International Standard

ISO/IEC/IEEE 24748-1

Second edition 2024-03

Systems and software engineering — Life cycle management —

Part 1: Guidelines for life cycle management

Ingénierie des systèmes et du logiciel — Gestion du cycle de vie — Partie 1: Lignes directrices pour la gestion du cycle de vie

Reference number
ISO/IEC/IEEE 24748-1:2024(en)

© ISO/IEC 2024
© IEEE 2024



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2024
© IEEE 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO or IEEE at the respective address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Institute of Electrical and Electronics Engineers, Inc
3 Park Avenue, New York
NY 10016-5997, USA

Email: stds.ipr@ieee.org
Website: www.ieee.org

Published in Switzerland

Contents

Page

Foreword ..... **v**
Introduction ..... **vii**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Life cycle-related concepts **11**
4.1 General 11
4.2 System concepts 11
4.2.1 General 11
4.2.2 Systems 12
4.2.3 System structure 12
4.2.4 Enabling systems 13
4.3 Life cycle concepts 15
4.3.1 System life cycle model 15
4.3.2 System life cycle stages 18
4.3.3 Stages in a SoI and its enabling systems 19
5 Life cycle stages **20**
5.1 General 20
5.2 Concept stage 21
5.2.1 Overview 21
5.2.2 Purpose 22
5.2.3 Outcomes 22
5.3 Development stage 23
5.3.1 Overview 23
5.3.2 Purpose 23
5.3.3 Outcomes 23
5.4 Production stage 24
5.4.1 Overview 24
5.4.2 Purpose 24
5.4.3 Outcomes 24
5.5 Utilization stage 24
5.5.1 Overview 24
5.5.2 Purpose 25
5.5.3 Outcomes 25
5.6 Support stage 25
5.6.1 Overview 25
5.6.2 Purpose 25
5.6.3 Outcomes 26
5.7 Retirement stage 26
5.7.1 Overview 26
5.7.2 Purpose 26
5.7.3 Outcomes 26
6 Life cycle model adaptation **27**
6.1 General 27
6.2 Adaptation sequence 27
6.2.1 General 27
6.2.2 Identification of the project environment and characteristics 27
6.2.3 Solicitation of inputs 28
6.2.4 Selection of appropriate standards 28
6.2.5 Selection of development approach 28
6.2.6 Selection of life cycle model 29
6.2.7 Selection of process model 29
6.2.8 Documentation of decisions and rationale 29

© ISO/IEC 2024 – All rights reserved
© IEEE 2024 – All rights reserved

6.3 Life cycle model adaptation guidance 29
6.3.1 General 29
6.3.2 Scope adaptation 30
6.3.3 Stage adaptation 30
6.3.4 Life cycle model adaptation for domains, disciplines and specialties 30
6.4 Evaluation-related activities 33
7 Relationship with detailed process standards 34
Annex A (informative) **Process concepts 36**
Annex B (informative) **Organizational concepts 49**
Annex C (informative) **Project concepts 51**
Annex D (informative) **Process views 56**
Annex E (informative) **Guidance on development approaches and build planning 66**
Annex F (informative) **Candidate joint stakeholder reviews 69**
Annex G (informative) **Problem reporting capability 72**
Bibliography 74
IEEE notices and abstract 77

© ISO/IEC 2024 – All rights reserved
© IEEE 2024 – All rights reserved

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 document 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).

IEEE Standards documents are developed within the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Association (IEEE-SA) Standards Board. The IEEE develops its standards through a consensus development process, approved by the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Institute and serve without compensation. While the IEEE administers the process and establishes rules to promote fairness in the consensus development process, the IEEE does not independently evaluate, test, or verify the accuracy of any of the information contained in its standards.

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and https://patents.iec.ch. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

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.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, 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 24748-1:2018), which has been technically revised.

The main changes are as follows:

— added system of systems topics based on ISO/IEC/IEEE 21839, ISO/IEC/IEEE 21840 and ISO/IEC/IEEE 21841;

— added references for interfacing and interoperating systems and general updates from ISO/IEC/IEEE 15288:2023;

— added more recent life cycle models such as DEVOPS.

A list of all parts in the ISO/IEC/IEEE 24748 series can be found on the ISO and IEC websites.

© ISO/IEC 2024 – All rights reserved
© IEEE 2024 – All rights reserved

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.

© ISO/IEC 2024 – All rights reserved
© IEEE 2024 – All rights reserved

Introduction

The purpose of this document is to facilitate the use of the process content of ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 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 in turn helps a project team design a life cycle model for the system-of-interest to facilitate managing the progress of their project. Hence, ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207 are the documents that apply the concepts found in this document to specific processes.

NOTE ISO/IEC/IEEE 16326 and ISO/IEC/IEEE 24641 also apply the concepts found in this document, in the process context for project management and model-based approaches respectively.

This document also aids in identifying and planning use of life cycle processes described in ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207 that enable the project to be completed successfully, meeting its objectives/requirements for each stage and for the overall project.

There is also increasing recognition of the importance of helping to ensure that all life cycle stages and all aspects within each stage are supported with thorough guidance to enable alignment with any process documents that can be created later that focus on areas besides systems and software, including hardware, humans, data, 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 document, the users of the process-focused ISO/IEC/IEEE 12207 and ISO/IEC/IEEE 15288 benefit not only from having one complementary document that addresses the management of life cycles of systems that provide products or services, but also from a framework that links life cycle management aspects to more than just the systems or software aspects of products or services. Additional discussion for system of systems can be found in ISO/IEC/IEEE 21839, ISO/IEC/IEEE 21840 and ISO/IEC/IEEE 21841.

In the context of this document, ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207, there is a continuum of human-made systems from those that use little to no software to those in which software is the primary interest. When software is the predominant system or element of interest, ISO/IEC/IEEE 12207 should be used. Both documents have the same process model, share most activities and tasks and differ primarily in descriptive notes. The determination of the applicability of ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207 should be decided by the nature of the system and its enabling systems. Often, a mixed tailoring of each standard can be appropriate.

ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207 also have published guidance documents (ISO/IEC/IEEE 24748-2 and ISO/IEC/IEEE 24748-3), respectively, to support use of the two International Standards individually.

© ISO/IEC 2024 – All rights reserved
© IEEE 2024 – All rights reserved

Systems and software engineering — Life cycle management —

Part 1: Guidelines for life cycle management

1 Scope

This document provides guidance for the life cycle management of systems and software, complementing the processes described in ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207. This document:

— addresses systems concepts and life cycle concepts, models, stages, processes, process application, key points of view, adaptation and use in various domains and by various disciplines;

— establishes a common framework for describing life cycles, including their individual stages, for the management of projects that provide or acquire either products or services;

— defines the concept 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 applying the processes in ISO/IEC/IEEE 15288 (systems aspects) and ISO/IEC/IEEE 12207 (software systems 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, risk management and model-based systems and software engineering.

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 terminology databases for use in standardization at the following addresses:

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

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

— 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.

© ISO/IEC 2024 – All rights reserved
© IEEE 2024 – All rights reserved