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Ingénierie des systèmes et du logiciel — Processus du cycle de vie du logiciel

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

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This document was prepared by Joint Technical Committee ISO/JTC 1, *Information technology,* Subcommittee SC 7, *Software and systems engineering*, in cooperation with the Systems and Software Engineering Standards Committee of the IEEE Computer Society, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

This second edition cancels and replaces the first edition (ISO/IEC/IEEE 12207:2017), which has been technically revised.

The main changes are as follows:

— clarifications and updates to reflect current practices in selected technical processes, including business or mission analysis, system architecture definition, implementation, integration, operations, and maintenance;

— improvements to selected technical management processes, including risk management and configuration management;

— updates to Clause 5, key concepts, including a more precise description of iteration, recursion, system-of-systems, and quality characteristics;

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— new content in Clause 5 on concept and system definition, and expanded content on agile methods, process application, and system concepts.

— revised Annex D on model-based systems and software engineering (MBSSE)

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.

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Introduction

The complexity of software systems continues to increase to unprecedented levels. Technology change has led to new opportunities, but also to increased challenges for the organizations that create and utilise systems. There is a continuum of human-made systems from those that use little or no software to those in which software is the primary interest. It is rare to encounter a complex system without software, and all software systems require physical system elements (hardware) to operate, either as part of the software system-of-interest (SoI) or as an enabling system or infrastructure. These challenges exist throughout the life cycle of a system and at all levels of architectural detail.

The purpose of this document is to provide a defined set of software life cycle processes. This document provides a common process framework for engineering the life cycle of systems created by humans, adopting a software engineering approach. Software engineering is an interdisciplinary approach and means to enable software. This document concerns software systems that are configured with software elements and with one or more of the following: hardware elements, data, humans, processes, services, procedures, and facilities.

This document provides processes for use by acquirers, suppliers, and other stakeholders in the life cycle of a software system, such as developers, integrators, operators, maintainers, managers, quality managers, and users of software services and products. It covers defining stakeholder needs, concerns, priorities, and constraints for the required functionality and non-functional characteristics early in the life cycle, establishing requirements, and concurrent design synthesis and system validation while considering the complete problem. It integrates disciplines and specialties into a team effort, forming a structured set of process that proceeds from concept through production operation and maintenance and sustainment to disposal. It considers both the business and the technical needs of stakeholders with the goal of providing a quality product that meets the needs of users and other applicable stakeholders. It provides the processes for acquiring and supplying systems. It helps to improve communication and cooperation among the parties that create, utilise, and manage modern software systems so they can work in an integrated, coherent fashion. Finally, this document provides the framework for assessment and improvement of the life cycle processes.

There is a wide variety of software systems in terms of their purpose, domain, complexity, size, novelty, adaptability, quantity, location, life span, and evolution. The processes in this document form a comprehensive set from which an organization can construct software life cycle models appropriate to its products and services. An organization can select and apply an appropriate subset of these processes to fulfil its specific objectives.

This document can be used in one or more of the following situations:

— By an organization — to help establish an environment of desired processes. These processes can be supported by an infrastructure of methods, procedures, techniques, tools, and trained personnel. The organization can then employ this environment to perform and manage its projects and progress systems through their life cycle stages. In this mode, this document can be used to assess conformance of a declared, established environment to its provisions. It can be used by a single organization in a self-imposed mode or in a multi-party situation. Parties can be from the same organization or from different organizations, and the situation can range from an informal agreement to a formal contract.

— By a project: to help select, structure, and employ the elements of an established environment to provide products and services. In this mode this document is used in the assessment of conformance of the project to the declared and established environment.

— By an acquirer and a supplier: to help develop an agreement concerning processes and activities. Via the agreement, the processes and activities in this document are selected, negotiated, agreed to, and performed. In this mode this document is used for guidance in developing the agreement.

— By process assessors: to serve as a process reference model for use in the performance of process assessments that can be used to support organizational process improvement.

This document is related to ISO/IEC/IEEE 15288, which covers system engineering processes. The choice of whether to apply this document for the software life cycle processes, or ISO/IEC/IEEE 15288:2023, depends

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on the system-of-interest (SoI). Processes in both documents have the same process purpose and process outcomes, but differ in activities and tasks to perform software engineering or systems engineering, respectively.

The requirements in this document are intended to be compatible with the requirements of the quality management system provided by ISO 9001, the service management system provided by ISO/IEC 20000-1, the IT asset management system provided by ISO/IEC 19770-1, and the information security management system provided by ISO/IEC 27001.

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Systems and software engineering — Software life cycle processes

1 Scope

This document establishes a common framework for software life cycle processes. Its terminology can be referenced and applied across the software industry. It contains processes, activities and tasks that can be applied during the acquisition of a software system, product, or service and during the supply, development, operation, maintenance, and disposal of software products and services. This is accomplished through the involvement of stakeholders, with the goal of achieving customer satisfaction. This document includes those aspects of system definition needed to provide the context for software systems and services. This document also provides processes that can be employed for defining, controlling, and improving software life cycle processes within an organization or a project.

This document is applicable to one-of-a-kind software systems, software systems for wide commercial or public distribution, and customised, adaptable software systems. Software includes the software portion of firmware. It applies to a complete stand-alone software system and to software systems that are embedded and integrated into larger more complex and complete systems of systems (SoS). The processes, activities, and tasks of this document can also be applied during the acquisition of a system that contains software.

This document applies to the full life cycle of software systems, products, and services, including conception, development, operations, support, and retirement, and to their acquisition and supply, whether performed internally or externally to an organization. The life cycle processes of this document can be applied concurrently, iteratively, and recursively to a software system and incrementally to its elements.

This document can be applied in organizations and software projects using a variety of formal engineering approaches. It is applicable for agile approaches and methods, which are most widely used for software development, sustainment, and maintenance, and which are believed to be more affordable and to deliver usable products more quickly.

This document does not identify or require any specific software life cycle model, development methodology, method, modelling approach, or techniques for selecting a life cycle model for the organization or project and mapping the processes, activities, and tasks in this document into that model. Using engineering judgment to help achieve the desired level of quality is also outside the scope of this document.

This document does not detail information items in terms of name, format, explicit content, and recording media. ISO/IEC/IEEE 15289 identifies the content for life cycle process information items (documentation).

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

ISO, IEC, and IEEE maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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— IEEE Standards Dictionary Online: available at: https://dictionary.ieee.org/

NOTE Definitions for other system and software engineering terms can be found in ISO/IEC/IEEE 24765, available at www.computer.org/sevocab.

3.1.1
acquirer
stakeholder (3.1.76) that acquires or procures a *system* (3.1.78), *product* (3.1.49), or *service* (3.1.65) from a *supplier* (3.1.77)

Note 1 to entry: Other terms commonly used for an acquirer are buyer, *customer* (3.1.19), owner, purchaser, or internal organizational sponsor.

3.1.2
acquisition
process (3.1.45) of obtaining a *system* (3.1.78), *product* (3.1.49) or *service* (3.1.65)

3.1.3
activity
set of cohesive *tasks* (3.1.83) of a *process* (3.1.45)

3.1.4
agile development
development approach based on iterative development, frequent inspection and adaptation, and incremental deliveries, in which *requirements* (3.1.56) and solutions evolve through collaboration in cross-functional teams and through continual *stakeholder* (3.1.76) feedback

3.1.5
agreement
mutual acknowledgement of terms and conditions under which a working relationship is conducted

EXAMPLE Contract, memorandum of agreement.

3.1.6
architecture
fundamental concepts or properties of an entity in its *environment* (3.1.25) and governing principles for the realization and evolution of this entity and its related *life cycle* (3.1.34)*processes* (3.1.45)

[SOURCE: ISO/IEC/IEEE 42010:2022, 3.2]

3.1.7
architecture description framework
conventions, principles and practices for the description of *architectures* (3.1.6) established within a specific domain of application or community of *stakeholders* (3.1.76)

EXAMPLE Generalized Enterprise Reference Architecture and Methodologies (GERAM) (ISO 15704:2019, Annex B), Reference Model of Open Distributed Processing (RM-ODP) (ISO/IEC 10746-1), Reference Model of Open Distributed Processing (RM-ODP), Unified Architecture Framework (UAF), and NATO Architecture Framework (NAF).

[SOURCE: ISO/IEC/IEEE 42010:2022, 3.5, modified — The abbreviated term and note 1 to entry have been removed.]

3.1.8
architecture view
information part comprising portion of an *architecture* (3.1.6) description

[SOURCE: ISO/IEC/IEEE 42010:2022, 3.7, modified — EXAMPLE has been removed.]

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