INTERNATIONAL STANDARD

ISO/IEC 29110-2-1

First edition
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Software Engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 2-1:
Framework and taxonomy

Ingénierie du logiciel — Profil de cycle de vie pour très petits organismes (TPO) —

Partie 2-1: Cadre général et taxinomie

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

This second edition cancels and replaces the first edition (ISO/IEC 29110-2:2011), which has been technically revised.

The full list of parts of ISO/IEC 29110 is available here.

Introduction

Very Small Entities (VSEs) around the world are creating valuable products and services. For the purpose of this part of ISO/IEC 29110, a Very Small Entity (VSE) is an enterprise, an organization, a department, or a project having up to 25 people. Since many VSEs develop and/or maintain system and software components used in systems, either as independent products or incorporated in larger systems, a recognition of VSEs as suppliers of high quality products is required.

According to the Organization for Economic Co-operation and Development (OECD) SME and Entrepreneurship Outlook report (2005), "Small and Medium Enterprises (SMEs) constitute the dominant form of business organization in all countries world-wide, accounting for over 95 % and up to 99 % of the business population depending on country". The challenge facing governments and economies 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 conformance 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 lifecycle processes. To address some of these difficulties, a set of guides has been developed based on a set of VSE characteristics. The guides 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 of International Standards and Technical Reports can be applied at any phase of system or software development within a lifecycle. This series of International Standards and Technical Reports 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 ISO/IEC 29110.

ISO/IEC 29110 is intended to be used with any lifecycle such as: waterfall, iterative, incremental, evolutionary, or agile.

The ISO/IEC 29110 series, targeted by audience, has been developed to improve system or software and/or service quality, and process performance (see Table 1).

Table 1 — ISO/IEC 29110 target audience

ISO/IEC 29110	Title	Target audience
Part 1	Overview	VSEs and their customers, assessors, standards producers, tool vendors, and methodology vendors.
Part 2	Framework	Profile producers, tool vendors, and methodology vendors. Not intended for VSEs.
Part 3	Assessment guide	VSEs and their customers, assessors, accreditation bodies.
Part 4	Profile specifications	VSEs, customers, standards producers, tool vendors, and methodology vendors.
Part 5	Management and engineering guide	VSEs and their customers.

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

ISO/IEC TR 29110-1 defines the terms common to the ISO/IEC 29110 series. It introduces processes, lifecycle, and standardization concepts, the taxonomy (catalogue) of ISO/IEC 29110 profiles, and the ISO/IEC 29110 series. It also introduces the characteristics and needs of a VSE, and clarifies the rationale for specific profiles, documents, standards, and guides.

ISO/IEC TR 29110-3 defines certification schemes, assessment guidelines, and compliance requirements for process capability assessment (ISO/IEC 33xxx), conformity assessments (ISO/IEC 17xxx), and self-assessments for process improvements. ISO/IEC TR 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, e.g. 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 29110-4-m provides the specification for all profiles in one profile group that are based on subsets of appropriate standards elements.

ISO/IEC TR 29110-5-m-n provides a management and engineering guide for each profile in one profile group.

ISO/IEC TR 29110-6-x provides management and engineering guides not tied to a specific profile.

This part of ISO/IEC 29110 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, conformance, 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.

Figure 1 describes the International Standards (IS) and Technical Reports (TR) of ISO/IEC 29110 and positions the parts within the framework of reference. Overview, assessment guide, management, and engineering guide are available from ISO as freely available Technical Reports (TR). The Framework document, profile specifications and certification schemes are published as International Standards (IS).
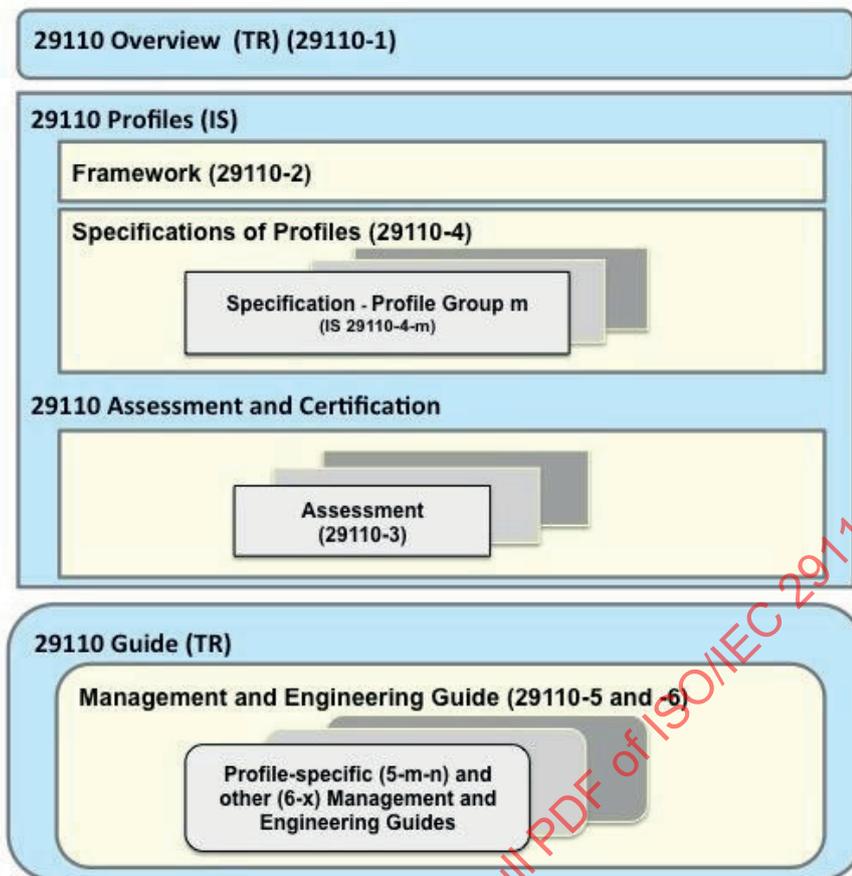
Figure 1 — ISO/IEC 29110 Series

Software Engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 2-1:
Framework and taxonomy

1 Scope

1.1 Fields of application

ISO/IEC 29110 is applicable to Very Small Entities (VSEs). The lifecycle processes described in ISO/IEC 29110 are not intended to preclude or discourage their use by organizations bigger than VSEs. However, certain issues faced by large organizations might not be covered by ISO/IEC 29110.

The lifecycle processes defined in ISO/IEC 29110 can be used by VSEs when acquiring and using, as well as when creating and supplying, a software, and systems. They can be applied at any level in a software and systems structure and at any stage in the lifecycle. The processes described in ISO/IEC 29110 are not intended to preclude or discourage the use of additional processes that VSEs find useful.

This part of ISO/IEC 29110 introduces the major concepts for software and systems engineering profiles for VSEs, and defines the terms common to the set of documents associated with VSE profiles.

It establishes the logic behind the definition and application of profiles. It specifies the elements common to all standardized profiles (structure, conformance, assessment).

This part of ISO/IEC 29110 is applicable to all profiles.

1.2 Target audience

This part of ISO/IEC 29110 is targeted at authors and reviewers of standardized profiles, authors of other parts, and authors of other VSE profiles.

2 Conformance to standardized profiles

2.1 Overview

Conformance is specified within each profile specification document, published as ISO/IEC 29110-4-6[1)] for systems engineering and ISO/IEC 29110-4-1 for software engineering. The general rules for conformance to ISO/IEC 29110 profiles are in accordance with ISO/IEC TR 10000-1 and outlined in 2.2 and 2.3.

2.2 General principles

2.2.1 Tailoring and exclusions

ISO/IEC 29110 standardized profiles are pre-tailored packages of related software and systems engineering standards, therefore

— tailoring of ISO/IEC 29110 profiles is not needed nor allowed (except in one case outlined in 2.3.2),

— partial compliance is not allowed (except in one case outlined in 2.2.3), and

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1) To be published.

— there are no levels of conformance.

2.2.2 Extensions

It is acceptable for an implementation to incorporate elements beyond what is defined in the specification of the profile.

If a profile allows extensions, each implementation shall fully support all required elements of the profile specification exactly as specified, and the extensions shall be consistent with, and permit conformance with, elements defined in the profile specification. The conformance clause of profiles that allow extensions should include some additional, more specific, requirements, such as the following.

— Extensions shall not re-define semantics for existing elements.

— Extensions shall not cause standard-conforming implementations (i.e. processes that do not use the extensions) to be performed incorrectly.

— Extensions shall follow the principles and guidelines of the specification they extend, i.e. the specifications must be extended in a standard manner (see section below).

— For implementations and/or applications that contain extensions, extensions shall be clearly described in supporting documentation and the extensions shall be marked as such within the implementation/application.

— For implementations that contain extensions, there shall be a mode under which the implementation can be directed to produce only conformant files (documents) or to operate in a strictly conformant manner.

2.2.3 Conformance to base standards

The purpose of a standardized profile is to specify the use of sets of specifications to provide clearly defined functionality. Hence, conformance to ISO/IEC 29110 standardized profile specifications always implies conformance to the referenced base standards' specifications, if it is referenced in totality in the profile.

However, if only part of the base standard is referenced in the profile, the above statement is true inasmuch as the base standard conformance clause allows for tailored and partial compliance.

The conformance requirements of an ISO/IEC 29110 standardized profile shall relate to the conformance requirements in the base standards in the following ways.

a) Unconditional mandatory requirements in the base standards shall remain mandatory in the ISO/IEC 29110 profile.

b) Unconditional options in base standards may remain optional or may be changed within the profile to become:

   1) mandatory;

   2) conditional, giving rise to different statuses dependent upon some appropriate condition;

   3) out of scope, if the option is not relevant to the scope of the profile; for example, functional elements which are unused in the context of the profile;

   4) prohibited, if the use of the option is to be regarded as non-conformant behaviour within the context of the profile. This choice should only be used when really necessary, "out of scope" can often be more appropriate.

c) If the conditions in the conditional requirements in the base standards can be fully evaluated in the context of the profile, then these requirements become unconditional mandatory requirements or

unconditional options, or they become out of scope or prohibited. Otherwise, the conditions remain conditional, with the appropriate, possibly partially, evaluated conditions.

2.3 Conformance requirements for standardized profiles

2.3.1 Conformance situations

Conformance can be interpreted differently for various situations. The relevant situation shall be identified in the claim of conformance.

ISO/IEC 29110 profiles can be implemented by organizations or projects implementing and using the processes and products prescribed by the profile.

NOTE   The case where another ISO document, such as a Guide or Technical Report, complies with the profile specification is not considered implementation conformance and subject to conformance clauses. For instance, ISO/IEC TR 29110-5 guides comply with ISO/IEC 29110-4 profile specifications, and this is evidenced by a normative reference to ISO/IEC 29110-4 in ISO/IEC TR 29110-5, not by a conformance clause.

2.3.2 Conformance to a standardized profile

A product that claims conformance to an ISO/IEC 29110 standardized profile shall implement all the mandatory profile elements as identified in the profile specification ISO/IEC 29110-4-m, and the associated properties and requirements as described in the base standards when applicable. Conformance is achieved by demonstrating that the conforming product does not exclude, modify, or contradict any of the mandatory profile elements.

An organization that claims conformance to an ISO/IEC 29110 profile shall identify which profile it is claiming conformance to, and implement and use all the mandatory profile requirements as identified in the profile specific clauses of the profile specification ISO/IEC 29110-4-m, and the associated properties and requirements as described in the base standards when applicable. Conformance is achieved by demonstrating that:

— mandatory requirements for the lifecycle processes have been satisfied using the required input and output products as evidence;

— mandatory requirements for the lifecycle products (information items) and content (information item content) have been satisfied using the content of conformant work products as evidence.

Unless otherwise noted in the standardized profile conformance clause, conformance to the profile implies conformance to the base standards.

NOTE   Information items are described as if it were published as a separate document. However, information items and their content will be considered as conforming if they are unpublished but available in a repository for reference, divided into separate documents or volumes, or combined with other information items into one document.

If a profile contains conditional mandatory requirements, then these requirements shall be grouped in a separately identifiable subclause, and the conformance clause in the profile specification ISO/IEC 29110-4-m shall identify what condition need to be met, and the specific subclause where there requirements are.

2.3.3 Limited conformance to the base standards included in the standardized profile

If an organization or a product cannot claim conformance to the profile, it can still claim conformance to the elements of the base standard included in the profile under the following conditions.

a) The base standard is not totally included in the profile (if it is totally included, then the implementation should claim conformance to the base standards).

b) The base standard's conformance clause allows for partial conformance and/or tailored conformance.

In that case, the conformance clause shall refer only to the mandatory profile elements as identified in the profile specification ISO/IEC 29110-4-m that refer to the base standards in question, and are identified as mandatory (normative) in the base standards.

3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC TR 10000-1:1998, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: General principles and documentation framework*

4 Terms and definitions

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

4.1
activity
set of cohesive tasks of a process

[SOURCE: ISO/IEC/IEEE 12207]

4.2
acquirer
stakeholder that acquires or procures a product or service from a supplier

Note 1 to entry: Other terms commonly used for an acquirer are buyer, customer, owner, or purchaser.

[SOURCE: ISO/IEC/IEEE 15288:2015]

4.3
advanced profile
profile targeted at VSEs which want to sustain and grow as an independent competitive system and/or software development business

4.4
agreement
mutual acknowledgement of terms and conditions under which a working relationship is conducted

EXAMPLE   Contract, memorandum of agreement.

[SOURCE: ISO/IEC/IEEE 12207]

4.5
assessment indicator
sources of objective evidence used to support the assessors' judgment in rating process attributes

EXAMPLE   Work products, practice, or resource.

[SOURCE: ISO/IEC 33001]

4.6
assessor
individual who participates in the rating of process attributes

[SOURCE: ISO/IEC 33001]

4.7
audit
systematic, independent, documented process for obtaining records, statements of fact, or other relevant information and assessing them objectively to determine the extent to which specified requirements are fulfilled

Note 1 to entry: While "audit" applies to management systems, "assessment" applies to conformity assessment bodies as well as more generally

[SOURCE: ISO/IEC 17000]

4.8
auditee
organization being audited

[SOURCE: ISO 9000]

4.9
auditor
person who conducts an audit

[SOURCE: ISO 19011]

4.10
audit team
one or more *auditors* (4.9) conducting an *audit* (4.7), supported if needed by technical experts

Note 1 to entry: One auditor of the audit team is appointed as the audit team leader.

Note 2 to entry: The audit team may include auditors-in-training.

[SOURCE: ISO 9000]

4.11
autonomy-based improvement
motivated professional *process improvement* (4.40) with understanding work (process) objectives, technology status quo, and outcomes from product use, not forced by anybody

4.12
baseline
specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be changed only through formal change control procedures

[SOURCE: IEEE 828-2012]

4.13
base standard
approved International Standard or Telecommunication Standardization Sector of the International Telecommunications Union (ITU-T) Recommendation

[SOURCE: ISO/IEC TR 10000-1]

4.14
basic profile
profile targeted at VSEs developing a single application by a single work team

4.15
certification
third-party attestation related to products, processes, systems, or persons

Note 1 to entry: Certification of a management system is sometimes also called registration.

Note 2 to entry: Certification is applicable to all objects of conformity assessment except for conformity assessment bodies themselves, to which accreditation is applicable.

[SOURCE: ISO/IEC 17000]

4.16
certification body
third-party *conformity assessment* (4.21) body operating certification schemes

Note 1 to entry: A certification body can be non-governmental or governmental (with or without regulatory authority).

[SOURCE: ISO/IEC 17065]

4.17
certification scheme
certification system related to specified products, to which the same specified requirements, specific rules, and procedures apply

Note 1 to entry: Adapted from ISO/IEC 17000:2004, 2.8.

Note 2 to entry: For definition of "certification system", refer to ISO/IEC 17000:2004, 2.7.

Note 3 to entry: The criteria for the rules, procedures, and management for implementing product, process, and service.

[SOURCE: ISO/IEC 17065]

4.18
certification scheme owner
person or organization that is responsible for developing and maintaining a specific *certification scheme* (4.17)

Note 1 to entry: The certification scheme owner can be the *certification body* (4.16) itself, a governmental authority, trade association, group of certification bodies, or other.

[SOURCE: ISO/IEC 17065]

4.19
client (for certification)
organization that is responsible to a *certification body* (4.16) for ensuring certification requirements, including product requirements are fulfilled

[SOURCE: ISO/IEC 17065]

4.20
competent assessor
assessor (4.6) who has demonstrated the competencies to conduct an assessment and to monitor and verify the conformance of a *process assessment* (4.36)

[SOURCE: ISO/IEC 33000]

4.21
conformity assessment
demonstration that specified requirements relating to a product, process, system, person or body are fulfilled

[SOURCE: ISO/IEC 17000:2004]

4.22
critical system
system having the potential for serious impact on the users or environment, due to factors including safety, performance, and security

4.23
customer
organization or person that receives a product or service

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

[SOURCE: ISO 9000:2005, modified – added 'service']

4.24
deployment package
set of artefacts developed to facilitate the implementation of a set of practices, of the selected framework, in a *very small entity* (4.71)

4.25
disposed system
system that has been transformed (i.e. state change) by applying the disposal process

Note 1 to entry: A systems approach considers the total system and the total *lifecycle* (4.32) of the system. This includes all aspects of the system and the system throughout its life until the day users dispose of the system and the external enterprises complete the handling of the disposed system products.

[SOURCE: ISO/IEC/IEEE 15288, modified]

4.26
entity
registered organization, group within a registered organization, or a project within an organization

4.27
entry profile
profile targeted at start-up VSEs (i.e. VSEs who started their operation less than 3 years) and/or at VSEs working on small project (e.g. project size of less than 6 person-months)

4.28
generic profile group
profile group applicable to VSEs (very small entities) that do not develop *critical systems* (4.22) or software products and have typical situational factors

4.29
guide
document published by ISO or IEC giving rules, orientation, advice, or recommendations relating to international standardization

[SOURCE: ISO/IEC Directives, Part 2]

4.30
intermediate profile
profile targeted at VSEs involved in the development of more than one project in parallel with more than one work team

4.31
international standard
standard that is adopted by an international standardizing/standards organization and made available to the public

[SOURCE: ISO/IEC Directives, Part 2]

4.32
lifecycle
evolution of a system, product, service, project or other human-made entity from conception through retirement

[SOURCE: ISO/IEC/IEEE 12207]

4.33
operator
entity ([4.26](#)) that performs the operations of a system

Note 1 to entry: The role of operator and the role of user can be vested, simultaneously, or sequentially, in the same individual or organization.

Note 2 to entry: An individual operator combined with knowledge, skills, and procedures can be considered as an element of the system.

Note 3 to entry: In the context of this specific definition, the term entity means an individual or an organization.

[SOURCE: ISO/IEC/IEEE 12207]

4.34
organization
person or a group of people and facilities with an arrangement of responsibilities, authorities, and relationships

[SOURCE: ISO 9000:2005, modified]

4.35
process
set of interrelated or interacting activities which transforms inputs into outputs

EXAMPLE   Welding engineering processes; heat treatment processes; manufacturing processes requiring confirmation of process capability (e.g. operating or producing product within specified tolerances); food production processes; plant growth processes.

[SOURCE: ISO 9000:2005]

4.36
process assessment
disciplined evaluation of an organizational unit's processes against a *process assessment model* ([4.37](#))

[SOURCE: ISO/IEC 33001]

4.37
process assessment model
model suitable for the purpose of assessing *process capability* ([4.38](#)), based on one or more *process reference models* ([4.43](#))

[SOURCE: ISO/IEC 33001]

4.38
process capability
characterization of the ability of a process to meet current or projected business goals

[SOURCE: ISO/IEC 33000]

4.39
process capability level
point on the six-point ordinal scale [of *process capability* ([4.38](#))] that represents the capability of the process; each level builds on the capability of the level below

[SOURCE: ISO/IEC 33000]

4.40
process improvement
actions taken to improve the quality of the organization's processes aligned with the business needs

[SOURCE: ISO/IEC 33001]

4.41
process outcome
observable result of the successful achievement of the process purpose

Note 1 to entry: An outcome statement describes one of the following:

— Production of an artefact;

— A significant change in state;

— Meeting of specified constraints, e.g., requirements, goals, etc.

[SOURCE: ISO/IEC/IEEE 12207]

4.42
process profile
set of process attribute ratings for an assessed process

[SOURCE: ISO/IEC 33001]

4.43
process reference model
model comprising definitions of processes in a *lifecycle* (4.32) described in terms of process purpose and outcomes, together with an architecture describing the relationships between the processes

[SOURCE: ISO/IEC 33001]

4.44
profile
set of one or more base standards and/or profiles, and where applicable, the identification of chosen classes, conforming subsets, option, and parameters of those base standard, or standardized profiles necessary to accomplish a particular function

[SOURCE: ISO/IEC TR 10000-1]

4.45
profile group
collection of profiles which are related either by composition of processes (i.e. activities, tasks), or by requirements sharing or composition, or both

4.46
project
endeavour with defined start and finish dates undertaken to create a product or service in accordance with specified resources and requirements

Note 1 to entry: 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 part of ISO/IEC 29110.

[SOURCE: ISO/IEC/IEEE 12207]

4.47
record
set of related data items treated as a unit

EXAMPLE   Document stating results achieved or providing evidence of activities performed.

[SOURCE: ISO/IEC/IEEE 15289, modified]

4.48
report
information item that describes the results of activities such as investigations, assessments, and tests

[SOURCE: ISO/IEC/IEEE 15289]

4.49
repository
collection of all system element or software related artefacts belonging to a system

Note 1 to entry: The location/format in which such a collection is stored

[SOURCE: ISO/IEC/IEEE 24765, modified]

4.50
resource
asset that is utilized or consumed during the execution of a process

Note 1 to entry: Includes diverse entities such as funding, personnel, facilities, capital equipment, tools, and utilities such as power, water, fuel and communication infrastructures.

Note 2 to entry: Resources include those that are reusable, renewable, or consumable.

[SOURCE: ISO/IEC/IEEE 12207]

4.51
review
process or meeting during which a *work product* (4.73), or set of work products, is presented to project personnel, managers, users, *customers* (4.23), or other interested parties for comment or approval

[SOURCE: ISO/IEC/IEEE 24765]

4.52
small and medium enterprise
SME
enterprises which employ fewer than 250 persons

[SOURCE: OECD 2005, modified]

4.53
software
computer programs, procedures, and possibly associated documentation and data pertaining to the operation of a computer system

[SOURCE: IEEE 828]

4.54
software component
general term used to refer to a software system or an element, such as module, unit, data, or document

[SOURCE: IEEE 1061]

4.55
standard
document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context

Note 1 to entry: Standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits

[SOURCE: ISO/IEC Directives, Part 2]

4.56
standardized profile
internationally agreed-to, harmonized standard which describes one or more profiles

[SOURCE: ISO/IEC TR 10000-1, modified]

4.57
surveillance
systematic iteration of *conformity assessment* (4.21) activities as a basis for maintaining the validity of the statement of conformity

[SOURCE: ISO/IEC 17000]

4.58
system
combination of interacting elements organized to achieve one or more stated purposes

Note 1 to entry: A system can be considered as a product 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" can be substituted simply by a context-dependent synonym, e.g. aircraft, though this can then obscure 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 12207]

4.59
systems engineering
interdisciplinary approach governing the total technical and managerial effort required to transform a set of customer needs, expectations, and constraints into a solution and to support that solution throughout its life.

[SOURCE: ISO/IEC/IEEE 12207]

4.60
systems engineering management plan
SEMP
top level technical planning document for a project which addresses technical management processes established by three principal sources (the project's contract or *agreement* (4.4), applicable organizational processes, and the systems engineering project team) as necessary to successfully accomplish the systems engineering-related tasks of the project

[SOURCE: ISO/IEC 24748-4]

4.61
statement of work
SOW
document used by the *acquirer* (4.2) that includes the needs and expectations, the scope, objectives, and deliverables

[SOURCE: ISO/IEC/IEEE 12207:2008]

4.62
system structure
decomposition of a system of interest into a set of interacting systems and system elements

Note 1 to entry: The system structure is described in a System Breakdown Structure (SBS)

[SOURCE: ISO/IEC/IEEE 15288]

4.63
taxonomy
classification scheme for referencing profiles or sets of profiles unambiguously

[SOURCE: ISO/IEC TR 10000-1]

4.64
technical report
document published by ISO or IEC containing collected data of a different kind from that normally published as an International Standard or Technical Specification

Note 1 to entry: Such data can include, for example, data obtained from a survey carried out among the national bodies, data on work in other international organizations or data on the "state of the art" in relation to standards of national bodies on a particular subject

[SOURCE: ISO/IEC Directives, Part 2]

4.65
task
requirement, recommendation, or permissible action, intended to contribute to the achievement of one or more outcomes of a process

[SOURCE: ISO/IEC/IEEE 12207]

4.66
trade-off
decision-making actions that select from various requirements and alternative solutions on the basis of net benefit to the stakeholders

[SOURCE: ISO/IEC/IEEE 15288]

4.67
traceability
discernible association among two or more logical entities, such as requirements, system elements, verifications, or tasks

EXAMPLE   Software features and test cases are typically traced to software requirements.

[SOURCE: ISO/IEC/IEEE 12007]

4.68
user
individual or group that benefits from a system during its utilization

[SOURCE: ISO/IEC 25010:2011]

4.69
validation
confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

Note 1 to entry: 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: Note 2 to entry: In a lifecycle 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 9000:2005, modified – Note 1 to entry and Note 2 to entry have been added]

4.70
verification
confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

Note 1 to entry: 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 9000:2005, modified – Note 1 has been modified]

4.71
very small entity
VSE
enterprise, organization, department, or project having up to 25 people

4.72
work breakdown structure
WBS
[Output/Input] a deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables

Note 1 to entry: It organizes and defines the total scope of the project.

[SOURCE: ISO/IEC/IEEE 24765]

4.73
work product
artefact associated with the execution of a process

[SOURCE: ISO/IEC 33000]

5 Conventions and abbreviated terms

5.1 Naming, diagramming, and definition conventions

None.

5.2 Abbreviated terms

SW   Software Engineering

SE   System Engineering

VSE   Very Small Entity

6 Software and Systems engineering profiles for VSEs

6.1 Basic concepts

The context of Functional Standardization is one part of the overall field of standardization activities covering:

Base Standards, which define fundamentals and generalized procedures. They provide an infrastructure that can be used by a variety of applications, each of which can make its own selection from the options offered by them.

Standardized Profiles, which define conforming subsets or combinations of base standards used to provide specific functions. Profiles identify the use of particular options available in the base standards, and provide a basis for the development of uniform, internationally recognized, conformance tests.

Registration Scheme, which provide the means to specify detailed parameterization within the framework of the base standards or profiles.

Within ISO/IEC JTC 1, the process of Functional Standardization is concerned with the methodology of defining profiles, and their publication as International Standards (ISs) in accordance with procedures contained in the Directives of JTC 1. The complete methodology is specified in ISO/IEC TR 10000:1998.

6.2   Purpose of standardized profiles

Standardized profiles promote integration of base standards by defining how to use a combination of base standards for a given function and environment. In addition to the selection of base standards, a choice is made of permitted options for each base standard and of suitable values for parameters left unspecified in the base standard.

In general, profiles are prepared in order to:

— Identify the standards and profiles, together with appropriate classes, conforming subsets, options and parameters, which are necessary to accomplish identified functions or to support a class of applications;

— Provide a scheme of referencing the various uses of standards and profiles which is meaningful to both users and suppliers in response to a systematic identification and analysis of user requirements;

— Provide a means to enhance the availability for procurement of consistent implementations of activities defined groups of standards and profiles, which are expected to be the major components of real IT systems, and which realize the intentions of the corresponding reference models or frameworks with which the standards are associated;

— Promote uniformity in the development of conformance tests for software and systems that implement the functions associated with the profiles.

Underlying all these purposes is the assumption that there exists a requirement for the definition, standardization, implementation, and testing of such a profile. The processes employed shall therefore include the identification, recording, and monitoring of such requirements, as expressed by the eventual users of the profile.

Occasionally, satisfaction of some of these requirements may identify activities that are not covered by accepted base standards. This is defined as a "gap" in available standards.

Profiles shall not contradict base standards but shall make specific choices where options and ranges of values are available. The choice of the base standard options should be restricted so as to maximize the probability of achieving the objective of the profile.

6.3   Preparation of profiles

The preparation of a standardized profile requires three types of activities.

6.3.1   Selection and preparation of base standards

Once the base standards have been selected, it is important to verify that their constituting elements can be unambiguously referred to, and that relationships between those base standards are also be unambiguously referred to.

This may involve assigning unique identifiers to relevant elements of the standards, and expressing external relationships between base standards using those identifiers. When a base standard has multiple related elements, for instance if an activity has an output, these internal relationships need to be expressed unambiguously (independently of their position in the document).

It is also important at this stage to identify if these elements are normative or informative.

6.3.2   Selection of profile elements

Once the purpose and the content of a profile has been defined, the profile is given and identified (from the taxonomy), and it is structured into profile elements. These profile elements have to be identified in such a way that they can be unambiguously referred to in conformance or capability assessment guides, and other profiles based on this profile.

Each of the profile element is then associated with the corresponding element in the base standard.

Relationships existing in the base standards cannot be altered by this process. For instance if process P1 has output O1 and activity A1, and process P2 has output O_2 and activity A2, their inclusion in a profile cannot make O_2 an output of P1, nor A2 a part of P1.

6.3.3   Refinement of the profile

If the base standards identified attributes or characteristics for the elements selected in the profile, then these attributes or characteristics may need to be selected and precised.

If there are "gaps" in available standards, the additional elements are incorporated in the profile as required.

A profile can be made more normative than the base standards that constitute it. It is therefore important to carry forward in the profile normative/informative characteristics, and levels of conformance if they exist.

7   Preparing profiles of Software and Systems Engineering standards

7.1   Rationale for profiles

In general there are multiple reasons that justify the need for profiling standards:

— As software and systems standards have been produced by several different groups and organisations, without a central guiding authority, many existing standards are not well integrated. By making more explicit the interdependencies between these standards, a profile will allow for integration whenever possible;

— SE and SW Standards generally target large entities, making initial compliance difficult for smaller entities. Preparing profiles with progressive conformance levels enables assessments for achievement of different conformance levels for different processes;

— SE and SW Standards are generally large, and specify many elements that are not necessarily applicable to small entities. The preparation of profiles that address a subset of the base standards facilitate the match between the standards and the target audiences;

— Since the ISO/IEC SE and SW Standards do not necessarily cover all the topics, profiles can be used to integrate required elements that are not yet addressed in existing ISO/IEC SE and SW Standards.

For the purpose of ISO/IEC 29110, SE and SW standards are categorized in two:

a)   Process standards define the activities required to achieve identified objectives or outcomes;

b)   Product standards define the structure and content of artefacts produced by the processes.

7.2 addresses point b, while 7.3 covers point a.

7.2   Profiling lifecycle product standards

A SE and/or SW process product profile could be prepared to clarify the multiple options available for a given specific artefact. For instance:

ISO/IEC/IEEE 15289 identifies "Database Design Description" as a standardized product of a lifecycle process.

A profile in Part 4 may decide to refer to Unified Modelling Language (UML) standard in order to describe the database design. In particular, it may suggest that Class diagram be used in order to describe the database schema. The Class diagram as an IV_Object is standardized in one of the Unified Modelling Language Specification. In particular, the Profile Composition refers to a particular element of a profile (defined in Part 4), then correspondence to the desired information product are given in the part of the table labelled Content of SE and/or SW lifecycle Information Product, in the example, reference to Database Design Description from ISO/IEC/IEEE 15289 is given.

In the case where the same artefact is identified differently in multiple documents, a profile might be created to formalize that correspondence, and facilitate the use of the documents. For instance, assessment standards have defined their own identification scheme for products.

A profile (or a part of a profile) could be built to formalize this correspondence.

7.3   Profiling lifecycle process standards

SE lifecycle standards are generally defined using a common pattern, involving processes and outcomes, activities, tasks and outputs.

Profiling such a standard would involve selecting applicable processes.

When elements are normative in the base standard, these elements have to be normative in the profile.

In the case where the same process is identified differently in multiple documents, a profile might be created to formalize that correspondence, and facilitate the use of the documents. For instance, assessment standards have defined their own identification scheme for SE and/or SW processes.

7.4   Relating process and product standards in profiles

The relationship between processes and products is established in either product or process standards. If both processes and products are carried forward in a profile, and their relationship is also carried forward, then the tables specifying the applicable relationships (input and or output) must be added to the profile.

It is important to note the applicable integrity constraint that is if in the base standard a product X is an output of a process Y, it cannot be shown in the profile as an output of another base standard process Z.

Table 2 gives an example of a modelling formalism profile for lifecycle products.

In the case where the same processes and products are identified differently in multiple documents, a profile might be created to formalize that correspondence, and facilitate the use of the documents. For instance, SE and/or SW assessment standards have defined their own identification scheme for SE and/or SW processes.

Table 3 gives an example of a correspondence profile for lifecycle products.

Table 4 gives an example of a profile for lifecycle processes and output products.

Table 2 — Example of a modelling formalism profile for lifecycle products

Profile Composition					Content of SE LC Information Products					Use of UML for ODP system specifications					Unified Modelling Language Specification				
Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			Profile Element		Standard ID			Record		Standard ID									
nnnnn-m	n	aaaaaaa	v.w	bbbbbb	ISO/IEC/IEEE 15289:2015	10	Specific Information Items	10.14	Database-Design Description	ISO 19793:2007	8	Information Specification		IV_Object	ISO 19501:2005	5	Static Structure Diagrams	5.19	Class Diagrams
…	…	…	…	…															

Table 3 — Example of a correspondence profile for lifecycle products

Profile Composition					Content of SE LC Information Products					Exemplar Process Assessment Model				
Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			Profile Element		Standard ID			Record		Standard ID			Work-product	
nnnnn-m	n	aaaaaaa	v.w	bbbbbb	ISO/IEC/IEEE 15289:2015	10	Specific Information Items	10.76	System Requirements Specification	ISO-5:2006	Annex B (Inf)	Work product characteristics	17–03	Customer requirements
					ISO/IEC/IEEE 15289:2015	10	Specific Information Items	10.76	System Requirements Specification	ISO/IEC 15504-5:2006	Annex B (Inf)	Work product characteristics	17–12	System requirements
					ISO/IEC/IEEE 15289:2015	10	Specific Information Items	10.21	Database-Design Description	ISO/IEC 15504-5:2006	Annex B (Inf)	Work product characteristics	04–01	Database design
...	...	...	...	...										

Table 4 — Example of a profile for lifecycle processes and output products

Profile Composition					Software Lifecycle Processes					Content of SE LC Information Products				
Docu-ment ID	Clause #	Clause Title	Element ID	Ele-ment Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (1S) ID			*Profile Element*		*Standard ID*			*Process*		*Standard ID*			*Record*	
nnnnn-m	7	aaaaaaa	7.1	…	ISO/IEC 12207:2008	6	Systems LC Processes	6.4.1	Stakeholder Require-ments Definition Process	ISO/IEC/IEEE 15289:2015	10	Specific Informa-tion Items	10.75	System Require-ments Specification
nnnnn-m	7	aaaaaaa	7.2	…	ISO/IEC 12207:2008	6	Systems LC Processes	6.4.2	System Require-ments Analysis Process	ISO/IEC/IEEE 15289:2015	10	Specific Informa-tion Items	10.75	System Require-ments Specification
…	…	…	…	…										

7.5 Graduated profiles in a profile group

When the objective of a profile group is to provide a set of gradually larger profiles, it may be a duplication of effort (and a risk in terms of consistency) to define each of these profiles in terms of the base standards.

In such a case, it is easier to define the smaller profile in the profile group in terms of the base standards, and then define the progressively larger profiles in terms of the previous profile, with references to the base standards for the incremental requirements

In Table 5, the Intermediate profile requires the performance of one more process than the Basic, and the Basic one more than the Entry.

Table 5 — Example of defining profiles in terms of other profiles

	Entry Profile					Basic Profile					Intermediate Profile				
	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
	Profile (IS) ID			*Process*		*Profile (IS) ID*			*Process*		*Profile (IS) ID*			*Process*	
	29110–4.m	7	aaaaaaa	Z1	Stakeholder Requirements Definition	29110–4.m	7	aaaaaaa	Z1	Stakeholder Require-ments Definition					Stakeholder Require-ments Definition
						29110–4.m	7	aaaaaaa	Z2	System Re-quirements Analysis	29110–4.m	7	aaaaaaa	Z1	System Re-quirements Analysis
											29110–4.m	7	aaaaaaa	Z2	System Architecture
	...	...	...	...	...	...	...	...	...	...	...		aaaaaaa	Z3	
											...				

7.6   Packaged profiles in a profile group

When a profile group contains profiles that are distinct (they do not have requirements in common), then each profile refers to the base standards, and the conformance clause of the profile specification shall indicate how they can be combined to create levels of conformance

8   The VSE profile taxonomy principles

8.1   VSE classification dimensions

The core characteristic of the entities targeted by this set of profiles is size. These profiles are targeted at Very Small Entities (VSEs). What is meant by "very small" is defined in section 4 of this document and in ISO/IEC 29110-1, as well as the other aspects and characteristics of VSEs that may affect profile preparation or selection. Examples of these may include:

— business models (commercial, contracting, in-house development, etc.) for VSEs;

— situational factors for VSEs, such as criticality, uncertainty environment, etc.;

— risk levels for VSEs;

— capability levels of VSEs.

8.2   Decoupling VSE classification from profile preparation

Creating one profile for each possible combination of values of the various dimensions introduced above would result in an unmanageable set of profiles.

Accordingly, profiles are grouped in such a way as to be applicable to more than one category.

Table 6 illustrates a Profile Group which contains three profiles (labelled A, B and C) that are mapped to nine combinations of business models and situational factors.

Table 6 — Allocating VSE characteristics to profile groups

Business Models	Profile Situational Factors		
	Critical	User Uncertainty	Environment Change
Contract	Profile A	Profile A	Profile A
In-House	Profile C	Profile B	Profile A
Commercial	Profile B	Profile A	Profile A

8.3   Graduating a profile group

Graduated Profile Groups are a collection of profiles which are related either by composition of processes (i.e. activities, tasks). In Figure 2, Profile Group A is a collection of four profiles (A-1 to A-4), providing a progressive approach to satisfying the requirements of profile group A.

Figure 2 — Graduated profile group

8.4 Packaging a profile group

Packaged Profile Groups are a collection of distinct profiles.

In Figure 3, Profile Group B is a collection of four profiles (B-1 to B-4), providing distinct profiles that can be assembled in multiple conformance units, or levels.

Figure 3

9 Taxonomy of VSE profiles

9.1 Introduction

VSE Profiles are identified by ISO/IEC 29110.g.p, where g is the profile group identifier, and p the profile identifier.

NOTE   Not to be confused with the part number in the ISO/IEC 29110- series, which use the profile identifier as a suffix to the part number for part 4 and 5.

9.2 Profile Taxonomy

At time of publication of this document, the standardized profiles listed in Table 7 have been registered. Profile and documents in *italics* have been identified, but the project has not been initiated at time of publication of this document.

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Table 7 — VSE Profile Taxonomy

Profile Group	Profile	Specification Part Ref.	Guide Part Ref.
29110.1 – Software Engineering - Generic	29110.1.1 - Entry	ISO 29110–4-1 Clause 7	TR 29110–5-1–1
	29110.1.2 - Basic	ISO 29110–4-1 Clause 8	TR 29110–5-1–2
	29110.1.3 - Intermediate	ISO 29110–4-1 Clause 9	TR 29110–5-1–3
	29110.1.4 - Advanced	ISO 29110–4-1 Clause 10	*TR 29110–5-1–4*
29110.2 Organisational Management	29110.2.1 – Organisational Management	ISO 29110–4-2 Clause 7	TR 29110–5-2
29110.3 – Service Delivery	29110.3.n – Reserved for Service Delivery Profiles. Service delivery profiles will be identified once the service delivery profile specifications are published	ISO 29110–4-3 Clause 7+	TR 29110–5-3
29110.6 – Systems Engineering - Generic	29110.6.1 - Entry	ISO 29110–4-6 Clause 7	TR 29110–5-6–1
	29110.6.2 - Basic	ISO 29110–4-6 Clause 8	TR 29110–5-6–2
	29110.6.3 - Intermediate	ISO 29110–4-6 Clause 9	*TR 29110–5-6–3*
	29110.6.4 - Advanced	ISO 29110–4-6 Clause 10	*TR 29110–5-6–4*

9.3 The Software Engineering Generic profile group

9.3.1 Introduction

The "Generic" profile group has been identified as applicable to a vast majority of VSEs that do not develop critical software and have typical situational factors. The "generic" profile group does not imply any specific application domain. However, it is envisaged that in the future new domain-specific sub-profiles may be developed in the future.

9.3.2 The Entry profile

The Entry profile is targeted at start-up VSEs (i.e. VSEs who started their operation less than 3 years) and/or at VSEs working on small project (e.g. project size of less than 6 person-months).

9.3.3 The Basic profile

The Basic profile is targeted at VSEs developing a single application by a single work team

9.3.4 The Intermediate profile

The Intermediate profile is targeted at VSEs involved in the development of more than one project in parallel with more than one work team.

9.3.5 The Advanced profile

The Advanced profile is targeted at VSEs which want to sustain and grow as an independent competitive system and/or software development business.

9.4 The Systems Engineering Generic profile group

9.4.1 Introduction

The "Generic" profile group has been identified as applicable to a vast majority of VSEs that do not develop critical system elements or products within the systems engineering processes and have typical situational factors. The "generic" profile group does not imply any specific application domain. However, it is envisaged that in the future new domain-specific sub-profiles may be developed.

9.4.2 The Entry profile

The Entry profile is targeted at start-up VSEs (i.e. VSEs who started their operation less than 3 years) and/or at VSEs working on small project (e.g. project size of less than 6 person-months).

9.4.3 The Basic profile

The Basic profile describes system development of a single application by a single work team with no special risk or situational factors.

9.4.4 The Intermediate profile

The Intermediate profile is targeted at VSEs involved in the development of more than one project in parallel with more than one work team.

9.4.5 The Advanced profile

The Advanced profile is targeted at VSEs which want to sustain and grow as an independent competitive system and/or software development business.

9.5 The Organisational Management Profile Group

The Organisational Management profile provides additional guidance for profiles described in ISO/IEC 29110 Part 4-3 through enterprise-wide processes such as Project Portfolio Management, Resource management and Process Management processes.

9.6 The Service Delivery Profile Group

The Service Delivery profiles provides additional guidance for profiles described in ISO/IEC 29110-4-1 and 4-6 by describing additional practices VSEs may implement when providing system and/or software services to their customers.

Service Delivery is defined as:

"A set of IT services provided to customers (internal or external) after the system or software development phase. These lifecycle processes are generally identified as Transition, Operation, Support, and Maintenance. In order for the VSE to offer effective delivery services, other lifecycle processes are performed, at least partially, such as Agreement Processes, Human Resource management, Risk Management, Configuration and Measurement."

NOTE   The identification and description of the profiles in the Service Delivery profile group will be added once the service delivery profile specifications are published.