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Software, systems and enterprise — Architecture evaluation framework

*Logiciel, systèmes et entreprise — Cadre d'évaluation 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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents 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).

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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.

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.

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.

Introduction

The complexity of human-made systems has grown to an unprecedented level. This complexity leads to new opportunities and greater challenges for organizations that conceive, develop, industrialize, produce, maintain, utilize, recycle and dismantle enterprises, systems and software, and for various stakeholders that are impacted by these things. To address these opportunities and challenges, organizations increasingly apply concepts, principles, procedures and tools to drive better architecture strategies, make better architecture-related decisions, create more useful and effective architectures and improve architecture maturity. Architecture-related activities are not only strategic in nature; they are tactical and operational as well. Furthermore, the use of architecture frameworks, architecture description languages and generalist modeling languages have become common practice in commercial, public service, government, civil and military domains.

The concept of architecture used in this document goes beyond the case where the architecture entity is a system. Architecture is increasingly being applied to things not normally thought of as systems, including entities with system-like structure and behavior such as enterprises, services, data, business functions, mission areas, product lines, families of systems, software items, etc. This allows for a more generalized usage of the concept of architecture when the evaluation elements specified in this document are applied.

Architecture evaluations are performed for many reasons, such as:

- a) determining if an entity of interest has been or is being architected in such a way that it fulfils its intended purpose (or can be changed in a way that suits a new purpose);
- b) evaluating the effectiveness and suitability of an architecture towards addressing stakeholder needs and expectations;
- c) identifying risks for mitigation;
- d) identifying opportunities for the improvement of an entity or its architecture;
- e) clarifying the problem space and stakeholder needs; and
- f) assessing progress towards meeting architecture objectives.

Architecture evaluations can be performed on any kind of architecture, including a reference architecture, an architecture for a family of systems or an architecture for a product line where there are multiple kinds of architecture entities for a single architecture.

This document provides a generic, conceptual guiding framework that can be used for the planning, execution and documentation of architecture evaluations. Execution is addressed by specification of evaluation elements that can be used during performance of an evaluation effort. Planning and documentation are addressed by specification of work products for the evaluation effort. An organization using this document can establish specific frameworks for the work products and the evaluation elements that can be used as the basis for multiple, recurring architecture evaluation efforts. An organization can also establish tools, methods, best practices, capabilities and resources based on the generic framework provided in this document. The generic framework makes it easier to compare evaluations and evaluation frameworks used in specific cases. Implementation of the proposed architecture framework will in time result in improvement of architecture maturity of the organization.

Software, systems and enterprise — Architecture evaluation framework

1 Scope

This document specifies the means to organize and record architecture evaluations for enterprise, systems and software fields of application.

The aim of this document is to enable architecture evaluations that are used to:

- a) validate that architectures address the concerns of stakeholders;
- b) assess the quality of architectures with respect to their intended purpose;
- c) assess the value of architectures to their stakeholders;
- d) determine whether architecture entities address their intended purpose;
- e) provide knowledge and information about architecture entities;
- f) assess progress towards achieving architecture objectives;
- g) clarify understanding of problem space and of stakeholder needs and expectations;
- h) identify risks and opportunities associated with architectures; and
- i) support decision making where architectures are involved.

NOTE This document addresses the evaluation of an architecture and not an evaluation of the architecture description's suitability. Matters concerning the evaluation of the architecture description fall within the scope of the architecture conceptualization and architecture elaboration processes as defined in ISO/IEC/IEEE 42020. However, it is sometimes the case that the architecture description is evaluated concurrently with the evaluation of the architecture itself.

The entity being evaluated can be of several kinds, as illustrated in the following examples: enterprise, organization, solution, system, subsystem, business, data (as a data element or data structure), application, information technology (as a collection), mission, product, service, software item, hardware item, etc. The kind of entity can also be a product line, family of systems, system of systems, etc. It also spans the variety of applications that utilize digital technology such as mobile, cloud, big data, robotics, Internet of Things (IoT), web, desktop, embedded systems, and so on.

The generic Architecture Evaluation (AE) framework specified in this document can be used in support of the Architecture Evaluation process defined in ISO/IEC/IEEE 42020. Specific frameworks can be derived from this generic framework, which can provide a mapping to the system life cycle processes in ISO/IEC/IEEE 15288 or to the software life cycle processes in ISO/IEC/IEEE 12207.

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.