TECHNICAL REPORT

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Systems and software engineering — Life cycle management —

Part 1: Guide for life cycle management

Ingénierie des systèmes et du logiciel — Gestion du cycle de vie —
Partie 1: Guide de gestion du cycle de vie

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

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.

ISO/IEC TR 24748-1, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

ISO/IEC TR 24748 consists of the following parts, under the general title *Systems and software engineering — Life cycle management*:

Part 1: Guide for life cycle management

Guides for the application of ISO/IEC 15288 (systems life cycle processes) and ISO/IEC 12207 (software life cycle processes) will form the subjects of future parts 2 and 3, respectively.

Introduction

ISO/IEC 15288, *Systems and software engineering — System life cycle processes*, and ISO/IEC 12207, *Systems and software engineering — Software life cycle processes*, each have published guides (ISO/IEC TR 19760 and ISO/IEC TR 15271, respectively) for the use of each International Standard individually. The purpose of this Technical Report is to facilitate the joint usage of the process content of the latest revisions of ISO/IEC 15288 and ISO/IEC 12207 by providing unified and consolidated guidance on life cycle management of systems and software. This is to help ensure consistency in system concepts and life cycle concepts, models, stages, processes, process application, key points of view, adaptation and use in various domains as the two International Standards are used in combination. That will in turn help a project team design a life cycle model for managing the progress of their project.

This Technical Report will also aid in identifying and planning use of life cycle processes described in ISO/IEC 15288 and ISO/IEC 12207 that will enable the project to be completed successfully, meeting its objectives/requirements for each stage and for the overall project. ISO/IEC TR 19760 and ISO/IEC TR 15271 will be replaced by ISO/IEC TR 24748-2 and ISO/IEC TR 24748-3, respectively, to support use of the two revised International Standards individually.

Besides the above, there is also increasing recognition of the importance of ensuring that all life cycle stages, and all aspects within each stage, are supported with thorough guidance to enable alignment with any process documents that might subsequently be created that focus on areas besides systems and software, including hardware, humans, processes (e.g. review process), procedures (e.g. operator instructions), facilities and naturally occurring entities (e.g. water, organisms, minerals).

By addressing these needs specifically in this Technical Report, the users of the process-focused ISO/IEC 12207 and ISO/IEC 15288 will not only benefit from having one document complementarily addressing the aspect of product or service life cycle: they will also benefit from a framework that links life cycle management aspects to more than just the systems or software aspects of products or services.

Systems and software engineering — Life cycle management —

Part 1:
Guide for life cycle management

1 Scope

This Technical Report is a guide for the life cycle management of systems and software based on ISO/IEC 15288 and ISO/IEC 12207. This Technical Report:

- addresses systems concepts and life cycle concepts, models, stages, processes, process application, key points of view, adaptation and use in various domains;
- establishes a common framework for describing life cycles, including their individual stages, for the management of projects to provide or acquire either products or services;
- defines the concept and terminology of a life cycle;
- supports the use of the life cycle processes within an organization or a project. Organizations and projects can use these life cycle concepts when acquiring and supplying either products or services;
- provides guidance on adapting a life cycle model and the content associated with a life cycle or a part of a life cycle;
- describes the relationship between life cycles and their use in ISO/IEC 15288 (systems aspects) and ISO/IEC 12207 (software aspects);
- shows the relationships of life cycle concepts to the hardware, human, services, process, procedure, facility and naturally occurring entity aspects of projects;
- describes how its concepts relate to detailed process standards, for example, in the areas of measurement, project management and risk management;
- complements domain-specific application guidance in ISO/IEC TR 19760 and ISO/IEC TR 15271.

NOTE When published, ISO/IEC TR 24748-2 and ISO/IEC 24748-3 will cancel and replace ISO/IEC TR 19760 and ISO/IEC TR 15271, respectively.

2 Terms and definitions

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

2.1
acquirer
stakeholder that acquires or procures a product or service from a supplier

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

NOTE The acquirer could be one of the following: buyer, customer, owner, or purchaser.

2.2
acquisition
process of obtaining a product or service

[ISO/IEC 15288:2008]

2.3
activity
set of cohesive tasks of a process

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

2.4
agreement
mutual acknowledgement of terms and conditions under which a working relationship is conducted

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

2.5
architecture
fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution

[ISO/IEC 42010:2007]

NOTE ISO/IEC 12207 and ISO/IEC 15288 use the word “elements” instead of “components” and this Technical Report follows that usage.

2.6
audit
systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled

[ISO 9000:2005]

2.7
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

[ISO/IEC 15288:2008]

2.8
contract
binding agreement between two parties, especially enforceable by law, or a similar internal agreement wholly within an organization

[ISO/IEC 12207:2008]

2.9
customer
organization or person that receives a product or service

NOTE 1 A customer can be internal or external to the organization.

NOTE 2 Adapted from ISO 9000:2005.

NOTE 3 Other terms commonly used for customer are acquirer, buyer, or purchaser.

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

2.10
developer
organization that performs development activities (including requirements analysis, design, testing through acceptance) during the life cycle process

NOTE Adapted from ISO/IEC 12207:2008.

2.11
enabling system
system that supports a system-of-interest during its life cycle stages but does not necessarily contribute directly to its function during operation

NOTE 1 Adapted from ISO/IEC 15288:2008.

NOTE 2 For example, when a system-of-interest enters the production stage, a production enabling system is required.

NOTE 3 Each enabling system has a life cycle of its own. This Technical Report is applicable to each enabling system when, in its own right, it is treated as a system-of-interest.

2.12
evaluation
systematic determination of the extent to which an entity meets its specified criteria

[ISO/IEC 12207:2008]

2.13
facility
physical means or equipment for facilitating the performance of an action, e.g. buildings, instruments, tools

[ISO/IEC 15288:2008]

2.14
life cycle
evolution of a system, product, service, project or other human-made entity from conception through retirement

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

2.15
life cycle model
framework of processes and activities concerned with the life cycle that may be organized into stages, which also acts as a common reference for communication and understanding

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

2.16
maintainer
individual who, or organization that, performs maintenance activities

NOTE Adapted from ISO/IEC 12207:2008.

2.17
monitoring
examination of the status of the activities of a supplier and of their results by the acquirer or a third party

[ISO/IEC 12207:2008]

2.18
operator
entity that performs the operation of a system

[ISO/IEC 15288:2008]

NOTE 1 The role of operator and the role of user may be vested, simultaneously or sequentially, in the same individual or organization.

NOTE 2 An individual operator combined with knowledge, skills and procedures may be considered as an element of the system.

NOTE 3 In the context of this specific definition, the term entity means an individual or an organization.

2.19
organization
person or a group of people and facilities with an arrangement of responsibilities, authorities and relationships

NOTE 1 Adapted from ISO 9000:2005.

NOTE 2 A body of persons organized for some specific purpose, such as a club, union, corporation, or society, is an organization.

NOTE 3 An identified part of an organization (even as small as a single individual) or an identified group of organizations can be regarded as an organization if it has responsibilities, authorities and relationships.

2.20
party
organization entering into an agreement

NOTE In this Technical Report, the agreeing parties are called the acquirer and the supplier.

[ISO/IEC 15288:2008]

2.21
process
set of interrelated or interacting activities which transforms inputs into outputs

[ISO 9000:2005]

2.22
process purpose
high level objective of performing the process and the likely outcomes of effective implementation of the process

NOTE The implementation of the process should provide tangible benefits to the stakeholders.

[ISO/IEC 12207:2008]

2.23
process outcome
observable result of the successful achievement of the process purpose

[ISO/IEC 12207:2008]

2.24
product
result of a process

[ISO 9000:2005]

2.25
project
endeavour with defined start and finish criteria undertaken to create a product or service in accordance with specified resources and requirements

NOTE 1 Adapted from ISO 9000:2005.

NOTE 2 A project may be viewed as a unique process comprising co-ordinated and controlled activities and may be composed of activities from the Project Processes and Technical Processes referred to in this Technical Report.

NOTE 3 A process can also be viewed as a specific instantiation of life cycle processes, adapted within a life cycle model, to create the service or product for the specific requirements and context of the project.

2.26
qualification
process of demonstrating whether an entity is capable of fulfilling specified requirements

[ISO/IEC 12207:2008]

2.27
quality assurance
part of quality management focused on providing confidence that quality requirements will be fulfilled

[ISO 9000:2005]

2.28
resource
asset that is utilized or consumed during the execution of a process

[ISO/IEC 15288:2008]

NOTE 1 Resources may include diverse entities such as funds, personnel, facilities, capital equipment, tools, and utilities such as power, water, fuel and communication infrastructures.

NOTE 2 Resources may be reusable, renewable or consumable.

2.29
retirement
withdrawal of active support by the operation and maintenance organization, partial or total replacement by a new system, or installation of an upgraded system

[ISO/IEC 12207:2008]

2.30
security
all aspects related to defining, achieving, and maintaining confidentiality, integrity, availability, non-repudiation, accountability and authenticity of a system

NOTE Adapted from ISO/IEC 13335-1:2004.

2.31
service
performance of activities, work, or duties associated with a product

[ISO/IEC 12207:2008]

2.32
software product
set of computer programs, procedures, and possibly associated documentation and data

[ISO/IEC 12207:2008]

2.33
stage
period within the life cycle of an entity that relates to the state of its description or realization

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

NOTE 1 As used in this Technical Report, stages relate to major progress and achievement milestones of the entity through its life cycle.

NOTE 2 Stages may be overlapping.

2.34
stakeholder
individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

2.35
supplier
organization or an individual that enters into an agreement with the acquirer for the supply of a product or service

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

NOTE 1 Other terms commonly used for supplier are contractor, producer, seller, or vendor.

NOTE 2 The acquirer and the supplier may be part of the same organization.

2.36
system
combination of interacting elements organized to achieve one or more stated purposes

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

NOTE 1 A system may be considered as a product or as the services it provides.

NOTE 2 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" may be substituted simply by a context-dependent synonym, e.g. aircraft, though this may then obscure a system principles perspective.

2.37
system element
member of a set of elements that constitutes a system

[ISO/IEC 15288:2008]

NOTE A system element is a discrete part of a system that can be implemented to fulfil specified requirements. A system element can be hardware, software, data, humans, processes (e.g. processes for providing service to users), procedures (e.g. operator instructions), facilities, materials, and naturally occurring entities (e.g. water, organisms, minerals), or any combination.

2.38
system-of-interest
system whose life cycle is under consideration in the context of this Technical Report

[ISO/IEC 15288:2008]

2.39
task
requirement, recommendation, or permissible action, intended to contribute to the achievement of one or more outcomes of a process

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

2.40
trade-off
decision-making actions that select from various requirements and alternative solutions on the basis of net benefit to the stakeholders

[ISO/IEC 15288:2008]

2.41
user
individual or group that benefits from a system during its utilization

[ISO/IEC 12207:2008 and ISO/IEC 15288:2008]

NOTE The role of user and the role of operator may be vested, simultaneously or sequentially, in the same individual or organization.

2.42
validation
confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

[ISO 9000:2005]

NOTE Validation is the set of activities ensuring and gaining confidence that a system is able to accomplish its intended use, goals and objectives (i.e. meet stakeholder requirements) in the intended operational environment.

2.43
verification
confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

[ISO 9000:2005]

NOTE Verification is a set of activities that compares a product of the life cycle against the required characteristics for that product. This may include, but is not limited to, specified requirements, design description and the system itself.

2.44
version
identified instance of an item

[ISO/IEC 12207:2008]

NOTE Modification to a version of a product, resulting in a new version, requires configuration management action.

3 Life cycle-related concepts

3.1 System concepts

3.1.1 Introduction

This section is included to highlight and to help explain essential concepts on which this Technical Report is based. These concepts are directly applicable to software, as addressed in ISO/IEC 12207, systems, as addressed in ISO/IEC 15288, and to hardware, facilities, services, humans, processes and procedures and naturally occurring entities.

3.1.2 Systems

The systems considered in this Technical Report are man-made and utilized to provide services in defined environments for the benefit of users and other stakeholders. These systems may be configured with one or more of the following: hardware, software, services, humans, processes (e.g. review process), procedures (e.g. operator instructions), facilities and naturally occurring entities (e.g. water, organisms, minerals).

The perception and definition of a particular system, its architecture and its system elements depend on an observer's interests and responsibilities. One person's system-of-interest can be viewed as a system element in another person's system-of-interest. Conversely, it can be viewed as being part of the environment of operation for yet another person's system-of-interest.