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Systems and software engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 6-1:
Software engineering — Specific Space Profile Specifications

ICS: 35.080

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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 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.

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

A list of all parts in the ISO/IEC 29110 series is available on the ISO and IEC 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.

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Introduction

Very Small Entities (VSEs) around the world are creating valuable products and services. For the purpose of ISO/IEC 29110, a Very Small Entity (VSE) is an enterprise, an organization (e.g. government agency, non-profit 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 2019 report, 'Small and medium-sized enterprises (SMEs) and entrepreneurship are essential drivers of economic and social well-being. Representing 99 % of all businesses, generating about 60 % of employment and totalling between 50 % and 60 % of value added in the OECD area'. 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 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 life cycle 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 standards and technical reports can be applied at any phase of system or software development within a life cycle. This series of 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.

Systems, in the context of ISO/IEC 29110, 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. See Table 1.

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Table 1 — ISO/IEC 29110 target audience

ISO/IEC 29110	Title	Target audience
ISO/IEC 29110-1	Overview	VSEs and their customers, assessors, standards producers, tool vendors and methodology vendors.
ISO/IEC 29110-2	Framework for profile preparation	Profile producers, tool vendors and methodology vendors. Not intended for VSEs.
ISO/IEC 29110-3	Certification and assessment guidance	VSEs and their customers, assessors, accreditation bodies.
ISO/IEC 29110-4	Profile specifications	VSEs, customers, standards producers, tool vendors and methodology vendors.
ISO/IEC 29110-5	Management, engineering and service delivery guidelines	VSEs and their customers.
ISO/IEC 29110-6	Specific profile specifications	VSEs, customers, standards producers, tool vendors and methodology vendors.
ISO/IEC 29110-7	Specific profile guidelines	VSEs and their customers.

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

ISO/IEC 29110-1 defines the terms common to the Set of ISO/IEC 29110 Documents. 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 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, conformance, 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 29110-3 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, 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 29110-6-m provides the specification for specific profiles that are based on subsets of appropriate standards elements.

ISO/IEC TR 29110-7-x provides a guide for each profile in the specific profile group.

This document defines the 3 profiles for VSEs that develop or maintain software in the space domain.

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Figure 1 describes the ISO/IEC 29110 International Standards (IS) and Technical Reports (TR) 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).

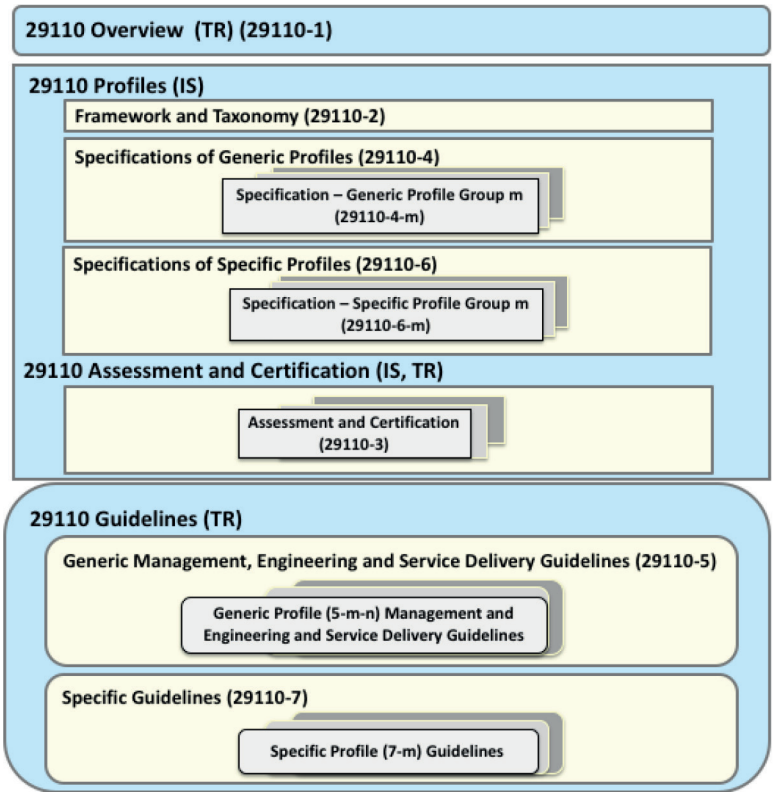


Figure 1 — ISO/IEC 29110 Series

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Systems and software engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 6-1: Software engineering — Specific Space Profile Specifications

1 Scope

Industry and large organisations recognize the value of VSEs, i.e. enterprises, organisations (e.g. government agency, non-profit organization), projects or departments with up to 25 people, in contributing with emerging new technology that bigger organisations cannot use them as easily nor incorporate them in their solutions as fast. But often these VSEs are not ready to comply with the requirements for space projects. But, Space-VSEs could demonstrate the quality of their processes in a stepwise approach to participate to space projects.

This document establishes a common framework for software lifecycle processes for Space-VSEs developing or maintaining software for the space domain.

This document is targeted at acquirers of space systems and software and services and for small suppliers, developers, managers, and quality assurance managers of software in the space domain.

This document provides the specifications of 3 space profiles for VSEs through a set of development and organisational processes.

This document adds specifications to the software Basic profile specifications, defined in ISO/IEC 29110-4-1, and to the software Organisational Management profile specifications, defined in ISO/IEC 29110-4-2.

This document provides a process assessment model and a maturity model for the process quality growth demonstration of Space-VSEs.

The document may also be used by a single party through a self-imposed set of processes.

This document does not:

- detail the processes in terms of methods or procedures required to meet the requirements and outcomes of a process.
- detail documentation in terms of name, format, explicit content and recording media.
- prescribe a specific system or software life cycle model, development methodology, model or technique.

The users of this document select the processes to be deployed and map them to the specific project lifecycle model. The parties are also responsible for selecting and applying the software development methods and for performing the activities and tasks suitable for the software project.

This document is not intended to be in conflict with any organization's policies, procedures, and standards or with any national laws and regulations. Any such conflict should be resolved before using this document.

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The requirements in this document are contained in Clauses 7, 8 and 9 in an incremental maturity process profiles definition. This document provides requirements for a number of processes suitable for usage during the lifecycle of a software developed or maintained by a VSE in the space domain. It is recognized that a specific project may not need to use all the processes provided by this document. Therefore, the implementation of this document typically involves selecting a set of processes suitable to the VSE.

This document provides the normative and informative links to the subsets of ISO/IEC IEEE 12207 and ISO/IEC IEEE 15289 selected for this standard.

This document is also applicable to the development or maintenance of software of the lowest level of software criticality categories C or D as defined in the European Cooperation for Space Standardization (ECSS) standard ECSS-Q-ST-80C rev1. Annex C of this document provides the processes of the Space-VSE profile according to the standards of the European Cooperation for Space Standardization (ECSS) and the ISO/IEC 29110 series. Annex C also provides the definition of the safety criticality categories of software according to ECSS standards.

Space-VSEs could use the guidelines provided in the ISO/IEC TR 29110-7-1 to implement the processes listed in this document.

2 Normative references

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

ISO/IEC 29110-2-1, *Software engineering — Lifecycle profiles for Very Small Entities (VSEs) — Part 2-1: Framework and taxonomy*

ISO/IEC IEEE 12207, *Systems and software engineering — Software life cycle processes*

ISO/IEC IEEE 15289, *Systems and software engineering — Content of systems and software life cycle process information products (Documentation)*

ISO/IEC 29110-4-1, *Systems and software engineering — Lifecycle profiles for Very Small Entities (VSEs) — Part 4-1: Software engineering - Profile specifications: Generic profile group*

ISO/IEC 29110-4-2, *Systems and software engineering — Lifecycle Profiles for Very Small Entities (VSEs) — Part 4-2: Software Engineering - Profile Specifications: Organisational management profile*

ISO/IEC 15504-5:2012, *Information technology — Process assessment — Part 5: An exemplar software life cycle process assessment model*

ISO/IEC/TS 15504-10:2011, *Information technology — Process assessment — Part 10: Safety extension*

ISO/IEC 33004:2015, *Information technology — Process assessment — Requirements for process reference, process assessment and maturity models*

ECSS-Q-HB-80-02 (8 October 2010) Space product assurance - Software process assessment and improvement – Part 2: Assessor instrument

ECSS-Q-ST-80C rev 1 (15 February 2017) Space product assurance - Software product assurance. ECSS.

ECSS-Q-ST-30C rev 1 (15 February 2017) Space product assurance – Dependability. ECSS.

ECSS-Q-ST-40C Rev 1 (15 February 2017) Space product assurance – Safety. ECSS.

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 29110-2-1 apply.

3.1
base standard
approved International Standard or Telecommunication Standardization Sector of the International Telecommunications Union (ITU-T) Recommendation

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

3.2
basic profile
profile targeted at VSEs developing a single product by a single work team

3.3
generic profile group
profile group applicable to VSEs (very small entities) that do not develop critical systems or software products

[SOURCE: ISO/IEC TR 29110-1]

3.4
organisational management profile
profile targeted at VSEs to provide them with additional organisational management guidance

[SOURCE: ISO/IEC TR 29110-1]

3.5
process assessment model
model suitable for the purpose of assessing a specified process quality characteristic, based on one or more process reference models

[SOURCE: ISO/IEC 33001]

3.6
process reference model
model comprising definitions of processes in a lifecycle described in terms of process purpose and outcomes, together with an architecture describing the relationships between the processes

[SOURCE: ISO/IEC 33001]

3.7
software
computer programs, procedures, and possibly associated documentation and data pertaining to the operation of a computer system

[SOURCE: IEEE 828]

3.8
Space-VSE
enterprise, organisation (e.g., government agency, non-profit organisation), department or project having up to 25 people that develops or maintain systems and/or software in the space domain.

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3.9
safety-critical software
software that falls into one or more of the following categories: a) software whose inadvertent response to stimuli, failure to respond when required, response out-of-sequence, or response in combination with other responses can result in an accident b) software that is intended to mitigate the result of an accident c) software that is intended to recover from the result of an accident

[SOURCE: ISO/IEC 24675]

Note 1 to entry: Software criticality categories are defined in Annex A

3.10
work product
artefact associated with the execution of a process

[SOURCE: ISO/IEC 33000]

4 Conformance

4.1 Conformance situations

Organisations can claim conformance to this standard.

This document describes one type of conformance situation: Process conformance. Process conformance is the conformance to the requirements in the process part of the profile specification;

A VSE can claim conformance to the process part of the profile if it meets all the mandatory profile process requirements as identified in its specification Clause 7 and the associated properties and requirements as described in the base standards when applicable.

It can be attested by a third party.

It can be mandated as part of procurement and contractual processes

5 Conventions and abbreviated terms

5.1 Naming, diagramming and definition conventions

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

5.2 Abbreviations

CAT	CATegory (referring to criticality of software)
CM	Configuration Management
ECSS	European Cooperation for Space Standardization
ENG	Engineering
MPG	Management Process Group
OM	Organisational Management
OPG	Organisational Processes Group
PAM	Process Assessment Model

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