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Software, systems and enterprise — Architecture description

Logiciel, systèmes et entreprise — Description de l'architecture

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO/IEC documents should be noted. This document was drafted in accordance with the rules given in the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

ISO/IEC/IEEE 42010 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.

This second edition cancels and replaces the first edition (ISO/IEC/IEEE 42010:2011), which has been technically revised.

The main changes are as follows:

— The term used to refer to the subject of an architecture description is changed from "system of interest" to "entity of interest" (EoI) to be compatible with ISO/IEC/IEEE 42020 and ISO/IEC/IEEE 42030 standards and to allow for its application in non-system architecture situations. The term "entity" is also used in this document when entities are considered as surrounding things in an environment of an EoI.

— The term "architecture description framework" (ADF) replaces "architecture framework" in the previous edition. It is defined in order to differentiate ADFs from other kinds of architecting frameworks like architecture evaluation frameworks specified in ISO/IEC/IEEE 42030.

— Architecture description element, introduced in the 2011 edition (see ISO/IEC/IEEE 42010:2011, 4.2.6, 5.7 and A.6) is now defined in Clause 3 as identified or named part of an architecture description allowing representing at least stakeholders, concerns, perspectives, and aspects identified in an AD, and views, view components, viewpoints, and model kinds included in an AD.

— Aspect and stakeholder perspective concepts —already introduced in the 2011 edition (See 3.5, note 1 of 5.6, Annex A and B) are defined and described to accommodate current practice where these ideas are prevalent.

— A correspondence defines an identified or named relation between AD elements, as in Clause 4.2.6 of the 2011 edition. But, to clarify the relationship between AD and correspondence, a note 1 to the definition is added to state that for the purpose of correspondences, an architecture description can be considered as an AD element in another architecture description. This correspondence between ADs is necessary because an architecture can be described by more than one AD and these alternatives of architectures have related for activities like trade-off analysis and decision making.

— The term “architecture view component” is introduced as a separable portion of one or more architecture views, replacing “architecture model” in the 2011 edition. This change is to account for the fact that some parts of a view are model-based while others may not be. View components can be derived from an information source, which can sometimes be a model.

— Model-based view components are governed by model kinds and documented by legends. Non-model-based view components are documented by legends.

— Model kinds are identified as a new conformance case to encourage model-based architecting.

— The concept of architecture viewpoint is updated to accommodate current practice where a viewpoint governs one or more architecture views within an AD.

— The definition of “model kind” given by the 2011 edition is extended to include categories of models as used by ADF like UAF.

— The figures use an informal entity-relationship diagram notation replacing UML class diagrams in the 2011 edition, to facilitate comprehension by users of this document. The multiplicities of the relationships are explained in the text when necessary.

— Annex E illustrates a few concepts pertaining to architecture life cycles and architecture description life cycles.

— Annex F shows examples of how some architecture description frameworks can conform to requirements of this document.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

The complexity of human-made entities has grown to an unprecedented level. This has led to new opportunities, and also increased challenges for organizations that create and use these entities. Architecting is increasingly applied by organizations, teams and individuals, to help manage the complexity faced by stakeholders of these entities.

Examples of entities include the following: Enterprise, organization, solution, system (including software systems), subsystem, process, business, data (as a data item or data structure), application, information technology (as a collection), mission, product, service, software item, hardware item, product line, family of systems, system of systems, collection of systems, collection of applications.

An architecture of an entity, expressed in one or more architecture descriptions (AD), assists in understanding the fundamental concepts or properties of the entity, pertaining to its structure, behaviour, design and evolution, such as feasibility, utility and maintainability and fundamental concepts for its development, operation, employment, external impacts, utilization and decommissioning.

ADs are used by the parties that create, use and manage human-made entities to improve communication and cooperation, enabling all parties, organizations, teams and individuals to work together in an integrated and coherent fashion.

NOTE ISO/IEC/IEEE 42020 specifies a set of processes for architecting which can be employed in support of creating one or more ADs. The architecture elaboration process in ISO/IEC/IEEE 42020 is especially relevant for creation of ADs.

Whereas an AD is a tangible work product, an architecture is intangible and abstract, understood through its concepts, properties and principles.

Architecture description frameworks (ADF) are used to codify the conventions and common practices of architecture description. Architecture description languages (ADL) are used to codify the description of architectures within different communities and domains of application.

ADs have many uses, such as design, development, documentation, analysis, evaluation, maintenance, risk mitigation, downstream user specifications, tool specification, communication, planning, guidance, life cycle support, decision support, review, training, design validation, solution trade studies, cost comparison and analysis, by a variety of stakeholders throughout the life cycles of their entities of interest. Annex D describes more uses of an AD.

This document provides terms, definitions and relationships for best practices in ADs. The provisions of this document serve to specify desired properties of ADs. This document also gives provisions that specify desired properties of ADFs and ADLs in order to usefully support the development and use of ADs. This document provides a basis for considering and comparing ADFs and ADLs by providing a common ontology for specifying their contents.

This document can be used to establish a coherent architecting practice for developing ADs, ADFs and ADLs within an organization, in the context of an entity of interest (EoI) or its architecture. The provisions of this document can be used to assess conformance of specifications of ADs, ADFs, ADLs, viewpoints and model kinds.

The intent of this document is to enable a range of consistent and coherent approaches to describing an architecture including document-centric and model-based techniques.

This document also provides motivations for use of architecture-related terms and concepts in other documents such as guides and standards.

Users of this document are advised to consult Clause 5 to gain appreciation of the conceptual foundations, along with the concepts and principles associated with an AD work product.

This document does not explicitly address completeness or correctness regarding the inclusion of particular elements in an AD. Nevertheless, completeness and correctness of an AD can be partially checked, for example, through the consistency of the AD elements established, whether relationships

are transitive, and whether AD elements are shown in the views. Consistency rules can also be defined by showing whether the same particular AD element has correspondences with an AD. In addition, specifications that appear as elements within an AD are expected to be complete, precise and verifiable with respect to the subject of the specification.

In this document, the following verbal forms are used:

— “shall” indicates a requirement;

— “should” indicates a recommendation;

— “may” indicates a permission.

Software, systems and enterprise — Architecture description

1 Scope

This document specifies requirements for the structure and expression of an architecture description (AD) for various entities, including software, systems, enterprises, systems of systems, families of systems, products (goods or services), product lines, service lines, technologies and business domains.

This document distinguishes the architecture of an entity of interest from an AD expressing that architecture. Architectures are not the subject of this document.

This document specifies requirements for use of the architectural concepts and their relationships as captured in an AD. It does not specify requirements for any entity of interest or its environment.

This document specifies requirements for an architecture description framework (ADF), an architecture description language (ADL), architecture viewpoints and model kinds in order to usefully support the development and use of an AD.

This document specifies conformance to the requirements for an AD, ADF, ADL, architecture viewpoint and model kind.

This document does not specify the processes, architecting methods, models, notations, techniques or tools by which an AD is created, utilized or managed.

This document does not specify any format or media for recording an AD.

2 Normative references

There are no normative references in this document.