TECHNICAL SPECIFICATION

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Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE): cloud services —

Part 1: Quality model

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Ingénierie des systèmes et du logiciel — Exigences de qualité et évaluation des systèmes et du logiciel (SQuaRE): services en nuage —

Partie 1: Modèles de qualité

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

A list of all parts in the ISO/IEC TS 25052 series can be found on the ISO website.

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

In the SQuaRE series, there are well-defined quality models for measuring and evaluating system and software products, IT services, data, etc. Although the SQuaRE series provides practical quality models, it does not fit new technologies well. To support the evaluation of new technologies, this document provides the quality model of cloud services, which is the extension to the quality models defined in ISO/IEC 2501n. In order to provide a practical guideline for quality evaluation of cloud services, this document has reflected special considerations on cloud computing, which are key characteristics, and cross-cutting aspects described in ISO/IEC 17788, and service level agreement (SLA) framework described in ISO/IEC 19086 (all parts).

Compared to the information and communication technology (ICT) systems, cloud computing has different characteristics. The followings are the key characteristics of cloud computing described in ISO/IEC 17788.

— Broad network access: physical or virtual resources are available when needed through the network using a variety of client devices.

— Measured service: resources are measured and paid for on a usage basis.

— Multi-tenancy: physical and virtual resources are allocated to multiple tenants, and their computations and data are isolated, therefore inaccessible from one another.

— On-demand self-service: cloud services are provisioned by cloud service customers automatically or with minimal interaction with cloud service providers.

— Rapid elasticity and scalability: resources are increased or decreased rapidly and elastically, and scalable horizontally and vertically.

— Resource pooling: physical or virtual resources are aggregated to provide services to one or more cloud service customers.

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The quality model in this document is to support the non-functional specification and evaluation of cloud services from different perspectives by those associated with cloud service selection, requirements analysis, development, use, evaluation, support, maintenance, quality assurance and control, and audit.

For example, activities during cloud service selection that can benefit from the use of the quality model include:

— identifying cloud services requirements;

— establishing cloud service selection criteria;

— defining service coverage and service objectives;

— establishing service level agreements;

— establishing measures of quality characteristics in support of these activities.

Activities during cloud service development that can benefit from the use of the quality model include:

— identifying cloud service requirements;

— validating comprehensiveness of requirement definitions;

— identifying cloud service design objectives;

— identifying cloud service testing objectives;

— identifying quality control criteria as part of quality assurance;

— identifying acceptance criteria for a cloud service;

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— establishing measures of quality characteristics in support of these activities.

Figure 1 (adapted from ISO/IEC 25000) illustrates the organization of the SQuaRE series representing families of standards, further called divisions. This document belongs to extension division 25050 to 25099.

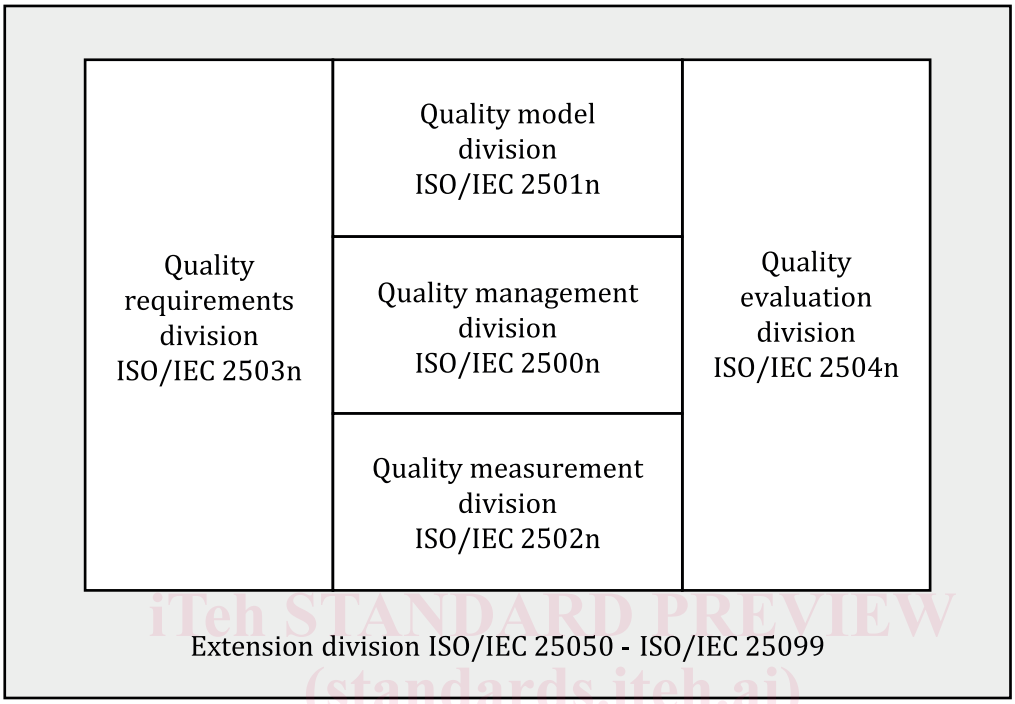

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Figure 1 — Organization of the SQuaRE series of International Standards

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The divisions within the SQuaRE series are:

— **ISO/IEC 2500n - Quality management division.** The International Standards that form this division define all common models, terms and definitions further referred to by all other International Standards from the SQuaRE series. The division also provides requirements and guidance for a supporting function that is responsible for the management of the requirements, specification and evaluation of software product quality.

— **ISO/IEC 2501n - Quality model division.** The International Standards that form this division present detailed quality models for computer systems and software products, quality in use, and data. Practical guidance on the use of the quality models is also provided.

— **ISO/IEC 2502n - Quality measurement division.** The International Standards that form this division include a quality model framework, mathematical definitions of quality measures, and practical guidance for their application. Examples are given of quality measures for software quality, and measures for quality in use. Quality measure elements (QME) forming foundations for these measures are defined and presented.

— **ISO/IEC 2503n - Quality requirements division.** The International Standards that form this division help specify quality requirements, based on quality models and quality measures. These quality requirements can be used in the process of quality requirements elicitation for a software product to be developed or as input for an evaluation process.

— **ISO/IEC 2504n - Quality evaluation division.** The International Standards that form this division provide requirements, recommendations and guidelines for software product evaluation, which are performed by evaluators, acquirers or developers. The support for documenting a measure as an evaluation module is also presented.

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— **ISO/IEC 25050 to ISO/IEC 25099 - SQuaRE extension division.** This division includes International Standards specifying requirements for quality of ready to use software product and common industry formats for usability reports, as well as this document.

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Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE): cloud services —

Part 1: Quality model

1 Scope

This document defines the quality model of cloud services.

The quality model of cloud services is composed of nine characteristics (some of which are further subdivided into subcharacteristics), which provide consistent terminology for specifying, measuring and evaluating cloud services so that the stakeholders, cloud service customer (CSC), cloud service provider (CSP) and cloud service partner (CSN) have a common understanding.

Since the quality model in this document is the extension to the existing quality models defined in ISO/IEC 2501n, it can be used with the product quality model, IT service quality model, data quality model, and quality-in-use model according to evaluation purposes. As there are several cloud service categories, this document focuses on the quality model of SaaS (Software as a Service).

NOTE Future documents are intended to address PaaS (Platform as a Service) and IaaS (Infrastructure as a Service).

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 25000, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Guide to SQuaRE*

ISO/IEC 22123-1, *Information technology — Cloud computing — Part 1: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 25000, ISO/IEC 22123-1, and the following apply.

ISO and IEC 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/

3.1 Quality model of cloud services

3.1.1
service performance efficiency
degree to which a cloud service meets performance requirements under stated conditions

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3.1.1.1
time-behaviour
degree to which a cloud service meets the requirements of the response times and throughput rates of a cloud service, when concurrent users take advantage of the cloud service

[SOURCE: ISO/IEC 25010:2011, 4.2.2.1, modified — "a cloud service meets the requirements of" has been added, "a product or system" has been replaced by "a cloud service" and "when performing its functions, meet requirements" by "when concurrent users take advantage of the cloud service"]

3.1.1.2
aggregated resource utilization
degree to which a cloud service utilizes efficiently aggregated resources from resource pooling in order to support multi-tenancy

Note 1 to entry: Resource pooling is the feature where physical or virtual resources can be aggregated to provide a cloud service to one or more cloud service customers.

Note 2 to entry: Resources include CPU, memory, disk and network.

3.1.1.3
capacity
degree to which the maximum limits of a cloud service's parameters meet requirements in SLA (Service Level Agreement)

Note 1 to entry: Parameters can include the limit of simultaneous cloud service connections, the limit of available cloud service resources, cloud service throughput and cloud service bandwidth.

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[SOURCE: ISO/IEC 25010:2011, 4.2.2.3, modified — "a product or system parameter" has been replaced by "a cloud service's parameters" and "in SLA (Service Level Agreement)" has been added]

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3.1.1.4
scalability
degree to which physical and virtual resources are available automatically and immediately, when they are needed, subject to constraints of service agreements

3.1.1.5
elasticity
degree to which a cloud service adjusts rapidly and elastically the amount of resources that are allocated to an instance of the service

3.1.2
service compatibility
degree to which a cloud service can exchange information with CSC's systems or other cloud services and/or perform its required functions

[SOURCE: ISO/IEC 25010:2011, 4.2.3, modified- "a product, system or component" has been replaced by "a cloud service" and "other products, systems or components" by "CSC's systems or other cloud services", and "while sharing the same hardware or software environment" has been deleted.]

3.1.2.1
cloud interoperability
degree to which a cloud service interacts with CSC's systems, or interacts with other cloud services, by exchanging information according to a prescribed method to obtain predictable results

[SOURCE: ISO/IEC 22123-1: 2021, 3.7.2, modified — "ability of a CSC's system to interact with a cloud service, or the ability for one cloud service to interact" has been replaced by "degree to which a cloud service interacts with CSC's systems, or interacts"]

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3.1.3
service usability
degree to which a cloud service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

[SOURCE: ISO/IEC 25010:2011, 4.2.4, modified — "a product or system" has been replaced by "a cloud service"]

3.1.3.1
accessibility
degree to which a cloud service can be accessed by a variety of client devices over a network through standard mechanisms

3.1.4
service reliability
degree to which a cloud service performs specified functions under specified conditions for a specified period of time

[SOURCE: ISO/IEC 25010:2011, 4.2.5, modified — "a system, product or component" has been replaced by "a cloud service"]

3.1.4.1
availability
degree to which a cloud service is accessible and usable upon demand by an authorized entity

[SOURCE: ISO/IEC 22123-1: 2021, 3.14.7, modified — "property of being" has been replaced by "degree to which a cloud service is"]

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3.1.4.2
resilience
degree to which a cloud service recovers operational condition quickly after a fault occurs

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[SOURCE: ISO/IEC 19086-1:2016, 3.19, modified — "ability of" has been replaced by "degree to which"]

3.1.4.3
recoverability
degree to which a cloud service supports its critical business functions to an acceptable level within a predetermined period of time following a disaster

[SOURCE: ISO/IEC 19086-1:2016, 3.7, modified — "ability of the ICT elements of an organization to support" has been replaced by "degree to which a cloud service supports"]

3.1.5
service security
degree to which a cloud service protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization

[SOURCE: ISO/IEC 25010:2011, 4.2.6, modified — "a product or system" has been replaced by "a cloud service"]

3.1.5.1
confidentiality
degree to which a cloud service ensures that data are accessible only to those authorized to have access

[SOURCE: ISO/IEC 25010:2011, 4.2.6.1, modified — "a product or system" has been replaced by "a cloud service"]

3.1.5.2
accountability
degree to which the actions of an entity can be traced back uniquely to the entity

[SOURCE: ISO/IEC 25010:2011, 4.2.6.4 — "back" has been added]

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