more outcomes of a *process* (3.18)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.66]

3.38
test condition
testable aspect of a component or system, such as a function, transaction, feature, quality attribute, or structural element identified as a basis for *testing* (3.47)

[SOURCE: ISO/IEC/IEEE 29119-1:2022, 3.88, modified — Note 1 to entry has been removed.]

3.39
test data
data created or selected to satisfy the input *requirements* (3.26) for executing one or more test cases

Note 1 to entry: Test data can be stored within the *test item* (3.43) (e.g. in arrays or flat files), or can come from external sources, such as other systems, hardware devices, or human operators.

[SOURCE: ISO/IEC/IEEE 29119-1:2022, 3.91]

3.40
test design technique
test technique
procedure used to create or select a test model, identify test coverage items, and derive corresponding test cases

EXAMPLE Equivalence partitioning, boundary value analysis, decision table *testing* (3.47), branch testing.

Note 1 to entry: The test design technique is typically used to achieve a required level of test coverage.

Note 2 to entry: Some test practices, such as exploratory testing or model-based testing are sometimes referred to as "test techniques". Following the definition in the ISO/IEC/IEEE 29119 series, they are not test design techniques as they are not themselves providing a way to create test cases, but instead use test design techniques to achieve that.

[SOURCE: ISO/IEC/IEEE 29119-1:2022, 3.94]

3.41
test environment
environment containing facilities, hardware, software, firmware, procedures, needed to conduct a test

Note 1 to entry: A test environment can contain multiple environments to accommodate specific test level or test types (e.g. a unit test environment, a performance test environment).