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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

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Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**
3.1 Index of terms 2
3.2 Architecting concepts 3
3.3 Entity related concepts 4
3.4 Architecture design concepts 6
3.5 Architecture description concepts 8
3.6 Entity life cycle concepts 9

4 Architecture concepts **10**
4.1 Overview 10
4.2 Architecture and architecting 10
4.2.1 Introduction 10
4.2.2 Architecting effort 11
4.2.3 Architecture features 12
4.2.4 Fundamental concepts and essential properties 13
4.2.5 Architecting principles and architecture principles 14
4.3 Architecture design and solution design 15
4.3.1 Architecting effort to produce an architecture design 15
4.3.2 Outcomes of an architecting effort 17
4.3.3 Primary entity of interest and related entities of interest 18
4.3.4 Architecture alternatives investigation 18
4.3.5 Environment and context 18
4.4 Architecture definition and communication 19
4.4.1 Architecture information package contents 19
4.4.2 Architecture and solution design information characteristics 20
4.4.3 Engineering effort to produce a solution design 21
4.4.4 Outcomes of an engineering effort 21
4.5 Stakeholder concerns and architectural aspects 21
4.5.1 Stakeholders and their perspectives 21
4.5.2 Stakeholder concerns 22
4.5.3 Architectural aspects 22
4.6 Architecture viewpoints and architecture views 24
4.6.1 Architecture viewpoints 24
4.6.2 Architecture views 24
4.7 Architecture frameworks and architecture description languages 25
4.7.1 Architecture description framework 25
4.7.2 Architecture evaluation framework 25
4.7.3 Architecture description language 26
4.8 Architecture descriptions and architecture models 26
4.8.1 Architecture descriptions 26
4.8.2 Structuring architecture descriptions 26
4.8.3 Architecture models 27
4.9 Reference architectures and reference models 28
4.9.1 Uses of reference architectures 28
4.9.2 Reference models, styles and design patterns 29
4.9.3 Reference architecture descriptions 29
4.10 Life cycle and life history 29
4.10.1 Overview of life cycle concepts 29
4.10.2 Visual representation of life cycle concepts 30
4.10.3 Life cycle elements 31
4.10.4 Life cycle modelling 32

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4.11 Architecting precepts ... 33
4.11.1 Architecture governance and management precepts ... 33
4.11.2 Architecture evaluation precepts ... 34
4.11.3 Architecture enablement precepts ... 35

5 Architecting principles ... 36
5.1 Introduction ... 36
5.2 Principles about the purpose of an architecture ... 37
5.2.1 Separation of concerns ... 37
5.2.2 Identification of key characteristics ... 38
5.2.3 Embodiment of decisions ... 39
5.2.4 Abstraction of entities ... 40
5.3 Principles about the focus of an architecture ... 41
5.3.1 Focus on value ... 41
5.3.2 Focus on effectiveness ... 42
5.3.3 Focus on intended use ... 43
5.3.4 Focus on decisions ... 44
5.4 Principles about architecting outcomes ... 45
5.4.1 Formulation of architecture features ... 45
5.4.2 Definition of relationships and interfaces ... 46
5.4.3 Development of entity realization principles ... 47
5.4.4 Development of entity evolution principles ... 48

Annex A (informative) **Notes on terms and concepts ... 50**

Annex B (informative) **Determining architectural significance of concepts and properties ... 60**

Annex C (informative) **A formal approach to distinguish architecture design statements from other design statements ... 68**

Bibliography ... 72

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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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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 42024 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*, in cooperation with the Software and Systems Engineering Standards Committee of the Computer Society of the IEEE, under the Partner Standards Development Organization cooperation agreement between ISO and IEEE.

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.

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Introduction

This document specifies the fundamentals of architecture practice by providing a core set of vocabulary, architecture concepts and architecting principles. The intent of this document is to help the reader understand these fundamentals and realize greater value from architecture-related standards through increased uniformity and better integration. Architecting, as a means to align form, function and fitness for purpose, is applied by organizations, projects, teams and individuals to facilitate understanding of the challenges faced by a variety of stakeholders (including downstream developers, implementors, integration authorities, certification bodies and other collaborators) and to address their concerns while also dealing with potential opportunities to be pursued.

In addition to an historic association of architecture with buildings and construction, the usage of architecture today has evolved into a commonly used practice for other sectors such as commercial, civil and defence, where the value proposition of architecture is increasingly acknowledged in various fields of application. Humankind is building exceedingly complex entities at an accelerated rate in these fields.

Organizations affected by these entities are faced with new opportunities to pursue along with an increase in architectural challenges when developing architectures for enterprises, business components, capability areas, mission areas, missions, systems, systems of systems, families of systems, infrastructure, products, services, product lines, hardware, software applications, technologies, etc. A common basis for aligning architecture concepts and architecting principles across various domains can improve the interoperability and harmonization of architecture standards and the resulting architecting work products.

To address the intimate and often misunderstood connection between architecture and design, this document clarifies the scope of architecture practice by introducing a fundamental distinction between two types of design. It considers ‘architecture design’ to entail the information that captures the strategic and enduring concepts that result from an architecting effort. This is distinct from ‘solution design’, which specifies the more detailed, tactical information necessary for implementation by subsequent engineering efforts. This conceptual separation, which is elaborated in Clauses 3 and 4, is intended to provide clarity and complement existing engineering and design standards, especially for ISO/IEC/IEEE 15288 and ISO/IEC/IEEE 12207:Ed2 (FDIS).

Architecture is a topic of tremendous variety. This document approaches the topic from the perspective of the enterprise, systems and software fields of application. This document is intended for organizations and projects that are:

— developing, updating, managing, governing and maintaining architectures and architecture descriptions;

— seeking sustained success through the implementation of architecture practice;

— seeking to improve communication about the architecture and the architectural objectives through a common understanding of the foundational architecture concepts and architecting principles;

— performing conformity assessments against the requirements of architecture-related standards, specifications and organizational practices;

— establishing and maintaining integration and alignment between architectures;

— using architectures to enable better governance of the life cycles and life cycle processes of entities.

Organizations that choose to employ architecture concepts and architecting principles can expect to see improvements in their ability to create value for stakeholders. The adoption of more formalised and comprehensive architecture practice can be a strategic decision for such organizations.

A well-defined architecture delivers a range of benefits that can result in strategic, technical and organizational advantages:

— Strategic alignment and planning: It increases the clarity, efficiency and effectiveness of transformation and modernization initiatives by helping to define roadmaps and plans. It promotes coherence between enterprise-level goals and technical solutions (e.g. systems, hardware, software, services and processes), framing the development and usage of these solutions to meet consumer and stakeholder demand;

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— Technical cohesion and evolution: It improves interoperability and compatibility between disparate systems, services and technologies. It promotes uniformity and consistency across a given domain, enabling commonalities between related entities and facilitating the reuse of solution elements. This provides a stable basis for managing evolution, offering guidelines for making changes that do not compromise stakeholder value, and for making provisions to accommodate future changes;

— Organizational enablement: It provides a basis for identifying necessary organizational and team member competencies, facilitating the on-boarding and training of new members of the organization and new customers;

— Stakeholder engagement and risk management: It provides a framework to express, share knowledge about, and evaluate challenges, opportunities and motivating factors. This fosters greater stakeholder engagement and cooperation in decision-making and provides a basis for the proactive identification of risks and opportunities.

This document is informed by existing architecture-related standards as illustrated in Figure 1.

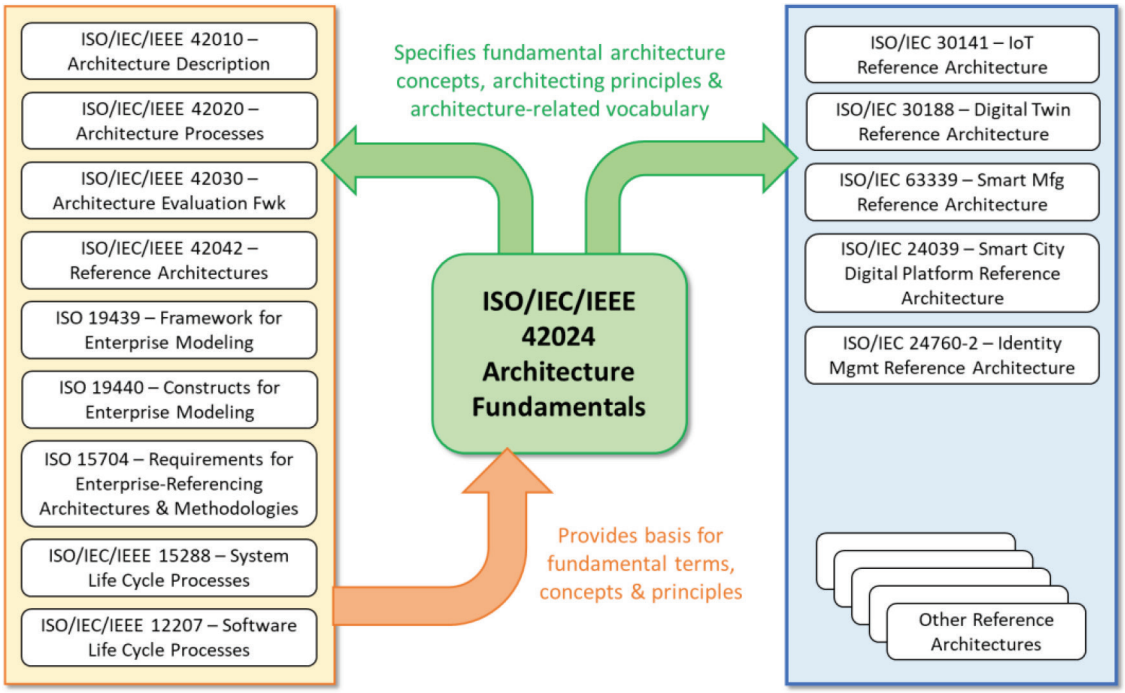


Figure 1 — Architecture-related standards

The business community benefits from using this document since it specifies architecture concepts and architecting principles, so they are better utilized across the organization. As a result, architecture-related decisions can align better with the overarching goals and strategies of the business and can facilitate increased agility in architecting new and improved enterprises, products and services.

The architecting community benefits from using this document since it provides a common foundation to communicate and share ideas about the attributes of a more mature and effective architecture practice. This document can help architecting efforts to identify and define the relevant challenges and opportunities, and more effectively convey the fundamental concepts and essential properties of an entity and communicate their recommendations more clearly to stakeholders.

The professional community of standards and reference architecture development organizations benefit from this document since it specifies architecture concepts, architecting principles and the associated vocabulary for use by these organizations. This leads to a better understanding of architecture fundamentals within the professional community and contributes to more effective standards and reference architectures as a result.

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The educational community benefits from using this document since it establishes core architecture concepts and architecting principles, which can then be disseminated, built upon, and refined over time. This document helps with professional practice and its development since practitioners can more readily apply documented best practices and stay more current with architecture trends and developments.

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Enterprise, systems and software — Architecture fundamentals

1 Scope

This document specifies a core set of vocabulary, architecture concepts and architecting principles associated with the architecture practice applicable to various entities such as enterprises, business components, capability areas, mission areas, missions, systems, systems of systems, families of systems, infrastructure, products, services, product lines, hardware, software applications and technologies.

This document is intended for:

— participants in architecting efforts;

— developers of architectures, architecture descriptions, reference architectures, reference architecture descriptions and reference models;

— stakeholders using architectures as the baseline for their activities and in understanding how and to what extent their concerns have been or will be satisfied;

— providers of architecture-related standards, guidelines, training, education and evaluation instruments used for assessment of architecture practices and architecting work products;

— developers of architecture description languages, architecture modelling languages, architecture frameworks, architecture development and modelling methodologies, and architecture-related tools and technologies.

This document does not address terms and definitions unique to specific application domains or areas. This document does not address concepts related to architecture competencies.

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/ui

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

— IEEE Standards Dictionary Online: available at https://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 www.computer.org/sevocab.

NOTE 2 The terms in this clause are listed in systematic order since this is the preferred ordering scheme according to ISO/IEC Directives, Part 2, 16.4, Principles and rules for the structure and draft of ISO and IEC documents. According to this directive, "Alphabetic order is the least preferred order." The Index of Terms is provided in 3.1 to facilitate finding the definitions for terms of interest.

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Terms and definitions for this document are organized according to the following categories:

— architecting concepts;

— entity related concepts;

— architecture design concepts;

— architecture description concepts;

— entity life cycle concepts.

3.1 Index of terms

The purpose of this Index is to facilitate access to the terminological entries in this clause.

architecting	3.2.3	information package, architecture	3.4.3
architecting principle	3.2.4	information package, solution	3.4.6
architecture	3.2.1	life cycle	3.6.1
architecture, reference	3.2.7	life cycle phase	3.6.2
architecture description	3.5.1	life cycle stage	3.6.3
architecture design	3.4.2	life history	3.6.4
architecture feature	3.2.2	metamodel	3.5.6
architecture framework	3.2.6	model	3.5.5
architecture information package	3.4.3	model, reference	3.5.7
architecture principle	3.2.5	perspective, stakeholder	3.4.8
architecture view	3.5.3	phase, life cycle	3.6.2
architecture viewpoint	3.5.4	principle, architecting	3.2.4
aspect	3.3.7	principle, architecture	3.2.5
concern	3.4.9	reference architecture	3.2.7
context	3.3.4	reference model	3.5.7
description, architecture	3.5.1	solution description	3.5.2
description, solution	3.5.2	solution design	3.4.5
design	3.4.1	solution entity	3.3.2
design, architecture	3.4.2	solution information package	3.4.6
design, solution	3.4.5	stage, life cycle	3.6.3
dimension	3.3.8	stakeholder	3.4.7

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engineering effort	3.4.4	stakeholder perspective	3.4.8
enterprise	3.3.5	system	3.3.6
entity, solution	3.3.2	view, architecture	3.5.3
entity of interest	3.3.1	viewpoint, architecture	3.5.4
environment	3.3.3	information package, architecture	3.4.3
framework, architecture	3.2.6	information package, solution	3.4.6

3.2 Architecting concepts

3.2.1
architecture

fundamental concepts and essential properties that manifest in an entity in its *environment* (3.3.3)

Note 1 to entry: Fundamental concepts include decisions, principles or patterns that shape the structure, operation and long-term viability of an entity. Essential properties include attributes, characteristics or qualities that sometimes are compounded from those of constituent elements, latent or emergent in nature, which are critical to stakeholder value and arise from strategic decisions that are especially difficult to change at a later time.

Note 2 to entry: Every entity has an "architecture", whether that architecture is described or not. Architecture is characteristic of its identity. The description of that architecture is based on insight into its structure, the relationships between the components that make up those structures, their behaviours, and the (intended or perceived) value and purpose.

Note 3 to entry: The fundamental concepts and essential properties are manifest in an entity in the sense of "making an appearance" in the entity when it is realized. In other words, the entity is a manifestation of these concepts and properties.

3.2.2
architecture feature

fundamental concept or essential property that is value-focused, holistic and enduring

Note 1 to entry: Fundamental concepts include decisions, principles or patterns that shape the structure, operation and long-term viability of an entity. Essential properties include attributes, characteristics or qualities that sometimes are compounded from those of constituent elements, latent or emergent in nature, which are critical to stakeholder value and arise from strategic decisions that may be difficult to change at a later time.

Note 2 to entry: 'Essential' and 'fundamental' are terms often used interchangeably to describe if something is necessary or crucial. However, there is a subtle difference between the two. A property is 'essential' if it is absolutely necessary or indispensable, or if it is crucial for the existence or functioning of the entity, while a concept is 'fundamental' if it is foundational or basic to the understanding of the purpose or the nature of an entity. A fundamental concept can also be used as the basis for elaborating the concept or for deriving new concepts.

Note 3 to entry: Architecture features of a component of an entity are not necessarily architecture features of the entity itself. An architecture feature of the entity applies to every component of the entity, i.e. the architecture of the entity constrains the architecture of its components.

3.2.3
architecting

conceiving, defining, analysing, expressing, documenting, communicating, certifying proper implementation of, extracting, applying, maintaining or improving an *architecture* (3.2.1)

[SOURCE: ISO/IEC/IEEE 42010:2022, modified – Removed 'for an entity', removed note to entry.]

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3.2.4
architecting principle
fundamental belief, norm, rule or value governing or guiding an *architecting* (3.2.3) effort that holds regardless of the entity being architected or technique being used

Note 1 to entry: Architecting principles are those that apply to architecting efforts. Some of the key architecting principles that are fundamental to the architecture practice are discussed in Clause 5.

3.2.5
architecture principle
fundamental belief, norm, rule or value about an architecture that influences the realization of the entity, its *life cycle* (3.6.1) and its *context* (3.3.4)

Note 1 to entry: Architecture principles can be used to help identify architecture features to be included in the architecture design. See the "architecting" principles at 5.4.3 and 5.4.4 on the development of "architecture" principles that guide the realization and evolution of an entity, respectively.

3.2.6
architecture framework
conventions, principles and practices for architecture-related activities established within a domain of activity or within a community of *stakeholders* (3.4.7)

EXAMPLE Unified Architecture Framework (UAF), Generalised Enterprise Reference Architecture and Methodology (GERAM) which includes an architecture description framework (called the GERA Modelling Framework), Reference Model for Open Distributed Processing (RM-ODP).

3.2.7
reference architecture
RA
architecture (3.2.1) that constitutes a standard or common approach to a problem, circumstance or opportunity within a field of application, domain of activity or area of concern

Note 1 to entry: A reference architecture description can serve as a standard or outline comprising general or common concepts, properties and principles that apply to a category of entities in a targeted field, domain or area.

Note 2 to entry: A reference architecture description can include or refer to reference models that provide a general or common approach to a recurring problem or circumstance.

Note 3 to entry: A reference architecture typically applies to a category of entities and is developed for fields such as artificial intelligence (AI), internet of things (IoT), cloud computing, cybersecurity, big data, smart cities, smart manufacturing, smart farming, agriculture, digital twin, telecommunications, aerospace, defence, banking, finance, insurance, energy, automotive, shipping, hospitality, healthcare, supply chain, transportation, manufacturing, production and infrastructure.

3.3 Entity related concepts

3.3.1
entity of interest
EOI
entity examined, created, changed or otherwise influenced by *architecting* (3.2.3) and engineering efforts

Note 1 to entry: An entity is 'anything perceivable or conceivable' [ISO 9000:2015]. Examples of entities provided in ISO 9000:2015 are: product, service, process, person, organization, system or resource. In this document, entities include enterprises, business components, capability areas, mission areas, missions, systems, systems of systems, families of systems, infrastructure, products, services, product lines, hardware items, software applications and technologies, among other things.

Note 2 to entry: The terms 'entity' and 'object' are catch-all terms analogous to 'something'. In terms of terminology, 'object' is commonly used in this way. In terms of ontology, 'entity' and 'thing' are commonly used. Objects can be material (e.g. an engine, a sheet of paper, a diamond), non-material (e.g. conversion ratio, a project plan, repair procedure) or imagined (e.g. an organization in a future state, a unicorn, a scientific theory).

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3.3.2
solution entity
entity of interest (3.3.1) and other entities necessary to sustain the entity of interest in one or more *context* (3.3.4) over its *life cycle* (3.6.1) that is a realization of the architectural entities of interest

Note 1 to entry: Sustainment of the solution entity involves dealing with several properties, such as continued viability, adaptability, evolvability, affordability, operational assurance and logistics support.

3.3.3
environment
totality of external entities, situations, conditions and circumstances enveloping an entity for a particular domain of interest

Note 1 to entry: An entity can have multiple environments, each one associated with a particular solution or portion of a solution that the entity is part of, or associated with different domains such as technological, economic, political, social, legal and ecological domains. See 4.3.5 for discussion about environment and context concepts.

3.3.4
context
set of entities, situations, conditions and circumstances within the environment that shape, influence, relate to, or interact with an entity

Note 1 to entry: Context can help determine, specify or clarify the meaning of an event or other occurrence with respect to an entity.

Note 2 to entry: The relations between an entity and things in the context can involve or enable interactions with that entity. These interactions can include exchanges of information, material, energy, data, etc.

3.3.5
enterprise
human undertaking or venture for dealing with a complex and challenging situation or circumstance

Note 1 to entry: An enterprise in its early stages usually has implicit or possibly ill-formed strategy, goals and objectives. A mature enterprise usually has explicit and clearly defined strategy, goals and objectives.

Note 2 to entry: It is common for an enterprise to be equated with an organization. However, in this document, the enterprise term is used to indicate the complex and challenging activity rather than the organization (or set of organizations) that participates in such an undertaking or venture.

Note 3 to entry: In this document, an enterprise can be an entity of interest that is subject to the architecting effort. An architecting effort can help clarify and make explicit the strategy, goals and objectives for an undertaking or venture. Architecting can help change the enterprise specification and scope over time as the need arises.

3.3.6
system
arrangement of parts or elements that together exhibit a stated behaviour or meaning that the individual constituents do not

Note 1 to entry: A complete system includes all of the associated equipment, facilities, material, computer programs, firmware, technical documentation, services and personnel required for operations and support to the extent necessary for self-sufficient use in its intended environment.

Note 2 to entry: In this document, a system can be an entity of interest that is subject to the architecting effort.

[SOURCE: ISO/IEC/IEEE 15288:2023, modified – Removed notes 1 and 2 to entry, added note 2 to entry.]

3.3.7
aspect
part of an entity's character or nature

Note 1 to entry: Aspects govern the selection of a subset of properties of an entity, represented as entity attributes,[34] which enables a model based on that aspect to answer a defined set of questions about the entity in its context. Aspects can be mapped to an architectural dimension to help identify and formulate the appropriate questions regarding the variety of concerns about an entity.

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Note 2 to entry: Aspects are characterized by a collection of observations, statements of fact or descriptive models about an entity feature or group of related features.

3.3.8
dimension
coherent collection of *aspects* (3.3.7) relevant to a domain or a particular field of knowledge or discipline

Note 1 to entry: A dimension is a set of aspects of the same type, residing in the same space.[57] Coherence among aspects within the collection refers to a shared relationship type, a meta-property of each aspect similar to membership in a set of a shared type. Each aspect in a dimension is differentiated within that shared type by some distinguishing feature such as the phases (aspects) of a life cycle (dimension).

Note 2 to entry: The coherence requirement of the dimension can result in a collection of aspects that are unordered, partially ordered, fully ordered, or related in some other manner, or not ordered in any way.

[SOURCE: IEC 63339:2024, modified – Changed 'manufacturing domain' to 'domain', expanded note 1 to entry, added note 2 to entry.)

3.4 Architecture design concepts

3.4.1
design, **noun**
information necessary and sufficient for creation, transformation or understanding of an entity

Note 1 to entry: Design as used in ISO/IEC/IEEE 15288:2023, 3.13 means the "specification of system elements and their relationships, that is sufficiently complete to support compliant implementation of the architecture" and that usage is a special case of the term 'solution design' as used in this document (see 4.4.2). Architecture design produced by the architecting effort is typically upstream from the engineering effort that produces the solution design but sometimes this happens concurrently.

Note 2 to entry: Often, the term 'system design' reflects the combination of work products resulting from all architecting and engineering efforts associated with that system. The same is true for software design and enterprise design cases.

3.4.2
architecture design, **noun**
information necessary and sufficient for creation, transformation or understanding of an *architecture* (3.2.1)

Note 1 to entry: In this document 'architecture design' refers to an output of the architecting effort, not to the effort itself (see 4.2.4). Architecture design includes information for subsequent elaboration in a solution design.

Note 2 to entry: Architecture design can include architecture descriptions and can help create necessary information to support engineering efforts and other related efforts such as marketing, business development, finance, manufacturing, test, integration, deployment, logistics and operations.

Note 3 to entry: Architecture design can include an architecture information package (see 4.4.1).

3.4.3
architecture information package
work product of an *architecting* (3.2.3) effort that conveys information about the *architecture design* (3.4.2) to be used as the basis for engineering and other architecture-related efforts

Note 1 to entry: The architecture information package term is used when the architecting efforts are intended to elaborate the architecture of an entity, The solution information package term (see 3.4.6) is used when the engineering efforts are intended to produce a solution design that provides the basis for realization of a solution entity that is aligned with the architecture.

Note 2 to entry: The architecture information package informs development of one or more architecture descriptions and can include additional information necessary to support an engineering effort and other related efforts such as marketing, business development, finance, manufacturing, test, integration, deployment, logistics and operations. See 4.4.1 for typical contents of this package.

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3.4.4
engineering effort
transformation of an *architecture design* (3.4.2) for a *solution entity* (3.3.2) into a *solution design* (3.4.5) by elaborating, refining, expanding and detailing to the extent that the design is sufficiently complete for implementation

Note 1 to entry: In this document 'solution design' refers to the output of the engineering effort rather than to the activity that produces this output.

Note 2 to entry: Architecture design produced by the architecting effort is typically upstream from the engineering effort that produces the solution design but sometimes this happens concurrently.

3.4.5
solution design
information necessary and sufficient for the implementation of *solution entities* (3.3.2) or for further *engineering efforts* (3.4.4)

Note 1 to entry: The solution design refines and expands upon the architecture design by specifying the particulars associated with each architecture design element to specify the ways and means of implementation for that element.

3.4.6
solution information package
work product of an *engineering effort* (3.4.4) that conveys information about the *solution design* (3.4.5) to be used as the basis for implementation and other engineering-related efforts

Note 1 to entry: Solution design provides the physical structure, behaviour, temporal and spatial relationships, and other attributes of an entity and its components suitable for implementation. This package also includes additional information necessary in support of solution design definition effort and in related efforts such as marketing, business development, finance, manufacturing, test, integration, deployment, logistics and operations.

3.4.7
stakeholder
role, position, individual, organization, or categories thereof, having a right, share, claim or other interest in an entity

Note 1 to entry: Both direct and indirect stakeholders exist. Indirect stakeholders are affected or impacted by an entity or its architecture by having intervening factors, persons or influences while direct stakeholders are engaged in the conceptualization, evaluation and elaboration of the architecture.

3.4.8
stakeholder perspective
way of perceiving or thinking about an entity, especially related to stakeholder *concerns* (3.4.9)

EXAMPLE Various domains have customary perspectives: (1) industrial production systems – operational and financial perspectives; (2) banking systems – business, management, acquisition, supply chain perspectives; (3) mobile applications – development, deployment, customization perspectives; (4) hospitality services – provider, customer perspectives; (5) content provider platform – data user, data provider perspectives.

[SOURCE: ISO/IEC/IEEE 42010:2022, modified – Removed notes to entry, replaced examples, added 'perceiving or'.]

3.4.9
concern
matter of interest, relevance or importance to or impact on a *stakeholder* (3.4.7)

Note 1 to entry: Stakeholder concerns which can affect the architecture include, for example, those that are technical in nature; organizational issues; socio-political factors; legal, ethical and regulatory considerations; and social equity issues. While some concerns are emergent manifestations of underlying causes that architecting is trying to address, new concerns can emerge as architecture decisions are made.

Note 2 to entry: Concerns can be identified with regards to an entity or independently, such as with regards to environment, scenario, situation or use case related to that entity.

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EXAMPLE For a Taxi Aggregator system: (1) wait time, price, revenue options and commission are the typical concerns of the driver; (2) cost efficiency, payment options, route trace and safety are the typical concerns of the rider; (3) safety, commission, rate and exploitation are the typical concerns of the regulatory bodies. Additional examples are provided in 4.5.1.

[SOURCE: ISO/IEC/IEEE 42010:2022, modified – Removed notes to entry, added notes to entry, added example.]

3.5 Architecture description concepts

3.5.1
architecture description
AD
work product used to express an *architecture* (3.2.1)

Note 1 to entry: The purpose for which an architecture description is created or utilized determines the scope of an architecture description for an entity. An AD is complete if it addresses the architecture with respect to its purpose. Often, several purpose-specific architecture descriptions are needed to wholly capture an entity's architecture, and even then, aspects of the entity's architecture are overlooked or ignored. See 4.4.1 and B.7 for more information regarding wholeness of architecture.

[SOURCE: ISO/IEC/IEEE 42010:2022, modified – Removed note to entry, added note to entry.]

3.5.2
solution description
work product that expresses a *solution entity* (3.3.2)

Note 1 to entry: A solution description usually covers several aspects of the solution entity over its full life cycle, possibly including objectives and requirements, manufacturing and construction considerations and plans, test and evaluation philosophy and approach, operational and employment concepts and characteristics, maintenance and sustainment approaches, deployment and distribution plans, etc.

3.5.3
architecture view
expression of an *architecture* (3.2.1) addressing *concerns* (3.4.9) and reflecting *aspects* (3.3.7)

Note 1 to entry: The primary purpose of an architecture view is to convey useful and practical information to people who are involved in the architecting and engineering efforts and to other stakeholders to communicate the manner in which their concerns are addressed. Architecture views express with respect to concerns, but the concerns belong to stakeholders, as defined in 3.4.9. As in the stated example of 3.4.9, neither "revenue options" nor "payment options" would likely be a view, but instead a "financial view" is likely needed to address the revenue and payment options as expressed in the architecture.

Note 2 to entry: Architecture views often become the basis for further architecting or engineering activities.

3.5.4
architecture viewpoint
conventions for the creation, interpretation and use of an *architecture view* (3.5.3)

Note 1 to entry: Architecture viewpoints are associated with stakeholder perspectives and frame their respective concerns, and they provide the conventions by which views can be created with architectural aspects in mind.

3.5.5
model
representation of an entity or collection of entities under conditions or situations of interest

Note 1 to entry: A model is typically used to help portray, specify, understand or predict the properties or characteristics of an entity or collection of entities.

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3.5.6
metamodel
model (3.5.5) that defines the elements and properties needed to create a model

Note 1 to entry: A metamodel is a model that consists of statements about terms used in models. Hence, a metamodel is also a model, but its universe of discourse is a set of models. A metamodel defines an abstract syntax and is the formal definition of concepts to be modelled and their relationships and attributes. The abstract syntax is distinguished from the concrete syntax, which is the formal definition of the representation of elements of the abstract syntax in a notation that is usually graphical or textual in nature. Rules of interpretation are associated with the abstract syntax to provide the semantics of the modelling language.

Note 2 to entry: The semantics of the terms defined in a metamodel are only defined in a limited way, because metamodels rely on denotations of the terminal symbols, as well as on implied but not explicitly defined axioms that are needed to correctly interpret models created using the terminology. Metamodels are a limited form of expression for the ontology of a field.

[SOURCE: ISO/IEC 19506:2012, modified - Removed 'special kind of', added notes to entry.]

3.5.7
reference model
model (3.5.5) that provides a standard or common approach to a recurring problem or circumstance

Note 1 to entry: A reference architecture can rely upon a reference model that has already defined the relevant architecture features for the architecture to be derived from the reference architecture. A reference architecture description can reference or contain one or more reference models.

3.6 Entity life cycle concepts

3.6.1
life cycle
set of *phases* (3.6.2) or *stages* (3.6.3) that an entity goes through from its conception until it ceases to exist

Note 1 to entry: The entity life cycle starts with the identification of a need for the entity and ends when it is no longer needed.

[SOURCE: ISO 15704:2019, modified – Removed notes to entry, added note to entry.]

3.6.2
life cycle phase
focused set of activities at an extent of abstraction, undertaken to develop and evolve an entity in its *life cycle* (3.6.1)

Note 1 to entry: A phase frames a typical set of activities that act upon an entity when considered with respect to its life cycle. Actual phases are instances of these typical phases when they are implemented in time, often repeatedly.

3.6.3
life cycle stage
period within the *life cycle* (3.6.1) of an entity that relates to the state of its evolution

Note 1 to entry: As used in this document, stages relate to major progress and achievement milestones of the entity through its life cycle. Analogous to phases, stages have a type (e.g. 'factory refurbishment stage'), and instances (the '1995 refurbishment of the factory', the '2007 refurbishment of the factory'). An actual stage (i.e. an instance of a stage type) consists of life cycle activity instances (i.e. actual phases), such as a set of completed architecture process activities, with the objective of achieving a given milestone.

3.6.4
life history
sequence of actual *life cycle phases* (3.6.2) that an entity goes through during its lifetime

Note 1 to entry: Actual phases can be aggregated into actual stages. Each of these can, and typically do, overlap. See A.3 for examples.

Note 2 to entry: There is only one 'past history' but there can be multiple possible 'future histories' (i.e. futures).

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[SOURCE: ISO 15704:2019, modified – Deleted 'as steps within phases', added note to entry.]

4 Architecture concepts

4.1 Overview

This clause presents concepts that are fundamental to the architecture practice. Clause 3 provides a definition for each key concept with regard to how it is used in this document. Annex A provides additional information on these terms and concepts beyond that provided in this clause.

4.2 Architecture and architecting

4.2.1 Introduction

Architecture is comprised of the fundamental concepts and essential properties that manifest in an entity in its environment. One or more entities can help attain the goals and objectives of an enterprise, organization, project or other initiative through their ability to cause or lead to desired effects and outcomes. These entities can influence and be influenced by other entities. The fundamental concepts and essential properties are conceptualized and defined through an architecting effort enabled by an understanding of the entities that can be realized as solutions that can achieve the desired effects.

Architecting involves the conceiving, defining, analysing, expressing, documenting, communicating, certifying proper implementation of, extracting, applying, maintaining, or improving an architecture for an entity. Processes associated with architecting such as conceptualizing, evaluating, elaborating, managing and governing an architecture are defined in ISO/IEC/IEEE 42020. Architecting produces information item artefacts as part of performing these processes.

NOTE Certifying the proper implementation of an architecture can be captured as an explicit statement by the architect to the client or user that the entity, as built, or otherwise realized, meets the criteria as ready for use.

Architecture applies to entities in every domain and to different kinds of considerations. Potential influences on an architecture, some of which can be embodied in the architecture, include fundamental practices, patterns, standards, regulations, policies and other driving factors. An architecture is more or less amenable to having the concepts and properties that help achieve certain desired effects, while being either focused on one consideration or balanced across a whole range of considerations.

Architecture embodies decisions and incorporates concepts and properties regarding the overall structure and behaviour of the entity, roadmapping imperatives, capability objectives, desired effects, enterprise vision, organizational directives, statutory regulations, etc. Often architecture informs the organizational decision process, particularly with respect to risk and opportunity management.

An architecture can address entities within a domain, or with respect to a perspective or concern, employing a corresponding qualifier, e.g. system architecture, business architecture.

EXAMPLE 1 (1) The 'Architecture of a Hospital Information System (HIS) entity' versus the 'Security Architecture of an HIS entity' where the latter is limited to the architecture of the security feature of the HIS from the perspective of HIS security engineers, and of hospital workers and managers. (2) The 'Architecture of the business design of the administrative operations of a hospital' versus the 'Architecture of the operating hospital' where the former is concerned with a particular subset of the hospital and the latter is concerned with all matters related to the structure and behaviour of the business of medical care provided by the hospital.

An architecture can focus on a particular subset of fundamental concepts or essential properties that are manifest in an entity, in which case a suitable qualifier is employed, e.g. information architecture, security architecture. Many different ways of qualifying an architecture exist.

EXAMPLE 2 An information architecture focuses on the information concepts or properties and simplifies complex information for users as a result; on the other hand, a security architecture focuses on the security concepts or properties and provides threat defence and mitigation measures as a result.

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