International Standard

ISO/IEC 29110-5-1-1

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

Part 5-1-1:
Software engineering guidelines for the generic Entry 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 cancels and replaces ISO/IEC TR 29110-5-1-1:2012, which has been technically revised.

The main changes are as follows:

— Many task statements have been reworded to facilitate their understanding. Some task statements are deleted to make this Entry profile light-weighted and suitable for streamlining to the Basic profile.

— Conditional tasks have been added to develop optional work products (e.g. change requests) that have been requested by a customer. This notation replaces the 'Optional' notation [e.g. *(optional) used in the first edition 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 ISO/IEC/IEEE 12207 and ISO/IEC/IEEE 15289.

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

A list of all parts in the ISO/IEC 29110 series can be found on the ISO website.

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 a number of employees, expertise, budget and time, nor do they see a net benefit in establishing over-complex 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.
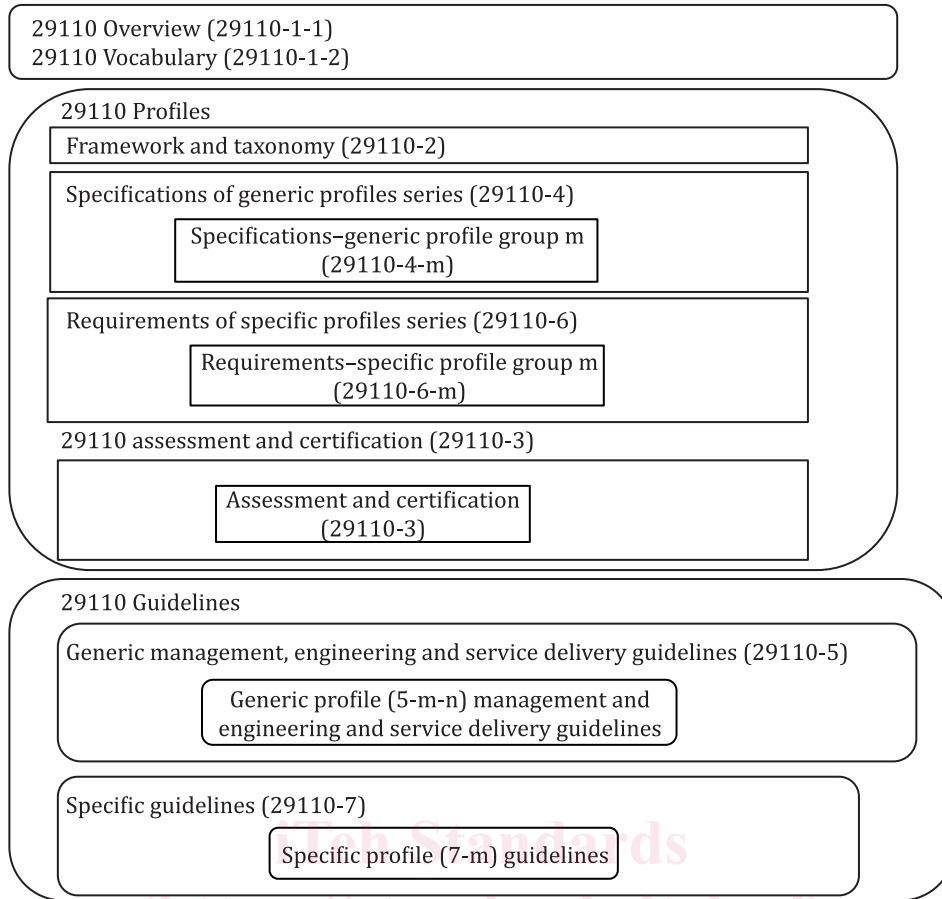
Figure 1 — The ISO/IEC 29110 series

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 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 first software profile of a four-profile software engineering roadmap (i.e. Entry, Basic, Intermediate and Advanced).

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.

For a start-up VSE that does not have customers yet, anybody who acts on behalf of customers can play the role of the customer.

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 Entry profile guidelines of the ISO/IEC 29110 series (i.e. ISO/IEC 29110-5-6-1).

In this document, Annex A describes the deployment packages for the software Entry 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 5-1-1:
Software engineering guidelines for the generic Entry profile

1 Scope

This document provides the management and engineering guidelines to the software Entry 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 applies to start-up VSEs (e.g. VSEs that started their operation less than three years ago) and/or VSEs working on small projects (e.g. projects with a size of less than six person-months).

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
agreement
mutual acknowledgment 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]

3.2
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]

3.3
defect
imperfection or deficiency in a *work product* (3.14) where that work product does not meet its *requirements* (3.8) or specifications and needs to be either repaired or replaced

[SOURCE: IEEE 1044:2009]

3.4
Entry profile
profile (3.5) targeted at start-up VSEs (i.e. VSEs who started their operation fewer than three years ago) and/or at VSEs working on a single small *project* (3.6) (e.g. project size of less than 6 person-months)

[SOURCE: ISO/IEC 29110-1-2:2024, 3.40]

3.5
profile
subset of appropriate standards' processes and their outcomes, activities and tasks combined to accomplish a particular function

Note 1 to entry: The base standards used to develop profiles for VSEs are ISO/IEC/IEEE 12207, ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 15289.

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

3.6
project
endeavour with defined start and finish dates undertaken to create a product or service in accordance with specified resources and *requirements* (3.8)

Note 1 to entry: A project is sometimes viewed as a unique process comprising coordinated and controlled activities 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]

3.7
report
information item that describes the results of activities such as investigations, observations, assessments, or tests

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

3.8
requirement
statement that translates or expresses a need and its associated constraints and conditions

Note 1 to entry: A constraint is an externally imposed limitation on the software, its design, or implementation or on the process 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.]

3.9
small and medium enterprise
SME
enterprise with less than 250 persons employed

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

3.10
software product
set of computer programs, procedures, and possibly associated documentation and data

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.45, modified — Note 1 to entry has been removed.]

3.11
task

requirement (3.8), recommendation, or permissible action intended to contribute to the achievement of one or more outcomes of a process

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

3.12
validation

confirmation, through the provision of objective evidence, that the *requirements* (3.8) for a specific intended use or application have been fulfilled

Note 1 to entry: A system is able to accomplish its intended use, goals, and objectives (i.e. meet stakeholder requirements) in the intended operational environment. The right system was built.

Note 2 to entry: In a life cycle context, validation involves the set of activities for gaining confidence that a system is able to accomplish its intended use, goals, and objectives in an environment like the operational environment.

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.71]

3.13
verification

confirmation, through the provision of objective evidence, that specified *requirements* (3.8) have been fulfilled

Note 1 to entry: Verification is a set of activities that compares a system or system element against the required characteristics. This includes, but is not limited to specified requirements, design, descriptions, and the system itself. The system was built right.

[SOURCE: ISO 9000:2015, 3.8.12, modified — Notes 1 to 3 to entry have been replaced by a new note 1 to entry.]

3.14
work product
artefact produced by a process

EXAMPLE   *Project* (3.6) plan, *requirements* (3.8) specification, design documentation, source code, test plan, test meeting minutes, schedules, budgets, and incident *reports* (3.7).

Note 1 to entry: A subset of the work products can be baselined to be used as the basis of further work, and some will form the set of project deliverables.

[SOURCE: ISO/IEC 20246:2017, 3.20]

4   Naming, diagramming and definitions conventions

4.1   General

Conventions for naming, diagramming, describing, and defining profiles are defined in ISO/IEC 29110-2-1:2015.

4.2   Naming, diagramming and definition conventions

The following process structure description and notation are used to describe the processes.

Process name – process identifier, followed by its abbreviation in parenthesis "( )".

Process purpose – high-level objective of performing the process and the likely outcomes of effective implementation of the process.

Process outcomes – observable result of the successful achievement of the process purpose. Outcomes are identified by the abbreviation of the process name, followed by the letter "O" and a consecutive number, for example, PM.O1, SI.O2.

Input work products – Work products that can be used to perform the process and its corresponding source, which can be another process or an external entity to the project, such as the customer. They are identified by the abbreviation of the process name.

Output work products – Work products generated by the process and its corresponding destination, which can be another process or an external entity to the project, such as customer. They are identified by the abbreviation of the process name.

All work products' names are initiated with capital letters. Some work products have one or more statuses attached to the work product name surrounded by square brackets "[ ]" and separated by ",". The work product state may change during the process execution. See Clause 9 for the alphabetical list of the work products, its descriptions, possible states, and the source of the work product. The source can be another process or an external entity to the project, such as the customer.

Roles involved – Names and abbreviations of the functions to be performed by project team members. Several roles may be played by a single person and one role may be assumed by several persons. Roles are assigned to project participants based on the characteristics of the project. The role list is identified by the abbreviation of the process name and shown as a two-column table. See Clause 8 for the alphabetical list of the roles and the description of the required competencies.

Diagram – Graphical representation of the processes. The large round-edged rectangles indicate processes or activities, and the smaller square-edged rectangles indicate the work products. The directional or bidirectional thick arrows indicate the major flow of information between processes or activities. The thin directional or bidirectional arrows indicate the input or output work products. The notation used in the diagrams does not imply the use of any specific process life cycle.

Activity – A set of cohesive tasks of a process. The task statements in this document are not imperative. A process activity is the first level of process workflow decomposition and the second one is a task. Activities are identified by process name abbreviation followed by consecutive number and the activity name.

Activity description – Each activity description is identified by the activity name and the list of related outcomes surrounded by parenthesis "( )". For example, PM.01 project planning (PM.01, PM.05, PM.06, PM.07) means that the activity PM.01 project planning contributes to the achievement of the listed outcomes: PM.01, PM.05, PM.06, and PM.07.

Task description – Each task description begins with an active verb (e.g. assign, test) and is followed by an object (e.g. review the project plan). To facilitate their implementation, a few tasks are broken down into elementary tasks. The task description doesn't impose any technique or method to perform it. The selection of the techniques or methods is left to the VSE or project team.

Task description tables contain four columns corresponding to:

— Role - the abbreviation of roles involved in the task execution.

— Task - description of the task to be performed. Each task is identified by activity ID and consecutive number, for example, PM.01.01, PM.01.02. A few numbered items are added to provide additional information intended to assist the understanding or use of tasks.

— Input work products – work products needed to execute a task.

— Output work products – work products created or modified by the execution of a task.

NOTE 1   A conditional task is executed if its associated work product (e.g. software user documentation) is required by the customer and listed in the delivery instructions. The conditional task statement is followed with this text: "Conditional task".

Incorporation to project repository – list of work products to be saved in a project repository. A few work products (e.g. requirements) are baselined, a change to a baselined work product can be done through an approved change request.

NOTE 2   Tables used in process description are for presentation purpose only.