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First edition

Systems and software engineering — Life cycle management — Specification for process description

*Ingénierie du logiciel et des systèmes — Gestion du cycle de vie —
Spécification pour la description des processus*

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

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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. In the IEC, see www.iec.ch/understanding-standards.

ISO/IEC/IEEE 24774 was prepared by Joint Technical Committee ISO/IEC 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 first edition cancels and replaces ISO/IEC TR 24774:2010, which has been technically revised.

The main changes compared to ISO/IEC TR 24774:2010 are as follows:

- process definition and examples have been updated to reflect SC 7 latest standards;
- the former ISO/IEC Technical Report has been jointly revised with IEEE as an International Standard.

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.

Introduction

For an organization to function effectively, the organization has to determine and manage numerous interrelated activities and tasks to achieve its goals. An activity or a set of activities using resources and managed in order to enable the achievement of outcomes through the transformation of inputs into outputs can be considered a process. Often the output from one process forms the input to other processes. When processes are explicitly described and performed in a systematic manner, the likelihood of consistent quality in the results is improved. Thus, process descriptions and process models (frameworks of related processes) enable consistent performance and delivery of expected results.

A number of international, national and industry standards describe processes and process reference models. The process descriptions vary in format, content and level of prescription. The purpose of this document is to encourage uniformity in the description of processes. Uniform description of processes facilitates adoption, adaptation and improvement of standardized processes, as well as process assessment. The combination of processes and the development of process views from different reference models eases the development of new models and facilitates comparison of processes.

In order for users of standards to select the appropriate forms of process description and apply them in a consistent fashion, it is desirable to develop a common characterization of all of these forms of process description. This document presents requirements for the description of processes in terms of their format, content and level of prescription. The requirements of this document can be applied to any process model developed for any purpose.

This document is intended for use by all parties that define process models, for example systems and software engineers, sector or special interest groups, professional standards groups, researchers, and process assessors.

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Systems and software engineering — Life cycle management — Specification for process description

1 Scope

This document provides an explanation of considerations involved in defining a process. This document gives requirements and recommendations for the description of processes by identifying elements and rules for their formulation.

This document also describes the use of process views.

This document explains how conformance to a process can be defined, when the process is described in accordance with this document.

This document does not describe how processes are composed or otherwise aggregated into larger frameworks or life cycle models. Nor does the document cover how to assess or evaluate the performance of a process, or the output (products) of a process.

NOTE Two prominent International Standards in process description for software and system engineering are ISO/IEC/IEEE 12207 and ISO/IEC/IEEE 15288. These two standards have very similar process models. The information items associated with their process definitions are given in ISO/IEC/IEEE 15289. Other International Standards provide further characterization of a single life cycle process by elaborating the process elements and levying specific requirements on the execution of the process.

This document is applicable when processes are described for various process definitions in any party, organization or standard relating to systems and software engineering processes.

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2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org>
- IEEE Standards Dictionary Online: available at <http://dictionary.ieee.org>

NOTE 1 For additional terms and definitions in the field of systems and software engineering, see ISO/IEC/IEEE 24765, which is published periodically as a “snapshot” of the SEVOCAB (Systems and software Engineering Vocabulary) database and is publicly accessible at computer.org/sevocab

3.1 activity

set of cohesive *tasks* (3.20) of a *process* (3.8)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.3]

3.2

base practice

activity (3.1) that, when consistently performed, contributes to achieving a specific *process purpose* (3.12)

[SOURCE: ISO/IEC 33001:2015, 3.3.2]

3.3

information item

separately identifiable body of information that is produced, stored, and delivered for human use

[SOURCE: ISO/IEC/IEEE 15289:2019, 3.1.12, modified — The preferred term "information product" has been removed; notes 1 and 2 to entry have been removed.]

3.4

life cycle

evolution of a *system* (3.18), *product* (3.16), service, project or other human-made entity from conception through retirement

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.26]

3.5

life cycle model

framework of *processes* (3.8) and *activities* (3.1) concerned with the *life cycle* (3.4), which can be organized into *stages* (3.17), acting as a common reference for communication and understanding

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.27]

3.6

output

product (3.16), result, or service generated by a *process* (3.8)

3.7

procedure

information item (3.3) that presents an ordered series of steps to perform a *process* (3.8), *activity* (3.1), or *task* (3.20)

[SOURCE: ISO/IEC/IEEE 15289:2019, 3.1.19, modified — Notes 1 and 2 to entry have been removed.]

3.8

process

set of interrelated or interacting *activities* (3.1) that transforms inputs into *outputs* (3.6)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.33]

3.9

process improvement

actions taken to improve the quality of the organization's *processes* (3.8) aligned with the business needs and the needs of other concerned parties

[SOURCE: ISO/IEC 33001:2015, 3.1.7]

3.10

process maturity

extent to which an organizational unit consistently implements *processes* (3.8) within a defined scope that contribute to the achievement of its business needs (current or projected)

Note 1 to entry: This term is "organizational process maturity" with the same definition in ISO/IEC 33001.

[SOURCE: ISO/IEC/IEEE 26511:2018, 3.1.23, modified — Note 1 to entry has been added.]

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3.11**process outcome**

observable result of the successful achievement of the *process purpose* (3.12)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.34]

3.12**process purpose**

high-level objective of performing the *process* (3.8) and the likely outcomes of effective implementation of the process

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.35, modified — Note 1 to entry has been removed.]

3.13**process reference model**

model comprising definitions of *processes* (3.8) in a domain of application described in terms of *process purpose* (3.12) and outcomes, together with an architecture describing the relationships between the processes

[SOURCE: ISO/IEC 33001:2015, 3.3.16]

3.14**process tailoring**

making, altering, or adapting a *process* (3.8) description for a particular end

EXAMPLE A project tailors its defined process from the organization's set of standard processes to meet the objectives, constraints, and environment of the project.

3.15**process view**

description of how a specified purpose and set of outcomes can be achieved by employing the *activities* (3.1) and *tasks* (3.20) of existing *processes* (3.8)

[SOURCE: ISO/IEC/IEEE 15026-1:2019, 3.2.2, modified — "may" has been changed to "can"; note 1 to entry has been removed.]

3.16**product**

result of a *process* (3.8)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.36, modified — Note 1 to entry has been removed.]

3.17**stage**

period within the *life cycle* (3.4) of an entity that relates to the state of its description or realization

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.58, modified — Notes 1 and 2 to entry have been removed.]

3.18**system**

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

[SOURCE: ISO/IEC/IEEE 15288:2015, 4.1.46, modified — Notes 1, 2 and 3 to entry have been removed.]

3.19**tailoring**

process (3.8) by which individual requirements in specifications, standards, and related documents are evaluated and made applicable to a specific project by selection, and in some exceptional cases, modification of existing or addition of new requirements

[SOURCE: ISO/IEC/IEEE 26513:2017, 3.38]

3.20

task

required, recommended, or permissible action, intended to contribute to the achievement of one or more outcomes of a *process* (3.8)

[SOURCE: ISO/IEC/IEEE 12207:2017, 3.1.66]

3.21

view

representation of a whole *system* (3.18) from the perspective of a related set of concerns

Note 1 to entry: For further details, refer to ISO/IEC/IEEE 42020:2019, 3.24.

3.22

viewpoint

specification of the conventions for constructing and using a *view* (3.21)

Note 1 to entry: A viewpoint is a pattern or template from which to develop individual views by establishing the purposes and audiences for a view, and the techniques for its creation and analysis.

Note 2 to entry: For a detailed explanation of view and viewpoint and how they can be defined and used, see ISO/IEC/IEEE 42010.

Note 3 to entry: For further details, refer to ISO/IEC/IEEE 42020:2019, 3.25.

4 Conformance

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Full conformance to this document can be claimed if process descriptions defined using the requirements of this document clearly cover the required elements (5.2). Any of the optional elements (5.3) may also be included either as requirements, recommendations, examples or suggestions.

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5 Specification of a process description and its elements

5.1 Elements of process description

This document characterizes the following elements of process description:

- name;
- purpose;
- outcomes;
- activities;
- tasks;
- inputs;
- outputs;
- controls and constraints.

5.2 Process and related concepts

As defined in 3.7, a process is a set of interrelated or interacting activities that transforms inputs into outputs. Figure 1 shows a typical representation of this transformation.

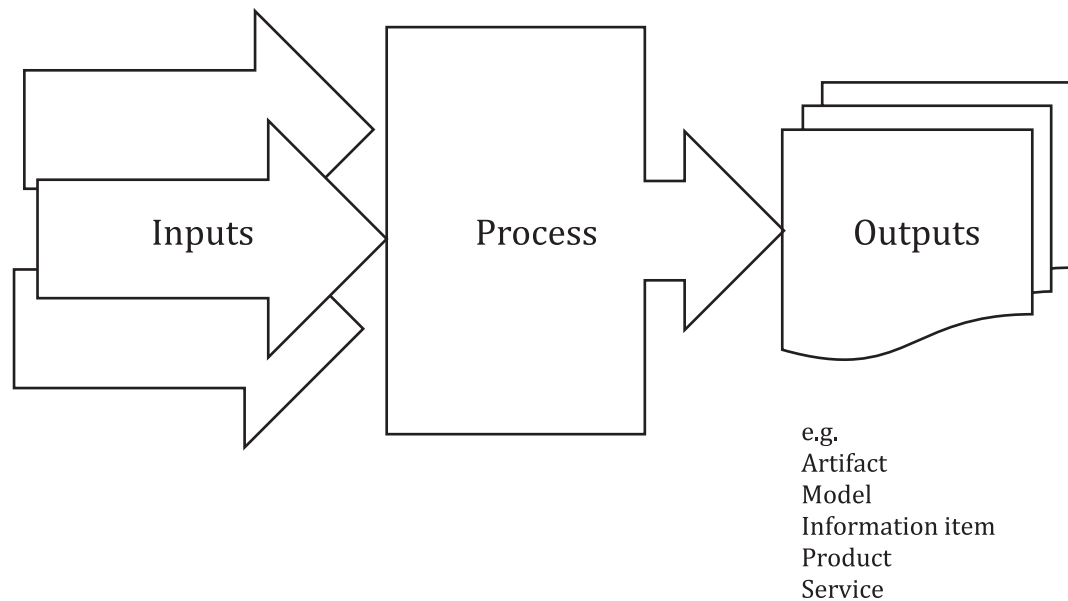


Figure 1 — Basic process

There is no fixed dividing line between what constitutes a process and what is considered as a sub-process or an activity within a process. Typically, processes are achieved through the performance of activities comprising groups of related tasks. A significant activity of interest with numerous tasks can also be described as a process if it were useful to treat the activity of interest in detail. The limits of a process generally are determined by the production of a major output and outcomes, rather than the intermediate outputs produced by activities within the process. Additionally, if processes are highly automated and require little human control or intervention, it can be appropriate to combine several processes into one process description.

NOTE 1 Often a set of processes are developed; and some processes are decomposed into more than one level. However, decomposition of processes into more than three levels is likely to be confusing and hard for humans to use.

Procedures differ from process descriptions in that procedures are written in steps to be followed in order. Procedures can be written as instructions to the persons performing the procedure. Procedures can also be written to assist an evaluator or auditor to understand the procedure, especially its controls or outputs.

NOTE 2 ISO/IEC/IEEE 82079-1 provides detailed requirements for writing instructions.

Required activities are stated in process descriptions using either the imperative (as a command), or as a 'shall' statement.

NOTE 3 [Annex A](#) shows different examples of the expression of mandatory/required process elements as used in sample process descriptions.

Complete processes generally involve several types of generic activities ([Table 1](#)).

Table 1 — Model of generic activities within a process

Generic activity	Example activities in the design definition process	Example activities/task in the implementation process
Strategize and plan (Plan)	Prepare for software system design definition	Prepare for implementation
Perform (Do)	Establish designs related to each software system element.	Perform implementation
NOTE Adapted from ISO/IEC/IEEE 24748-3:2020, Table 1.		

Table 1 (continued)

Generic activity	Example activities in the design definition process	Example activities/task in the implementation process
Evaluate and decide (Check)	Assess alternatives for obtaining software system elements	Evaluate software unit and affiliated data or other information according to the implementation strategy and criteria.
Manage outcomes and outputs (Act): Preserve and present artefacts and information items	Manage the design.	Manage results of implementation
NOTE Adapted from ISO/IEC/IEEE 24748-3:2020, Table 1.		

Generally, several software or systems engineering processes are performed concurrently during a life cycle stage. However, concurrent activities (e.g. installation and quality assurance inspections) are not necessarily part of the same process, since their purpose, resources, methods, outputs, and outcomes are different.

Process descriptions may be used either to describe generic processes (for example “project management process”) or to describe a particular instance of a generic type (for example “project management process for project A”). For specific process descriptions, generic process descriptions may be instantiated with respect to roles or responsibilities, resources, required inputs and outputs, constraints and controls, and time. [Annex A](#) provides examples of process descriptions used to develop a process model. [Annex B](#) provides a technique for demonstration of process traceability between elements, using an example process from [Annex A](#).

Processes are often combined to form a process model (framework of related processes). ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207, for example, provide life cycle process reference models for systems and software in which outcomes are defined and activities grouped for generic life cycle process description. Based on ISO/IEC/IEEE 15288:2015, Annex A and ISO/IEC/IEEE 12207:2017, Annex A, organizations or projects can apply process tailoring to suit the nature of the effort.

NOTE 4 ISO/PAS 19450 specifies concepts, semantics, and syntax of Object-Process Methodology as a modelling paradigm and language for producing conceptual models at various extents of detail.

Various schemas for characterizing and evaluating process maturity, capability or quality are in use. These schemas typically distinguish between levels of process performance and involve process improvement. Process levels can involve following the process repeatedly to successfully achieve its outcome or produce specified output, and automating and improving the process. The choice of details in the process description can be used to characterize the process description at a certain level of process maturity, capability or quality.

NOTE 5 ISO/IEC 33020 defines a process measurement framework for the assessment of process capability.

5.3 Process description – required elements

5.3.1 General

A process description can include the elements as shown in [Figure 2](#). The minimum required elements for a process description shall be the name, purpose, and outcomes. Optional elements, such as outputs, activities, and tasks, may be included in process descriptions.

The goals and objectives of performing a process shall be described by using the elements of name, purpose, and outcomes. These elements are used to describe intended results without the necessity of performing structural decomposition of the process. Processes defined using name, purpose, and outcomes provide a common starting point for process implementation and process assessment.

NOTE ISO/IEC/IEEE 15288:2015, Figure D.1 and ISO/IEC/IEEE 12207:2017, Figure D.1 show a process construct. ISO/IEC/IEEE 24748-1:2018, Annex A also describes process elements.