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Systems and software engineering — System life cycle processes

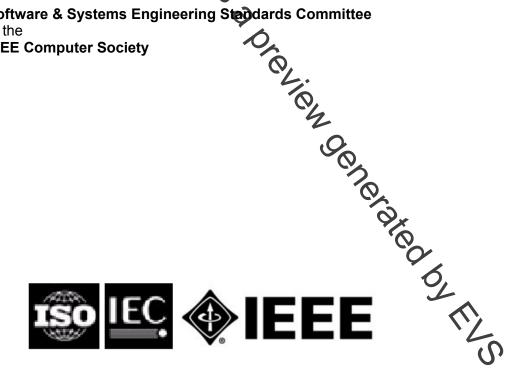*Ingénierie des systèmes et du logiciel — Processus du cycle de vie du système*

Systems and software engineering — System life cycle processes

Sponsor

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Abstract: This International Standard establishes a common process framework for describing the life cycle of man-made systems. It defines a set of processes and associated terminology for the full life cycle, including conception, development, production, utilization, support and retirement. This standard also supports the definition, control, assessment, and improvement of these processes. These processes can be applied concurrently, iteratively, and recursively to a system and its elements throughout the life cycle of a system.

Keywords: acquisition, agreement, architectural design, assessment, audit, configuration management, decision management, development, disposal, enabling system, implementation, information management, infrastructure, integration, life cycle, life cycle model, life cycle stages, maintenance, measurement, operation, planning, process, process improvement, process reference model, process tailoring, process view, product, project portfolio, quality management, requirements, retirement, risk management, service, stages, stakeholder requirements, supply, system, system structure, system-of-interest, tailoring, transition, validation, verification

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International Standard ISO/IEC 15288:2008(E)

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ISO/IEC 15288 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Systems and software engineering*.

This second edition cancels and replaces the first edition (ISO/IEC 15288:2002), which has been technically revised.

The IEEE Computer Society collaborated with ISO/IEC JTC 1 in the development of this International Standard. *IEEE Std 15288-2004, Adoption of ISO/IEC 15288:2002, Systems Engineering—System Life Cycle Processes,* was one of the base documents used in the development of this International Standard.

Changes in this revision of ISO/IEC 15288 were developed in conjunction with a corresponding revision of ISO/IEC 12207. The purpose of these revisions is to better align the two International Standards to facilitate their joint use. This alignment takes the first step toward harmonization of the structures and contents of the two International Standards, while supporting the requirements of the assessment community. This alignment provides the foundation to facilitate evolution to an integrated and fully harmonized treatment of life cycle processes.

This International Standard was developed with the following goals:

— provide a common terminology between the revision of the ISO/IEC 15288 and ISO/IEC 12207;

— where applicable, provide common process names and process structure between the revision of the ISO/IEC 15288 and ISO/IEC 12207;

— enable user community to evolve towards fully harmonized standards, while maximizing backward compatibility, and

— leverage ten years of experience with the development and use of ISO/IEC 12207 and ISO/IEC 15288.

A subsequent revision is intended to achieve a fully harmonized view of the system and software life cycle processes. Identified areas to consider in the future include: common process purposes and outcomes, architecture of the standards, level of prescription of activities and tasks, life cycle treatments, treatment of products and services, common verification and validation concepts, common configuration management concepts, deferred recommendations, alignment with other applicable standards, and rationalization of application guides.

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Introduction

The complexity of man-made systems has increased to an unprecedented level. This has led to new opportunities, but also to increased challenges for the organizations that create and utilize systems. These challenges exist throughout the life cycle of a system and at all levels of architectural detail. They arise from several sources:

— There are inherent differences among the hardware, software and human elements from which systems are constructed.

— Almost every present-day system contains, and/or is modelled and supported by computer-based technology.

— There is a lack of harmonization and integration of the involved disciplines, including science, engineering, management and finance.

There is therefore a need for a common framework to improve communication and cooperation among the parties that create, utilize and manage modern systems in order that they can work in an integrated, coherent fashion.

This International Standard provides a common process framework covering the life cycle of man-made systems. This life cycle spans the conception of ideas through to the retirement of a system. It provides the processes for acquiring and supplying systems. In addition, this framework provides for the assessment and improvement of the life cycle processes.

This revised International Standard is an initial step in the SC7 harmonization strategy to achieve a fully integrated suite of system and software life cycle processes and guidance for their application. This revision aligns with the revision to ISO/IEC 12207 within the context of system life cycle processes and applies SC7 guidelines for process definition to support consistency, to improve usability and to align structure, terms, and corresponding organizational and project processes.

The processes in this International Standard form a comprehensive set from which an organization can construct system life cycle models appropriate to its products and services. An organization, depending on its purpose, can select and apply an appropriate subset to fulfil that purpose.

This International Standard can be used in one or more of the following modes:

— 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 may then employ this environment to perform and manage its projects and progress systems through their life cycle stages. In this mode this International Standard is used to assess conformance of a declared, established environment to its provisions.

— By a project — to help select, structure and employ the elements of an established environment to provide products and services. In this mode this International Standard 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 International Standard are selected, negotiated, agreed to and performed. In this mode this International Standard 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 may be used to support organizational process improvement.

This International Standard contains requirements in two clauses: Clause 6, that defines the requirements for the system life cycle processes and Annex A that provides requirements for tailoring of this International Standard. There are also several informative annexes contained in this International Standard:

— Annex B provides information about use of the system life cycle processes as a process reference model to support process assessment.

— Annex C provides a description of the process constructs used in this standard.

— Annex D provides an example of a process view for Specialty Engineering, intended to illustrate how a project might assemble processes, activities and tasks of ISO/IEC 15288 to provide focused attention to the achievement of product characteristics that have been selected as being of special interest.

— Annex E describes the alignment of the processes of ISO/IEC 15288 and ISO/IEC 12207.

— Annex F describes relationships to other IEEE standards.

NOTE   A future Technical Report (ISO/IEC TR 24748) will describe the relations between this International Standard and ISO/IEC 12207:2008.

IEEE Introduction

This introduction is not part of IEEE Std 15288™-2008, Systems and Software Engineering — Systems Life Cycle Processes.

IEEE Std 12207™-2008 and IEEE Std 15288™-2008 are identical to ISO/IEC 12207:2008 and ISO/IEC 15288:2008. Therefore, all references to ISO/IEC 12207 or ISO/IEC 15288 apply equally well to their IEEE counterparts. Further details regarding relationships to IEEE standards can be found in Annex F.

This standard replaces IEEE Std 15288™-2004, Adoption of ISO/IEC 15288:2002, Systems Engineering—System Life Cycle Processes. The original ISO/IEC 15288 was published in November 2002 and was the first international standard to provide a comprehensive set of life cycle processes for systems.

This new revision of ISO/IEC 15288 is the product of a coordinated effort by IEEE and ISO/IEC JTC 1/SC 7. The base documents for the revision included the ISO/IEC standard and informative material from the 2004 IEEE adoption. Development of this revision was carefully coordinated with the parallel revision of ISO/IEC 12207:1995 to align structure, terms, and corresponding organizational and project processes.

This revised standard is a step in the SC7 harmonization strategy to achieve a fully integrated suite of system and software life cycle processes and guidance for their application. It is also an important step in the shared strategy of ISO/IEC JTC 1/SC 7 and the IEEE to harmonize their respective collections of standards. The new editions of ISO/IEC 12207 and ISO/IEC 15288, and their identical IEEE editions, will provide a single, shared baseline of systems and software life cycle processes applicable to both ISO/IEC and the IEEE standards collections.

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1.1 Scope

This International Standard establishes a common framework for describing the life cycle of systems created by humans. It defines a set of processes and associated terminology. These processes can be applied at any level in the hierarchy of a system's structure. Selected sets of these processes can be applied throughout the life cycle for managing and performing the stages of a system's life cycle. This is accomplished through the involvement of all interested parties, with the ultimate goal of achieving customer satisfaction.

This International Standard also provides processes that support the definition, control and improvement of the life cycle processes used within an organization or a project. Organizations and projects can use these life cycle processes when acquiring and supplying systems.

This International Standard concerns those systems that are man-made and may be configured with one or more of the following: hardware, software, data, humans, processes (e.g., processes for providing service to users), procedures (e.g., operator instructions), facilities, materials and naturally occurring entities.

When a system element is software, the software life cycle processes documented in ISO/IEC 12207:2008 may be used to implement that system element. The two standards are harmonized for concurrent use on a single project or in a single organization. When the system element is hardware, refer to other International Standards outside the scope of SC7.

1.2 Purpose

The purpose of this International Standard is to provide a defined set of processes to facilitate communication among acquirers, suppliers and other stakeholders in the life cycle of a system.

This International Standard applies to organizations in their roles as both acquirers and suppliers. 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.

The processes in this International Standard can be used as a basis for establishing business environments, e.g., methods, procedures, techniques, tools and trained personnel. Annex A provides normative direction regarding the tailoring of these system life cycle processes.

1.3 Field of application

This International Standard applies to the full life cycle of systems, including conception, development, production, utilization, support and retirement of systems, and to the acquisition and supply of systems, whether performed internally or externally to an organization. The life cycle processes of this International Standard can be applied concurrently, iteratively and recursively to a system and its elements.

There is a wide variety of systems in terms of their purpose, domain of application, complexity, size, novelty, adaptability, quantities, locations, life spans and evolution. This International Standard describes the processes that comprise the life cycle of any man-made system. It therefore applies to one-of-a-kind systems, mass-produced systems and customized, adaptable systems. It also applies to a complete stand-alone system and to systems that are embedded and integrated into larger more complex and complete systems.