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Standard**

**ISO/IEC/IEEE  
24748-4**

**Systems and software  
engineering — Life cycle  
management —**

**Part 4:  
Systems engineering management  
planning**

*Ingénierie des systèmes et du logiciel — Gestion du cycle de vie —  
Partie 4: Planification de la gestion de l'ingénierie des systèmes*

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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 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](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

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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](http://www.iso.org/iso/foreword.html). In the IEC, see [www.iec.ch/understanding-standards](http://www.iec.ch/understanding-standards).

This document 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 second edition cancels and replaces the first edition (ISO/IEC/IEEE 24748-4:2016), which has been technically revised.

The main changes are as follows:

- aligns with updates to ISO/IEC/IEEE 15288:2023, ISO/IEC/IEEE 24748-1:2024, ISO/IEC/IEEE 24748-2:2024, ISO/IEC/IEEE 16085:2021, and ISO/IEC/IEEE 29148:2018;
- streamlines and reduces redundancies from the publication of ISO/IEC/IEEE 16326:2019;
- maintains harmonization with new documents within the SC 7 portfolio, including ISO/IEC/IEEE 15289, ISO/IEC/IEEE 15939, ISO/IEC/IEEE 21839, ISO/IEC/IEEE 21840, ISO/IEC/IEEE 21841, ISO/IEC/IEEE 24748-7 and ISO/IEC/IEEE 24748-8;
- addresses feedback from users and the advancement of system-related technologies, including systems of systems and model-based systems and software engineering;

## ISO/IEC/IEEE 24748-4:2026(en)

- adds a new annex with an expanded process view for systems engineering management planning;
- adds a new annex with example information item content mapping tables;
- removes provisions for conformance to process.

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

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](http://www.iso.org/members.html) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).

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## Introduction

ISO/IEC/IEEE 15288 provides a common process framework covering the life cycle of human-made systems, from 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 common framework improves communication and cooperation among the parties that create, utilize, and manage modern systems in order that they can work in an integrated, coherent fashion.

The acquisition or supply of a system is usually done within a project. A project prepares and implements the technical planning, resources and schedules necessary to guide the project toward accomplishment of its objectives and proper conclusion. The project's authorization and objectives are documented in an information item typically identified as a systems engineering management plan (SEMP).

This document defines a SEMP as the key vehicle for representing a project's application of systems life cycle processes. In this document, the terms technical planning and systems engineering (SE) planning are used interchangeably to emphasize or differentiate technical contributions in the processes under discussion.

In many organizations, the various responsibilities of technical management are assigned to more than one person. Where the term "technical manager" or "systems engineering manager" is used in this document, the guidance, advice or normative requirement applies to the applicable role within the project or organization.

NOTE ISO/IEC/IEEE 24748-1 and ISO/IEC/IEEE 24748-2 provide guidance on the application of ISO/IEC/IEEE 15288, including definition or expansion of important organization, project, process, and life cycle model concepts and their adaptation for successful project implementation.

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# Systems and software engineering — Life cycle management —

## Part 4: Systems engineering management planning

### 1 Scope

This document:

- provides an expanded view of the processes from ISO/IEC/IEEE 15288 that implement systems engineering (SE) management for the life cycles of technical solutions;
- describes a required information item, termed the systems engineering management plan (SEMP) for the technical management and execution of the SE of technical solutions,
- provides requirements and guidance for the content of the required information item.

This document is applicable to:

- those who use or plan to use ISO/IEC/IEEE 15288 on projects dealing with human-made systems, products and services;
- those who are responsible for the technical management of projects concerned with the engineering of systems;
- those responsible for planning or executing ISO/IEC/IEEE 15288 system life cycle processes at a project level;
- organizations and individuals involved with a technical project management effort;
- anyone developing engineering management documentation to complete technical planning aspects of their project's processes.

This document is intended to provide guidance for two-party situations and can be equally applied where the two parties are from the same organization. This document can also be used by a single party as self-imposed tasks.

This document can also serve as guidance in multi-party situations, where high risks are inherent in the supply and integration of complex systems, and procurement can involve several suppliers, organizations or parties.

### 2 Normative references

There are no normative references in this document.

### 3 Terms, definitions and abbreviated terms

#### 3.1 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:

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

NOTE 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 which is publicly accessible at <http://www.computer.org/sevocab>.

### **3.1.1 audit**

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

[SOURCE: ISO 9000:2015, 3.13.1, modified — Notes to entry have been removed.]

### **3.1.2 include**

<information> has either the information or a reference to the information

[SOURCE: ISO/IEC/IEEE 15289:2019, 3.1.11]

### **3.1.3 information item**

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

Note 1 to entry: A document produced to meet information requirements can be an information item, part of an information item, or a combination of several information items.

Note 2 to entry: An information item can be produced in several versions during a project or system life cycle.

[SOURCE: ISO/IEC/IEEE 15289:2019, 3.1.12]

### **3.1.4 measure of effectiveness MoE**

measures that define the acquirer’s key indicators of achieving the mission needs for performance, suitability and affordability across the life cycle

[SOURCE: INCOSE Systems Engineering Handbook, 5th ed., © 2023 John Wiley & Sons Ltd. Used with permission.]

### **3.1.5 measure of performance MoP**

measure to assess whether the system meets design or performance requirements and has the capability to achieve operational objective

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### **3.1.6 plan**

*information item* (3.1.3) that presents a systematic course of action for achieving a declared purpose, including when, how, and by whom specific activities are to be performed

[SOURCE: ISO/IEC/IEEE 15289:2019, 3.1.16]

### 3.1.7 systems engineering management plan SEMP

top-level technical *plan* (3.1.6) for managing the systems engineering effort which defines how the technical aspects of the project will be organized, structured, and conducted and how the systems life cycle processes will be controlled to provide a product that satisfies stakeholder requirements

Note 1 to entry: An alternate title, such as a systems engineering plan (SEP), can be used.

Note 2 to entry: The content of the SEMP can be incorporated into another plan such as a single integrated engineering management plan (IEMP) that includes other management plans such as project, configuration management and risk.

Note 3 to entry: The content of the SEMP can be distributed across multiple plans.

Note 4 to entry: This document does not prescribe the form of the *information item* (3.1.3). The content of the SEMP can be in the form of documents or models or other form(s) appropriate to the context of the project.

### 3.1.8 technical performance measure TPM

measure to assess design progress, compliance to performance requirements, or technical risks and provide visibility into the status of important technical parameters to enable effective management, thus enhancing the likelihood of achieving the technical objectives of the project

[SOURCE: INCOSE Systems Engineering Handbook, 5th ed., © 2023 John Wiley & Sons Ltd. Used with permission.]

## 3.2 Abbreviated terms

CS	constituent system
DE	digital engineering
INCOSE	International Council on Systems Engineering
MBSE	model-based systems engineering
MBSSE	model-based system and software engineering
PMP	project management plan
PLM	product life cycle management
QA	quality assurance
SE	systems engineering
SEP	systems engineering plan
SoI	system of interest
SoS	system of systems
WBS	work breakdown structure

## 4 Conformance

### 4.1 Intended usage

This document provides guidance for the execution of the ISO/IEC/IEEE 15288 processes related to the planning and managing a project to implement a significant technical effort. This document also provides

normative definition of the content and recommendations for the related information item, the project's SEMP.

## 4.2 Full conformance

This document provides one approach to the requirements for an information item – the SEMP.

A claim of full conformance to this document means that:

- the user produces the required information item stated in this document; and
- the user demonstrates that the information item produced during the project planning activities conforms to the content requirements defined in this document.

The requirements for the information item in this document are contained in [Clause 6](#).

The requirements for the content of the information item in this document are contained in [Clause 6](#).

This document addresses all of the information item elements of ISO/IEC/IEEE 15289:2019, 7.3 and 10.42, but does not assert a claim of conformance to that document.

NOTE 1 If a user of this document claims full conformance to ISO/IEC/IEEE 15289, it does not imply that the user can claim conformance to the information items and information item content in this document. The reason is that this document adds additional information items and additional detail.

NOTE 2 In this document, for simplicity of reference, an information item is described as if it were published as a separate document. However, information items are considered as conforming if they are unpublished but available in a repository for reference or divided into separate documents or volumes.

## 4.3 Tailored conformance

The tailoring process shall be in accordance with [Annex A](#).

# 5 Key concepts and their application

## 5.1 General

This clause presents concepts that apply to and are necessary to understand the SE planning aspects of a project and for the development and content of a project's SEMP.

The agreement processes of ISO/IEC/IEEE 15288 define the activities necessary to establish an agreement between two organizations. The organizational project-enabling processes of ISO/IEC/IEEE 15288 are concerned with providing the resources needed to enable the project to meet the needs and expectations of the organization's stakeholders. The technical management processes of ISO/IEC/IEEE 15288 are concerned with managing the resources and assets allocated by organization management and with applying them to fulfil the agreements into which the organization or organizations enter. The technical processes of ISO/IEC/IEEE 15288 are concerned with technical actions throughout the life cycle. Technical processes transform the needs of stakeholders into products or services.

This document unifies and supplements the extensive application information available to assist organizations and project management teams in their SE management planning.

Development of a SEMP presupposes an understanding of several key concepts. Foundational material that explains these concepts is discussed or identified in [5.2](#) to [5.10](#).

## 5.2 System concepts

System concepts for systems that are any mix of products and services are introduced in ISO/IEC/IEEE 15288:2023, 5.2. Additional discussion is in ISO/IEC/IEEE 24748-1:2024, 4.2, which explains systems, system boundaries, structure in systems and projects, and enabling systems.

### 5.3 Life cycle concepts

System life cycle concepts are introduced in ISO/IEC/IEEE 15288:2023, 5.5. Additional discussion is in ISO/IEC/IEEE 24748-1:2024, 4.3.

Project life cycle concepts and application are addressed in ISO/IEC/IEEE 16326.

The INCOSE SE Handbook<sup>[20]</sup> discusses system life cycle concepts in terms of business, budget and technical aspects, and project cycles in terms of decision gates. Discussion of different methods, implementation strategies and case studies highlight some of the decisions facing organizations and projects in determining appropriate system and life cycle models to employ. Planning and management need to account for the SoS considerations in ISO/IEC/IEEE 21839 and plan in the context of ISO/IEC/IEEE 21840.

### 5.4 Process concepts

ISO/IEC/IEEE 24774 provides foundational discussion of process concepts to encourage consistency in development of standard process reference models. It presents guidelines for the elements used most frequently in describing a process: the title, purpose, outcomes, activities, tasks and information items.

Process concepts are introduced in ISO/IEC/IEEE 15288:2023, 5.6.

ISO/IEC/IEEE 15288 establishes a top-level framework of the life cycle of systems from conception through retirement. The framework is constructed with a set of processes and interrelationships among these processes.

The recursive, iterative and concurrent application of processes is discussed in ISO/IEC/IEEE 15288:2023, 5.8.2.

### 5.5 Organizational concepts

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. In ISO/IEC/IEEE 15288, when an organization, as a whole or a part, enters into an agreement, it is a “party” to the agreement. Organizations are separate bodies, but the parties can be from the same organization or from separate organizations.

Organizational concepts, such as responsibility, organizational relationships and project organizational structure, are discussed in ISO/IEC/IEEE 24748-2:2024, 6.5 and ISO/IEC/IEEE 15288:2023, 5.3.

### 5.6 Project concepts

A project can be viewed as a single endeavour, unique in its purpose and consisting of various implemented life cycle processes.

ISO/IEC/IEEE 24748-1:2024, 4.2.3 discusses system structure and implications in projects.

ISO/IEC/IEEE 24748-1:2024, 4.2.4, explains enabling systems in terms of the system-of-interest and its operational environment.

ISO/IEC/IEEE 24748-2:2024, 6.6, discusses project concepts, relationships among projects, project relationships with enabling systems and hierarchy of projects.

ISO/IEC/IEEE 16326 provides more information on project management and the information item, project management plan (PMP).

### 5.7 System of system concepts

A system of systems (SoS) is a set of systems that interact to provide a unique capability that none of the constituent systems (CS) can accomplish on its own. In the context of SoS, the relevant pieces of the system

of interest (SoI) are, by definition, systems themselves. An SoS consists of some number of CS, plus any inter-system infrastructure, facilities, and processes necessary to enable the CS to integrate or interoperate.

An essential characteristic of the SoS is that CS within the SoS are operationally independent. That is, the CS can (and do) operate independently to fulfil some number of purposes on their own, separate from the SoS. While CS operate independently from each other for their own purposes, they also operate interdependently with each other and other elements to produce the SoS outputs. CS are never totally independent, yet they are also never totally subservient to the SoS.

Another essential characteristic is that CS within the SoS are both managerially independent and interdependent. Managerial independence suggests that the CS can be managed by organizations that retain some degree of independence even though they are interdependent while participating in SoS. The implication is that these organizations can have goals and objectives for the CS that differ from those of the SoS and the other CS. If so, there is likely some degree of independence and interdependence of governance, as well as some degree of independence and interdependence of management. For systems that participate in SoS, the SEMP should elaborate shared or distributed responsibilities for interface management, configuration control, and governance agreements across organizational boundaries.

Using essential characteristics to partition the various types of SoS provides an abbreviated nomenclature for thinking about SoS. ISO/IEC/IEEE 21841 defines a normalised taxonomy for SoS to facilitate communications among stakeholders. It also briefly explains what a taxonomy is and how it applies to the SoS to aid in understanding and communication. There are many characteristics such as scale and scope, around which taxonomies can be derived.

ISO/IEC/IEEE 21839 provides a set of SoS considerations to be addressed at key points in the life cycle of the SoI. The considerations and key points align with those which are introduced in this document. Selected subsets of these considerations can be applied throughout the life of systems through the involvement of stakeholders. The ultimate goal is to achieve stakeholder satisfaction, so that when delivered, the SoI operates effectively in the operational environment which is typically characterized as one or more systems of systems.

ISO/IEC/IEEE 21840 provides guidance for the utilization of this document in the context of SoS. While this document applies to systems in general (including CS), ISO/IEC/IEEE 21840 provides guidance on the application of these processes to the special case of SoS.

## 5.8 Model-based SE and digital engineering concepts

Model-based SE (MBSE) or model-based systems and software engineering (MBSSE) is “formalized applications of modelling to support systems and software engineering.”<sup>[9]</sup> Digital engineering (DE) facilitates a shift from a design-build-test approach to a model-analyse-build approach<sup>[21]</sup>.

ISO/IEC/IEEE 24641 deals with the tool capabilities and methods for model-based systems and software engineering (MBSSE). ISO/IEC/IEEE 24641:

- specifies a reference model for the overall structure and processes of MBSSE-specific processes, and describes how the components of the reference model fit together;
- specifies interrelationships between the components of the reference model;
- specifies MBSSE-specific processes for model-based systems and software engineering; the processes are described in terms of purpose, inputs, outcomes and tasks;
- specifies methods to support the defined tasks of each process;
- specifies tool capabilities to automate or semi-automate tasks or methods.

ISO/IEC/IEEE 24641 does not bring any additional life cycle processes for system and software but specifies an MBSSE reference model considered as activities, not only from the life cycle perspectives of SE problem solving and the system-of-interest evolution, but also from the cognitive perspectives of modelling and model management, which can sustain and facilitate the system and software life cycle processes during digital transformation and in the digital age.

## 5.9 Information items concepts

ISO/IEC/IEEE 15289 provides more detail on information items and specifies how life cycle data is managed in information items.

NOTE This document uses the term “include” in the same sense as ISO/IEC/IEEE 15289:2019, 3.1.11, that the information “has either the information or a reference to the information.”

ISO/IEC/IEEE 15289 indicates that an information item is required to be consistent with an information item generic type. The key information item addressed in this document is of type plan.

As noted in ISO/IEC/IEEE 24748-2:2024, 6.7.4.1, “Plans are developed to define project goals and objectives (why?), the work that needs to be accomplished (what?), the project schedule (when?), the project organizational structure (who?), and how the organization’s processes, policies and procedures are adapted to match project-specific needs (how?). Plans should include the scope, tasks, methods, tools, measures, risks and resources for applicable system or system element implementation, integration, verification, transition and validation processes, so that each contingency option can be efficiently and effectively used.”

ISO/IEC/IEEE 15289:2019, Clause 7 identifies several generic types of information items and provides generic content for each information item type.

ISO/IEC/IEEE 15289:2019, 7.3 provides generic content elements for plans.

Each information item produced as a document supports certain life cycle data characteristics. Documents are produced and communicated for human use and contain formal elements (such as purpose, scope, and summary), intended to make them usable by their intended audience.

ISO/IEC/IEEE 15289:2019, 6.4 provides requirements for the management of information items through the application of ISO/IEC/IEEE 15288 processes. These include the information management process and select activities from the knowledge management process.

## 5.10 SEMP development concepts

Systems engineering management planning can be applied for technical efforts as practiced across an entire organization, or to specific projects. The SEMP should be developed in the earliest project planning stages. It is tightly coupled with Project Management Plan (PMP) development and content. Although sometimes combined with the PMP, the SEMP is typically a separate information item that focuses on managing the technical project management effort.

The SEMP provides an explanation of what needs to be done, how it will be done, who will do it, when it will be done and where it will be done; as well as how much of a resource is necessary to do the work for each technical process. The SEMP explains these activities and tasks within established constraints of resources and staff and in order to meet cost, schedule and performance requirements within acceptable risks.

A SEMP should be periodically updated as plans are solidified or modified, activities move from plans to historical facts, known risks are mitigated or significantly changed, new risks are identified, new tools and technologies are adopted, and as a myriad of other factors cause an adjustment to the project’s overall technical approach. Thus, it is expected that the SEMP will evolve over time and go through revisions when a new agreement is awarded, or as the project moves from stage to stage. The SEMP should include versioning and change history tracking, aligned with the project’s configuration management plans. The SEMP should reference or provide a link to other relevant planning information items, especially those that include more detailed planning information for topics in the SEMP.

ISO/IEC/IEEE 16326 supplements the technical management processes of ISO/IEC/IEEE 15288, providing detailed guidance and normative content specifications for project management plans. ISO/IEC/IEEE 16326 notes that a SEMP is typically developed at a lower level of abstraction than the PMP to address and gather most of the other plans required to satisfy product requirements and agreement terms (e.g. specialty plans for safety, security, training, integration, transition). Technical plans such as the SEMP need to coordinate the technical and management aspects of a project (or many projects) across one or more organizations to help ensure successful achievement of organizational and agreement goals for the project. A SEMP will typically complete or supplement plan elements initiated at the PMP level. Organizational processes, agreement