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

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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.

ISO/IEC IEEE 24774 was prepared by ISO/IEC Joint Technical Committee (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 document cancels and replaces ISO/IEC TR 24774:2010. The main changes compared to the previous edition are as follows:

— Process definition and examples have been updated to reflect SC7 latest standards;

— The former ISO/IEC Guidance document (Technical Report) has been jointly revised with IEEE as a normative standard.

Any feedback or questions on this document shall be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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 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.

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.

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 to entry 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 of a process

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

3.2
base practice
activity that, when consistently performed, contributes to achieving a specific process purpose

[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]

3.4
life cycle
evolution of a system, product, 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 and activities concerned with the life cycle that can be organized into stages, which also acts as a common reference for communication and understanding

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

3.6
output
product, result, or service generated by a process

3.7
procedure
information item that presents an ordered series of steps to perform a process, activity, or task

[SOURCE: ISO/IEC IEEE 15289:2019, 3.1.19]

3.8
process
set of interrelated or interacting activities that transforms inputs into outputs

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

3.9
process improvement
actions taken to improve the quality of the organization's processes 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 within a defined scope that contribute to the achievement of its business needs (current or projected)

[SOURCE: ISO/IEC IEEE 26511:2018, 3.1.23]

Note 1 to entry: to entry: This term is “Organizational Process Maturity” with the same definition in ISO/IEC 33001.

3.11
process outcome
observable result of the successful achievement of the process purpose

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

3.12
process purpose
high-level objective of performing the process and the likely outcomes of effective implementation of the process

[SOURCE: ISO/IEC IEEE 12207:2017, 3.1.35]

3.13
process reference model
PRM
model comprising definitions of processes in a domain of application described in terms of process purpose 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 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 and tasks of existing processes

[SOURCE: ISO/IEC IEEE 15026-1:2019, 3.2.2]

3.16
product
result of a process

[SOURCE: ISO/IEC IEEE 12207:2017, 3.1.36]

3.17
stage
period within the life cycle of an entity that relates to the state of its description or realization]

[SOURCE: ISO/IEC IEEE 12207:2017, 3.1.58]

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 omitted]

3.19
tailoring
process 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

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

3.21
view
representation of a whole system 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

Note 1 to entry: Note1 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 42010.

Note 3 to entry: to entry Further detail is found in ISO/IEC IEEE 42020:2019, 3.25]

4 Conformance

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

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

In its definition [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.

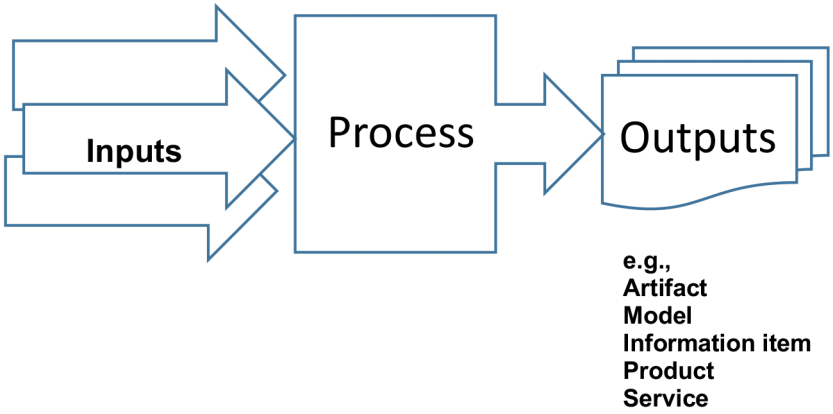

Figure 1 — Basic Process

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 could 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 may 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 82079-1:2019 provides detailed requirements for writing instructions.

In English, normative (i.e. mandatory, required) process elements are stated in process descriptions using either the imperative (as a command), or as a 'shall' ' statement, or as explicitly identified as normative, regardless of the wording used.

NOTE 3 Annex A shows different examples of the expression of normative 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
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

[Source: ISO/IEC IEEE 24748-3:2020]

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.

NOTE 4 ISO/PAS 19450:2015 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 schema for characterizing and evaluating process maturity, capability or quality are in use. These typically distinguish between levels of having a defined and described process, 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, can be included in process descriptions.