

I n t e r n a t i o n a l T e l e c o m m u n i c a t i o n U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.3501

(06/2016)

SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Cloud Computing

Cloud computing – Framework and high-level requirements

Recommendation ITU-T Y.3501



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Recommendation ITU-T Y.3501

Cloud computing – Framework and high-level requirements

Summary

Recommendation ITU-T Y.3501 provides a cloud computing framework by identifying high-level requirements for cloud computing. It specifies the requirements which are derived from an analysis of several use cases.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y.3501	2013-05-22	13	11.1002/1000/11917
2.0	ITU-T Y.3501	2016-06-13	13	11.1002/1000/12880

Keywords

Cloud computing, cloud service, framework, requirement, use case.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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Recommendation ITU-T Y.3501

Cloud computing – Framework and high-level requirements

1 Scope

This Recommendation provides a cloud computing framework by identifying high-level requirements for cloud computing. The Recommendation addresses the general requirements and use cases for:

- Cloud computing;
- Infrastructure as a service (IaaS), network as a service (NaaS), desktop as a service (DaaS), platform as a service (PaaS), communication as a service (CaaS) and big data as a service (BDaaS);
- Inter-cloud computing, end-to-end cloud computing management, trusted cloud service, and cloud infrastructure.

This Recommendation addresses a set of use cases and related requirements which are included in Appendix I. Appendix II provides information on the methodology and edition plan of this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T X.1601] Recommendation ITU-T X.1601 (2015), *Security framework for cloud computing*.
- [ITU-T X.1631] Recommendation ITU-T X.1631 (2015), *Information technology – Security techniques – Code of practice for information security controls based on ISO/IEC 27002 for cloud services*.
- [ITU-T Y.3500] Recommendation ITU-T Y.3500 (2014), *Information technology – Cloud computing – Overview and vocabulary*.
- [ITU-T Y.3502] Recommendation ITU-T Y.3502 (2014), *Information technology – Cloud computing – Reference architecture*.
- [ITU-T Y.3503] Recommendation ITU-T Y.3503 (2013), *Requirements for desktop as a service*.
- [ITU-T Y.3510] Recommendation ITU-T Y.3510 (2016), *Cloud computing infrastructure requirements*.
- [ITU-T Y.3511] Recommendation ITU-T Y.3511 (2014), *Framework of inter-cloud computing*.
- [ITU-T Y.3512] Recommendation ITU-T Y.3512 (2014), *Cloud computing – Functional requirements of Network as a Service*.
- [ITU-T Y.3513] Recommendation ITU-T Y.3513 (2014), *Cloud computing – Functional requirements of Infrastructure as a Service*.

- [ITU-T Y.3520] Recommendation ITU-T Y.3520 (2015), *Cloud computing framework for end to end resource management*.
- [ITU-T Y.3521] Recommendation ITU-T Y.3521/M.3070 (2016), *Overview of end-to-end cloud computing management*.
- [ITU-T Y.3600] Recommendation ITU-T Y.3600 (2015), *Big data – cloud computing based requirements and capabilities*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 big data [ITU-T Y.3600]: A paradigm for enabling the collection, storage, management, analysis and visualization, potentially under real-time constraints, of extensive datasets with heterogeneous characteristics.

NOTE – Examples of datasets characteristics include high-volume, high-velocity, high-variety, etc.

3.1.2 big data as a service (BDaaS) [ITU-T Y.3600]: A cloud service category in which the capabilities provided to the cloud service customer are the ability to collect, store, analyse, visualize and manage data using big data.

3.1.3 cloud computing [ITU-T Y.3500]: Paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand.

NOTE – Examples of resources include servers, operating systems, networks, software, applications, and storage equipment.

3.1.4 cloud service [ITU-T Y.3500]: One or more capabilities offered via cloud computing invoked using a defined interface.

3.1.5 cloud service category [ITU-T Y.3500]: Group of cloud services that possess some common set of qualities.

3.1.6 cloud service customer [ITU-T Y.3500]: Party which is in a business relationship for the purpose of using cloud services.

NOTE – A business relationship does not necessarily imply financial agreements.

3.1.7 cloud service partner [ITU-T Y.3500]: Party which is engaged in support of, or auxiliary to, activities of either the cloud service provider or the cloud service customer, or both.

3.1.8 cloud service provider [ITU-T Y.3500]: Party which makes cloud services available.

3.1.9 cloud service user [ITU-T Y.3500]: Natural person, or entity acting on their behalf, associated with a cloud service customer that uses cloud services.

NOTE – Examples of such entities include devices and applications.

3.1.10 communications as a service (CaaS) [ITU-T Y.3500]: Cloud service category in which the capability provided to the cloud service customer is real time interaction and collaboration.

NOTE – CaaS can provide both application capabilities type and platform capabilities type.

3.1.11 desktop as a service (DaaS) [ITU-T Y.3503]: A cloud service category in which the capabilities provided to the cloud service customer are the ability to build, configure, manage, store, execute and deliver users' desktop functions remotely.

3.1.12 hypervisor [ITU-T Y.3510]: A type of system software that allows multiple operating systems to share a single hardware host.

NOTE – Each operating system appears to have the host's processor, memory and other resources, all to itself.

3.1.13 infrastructure as a service (IaaS) [ITU-T Y.3500]: Cloud service category in which the cloud capabilities type provided to the cloud service customer is an infrastructure capabilities type.

NOTE – The cloud service customer does not manage or control the underlying physical and virtual resources, but does have control over operating systems, storage, and deployed applications that use the physical and virtual resources. The cloud service customer may also have limited ability to control certain networking components (e.g., host firewalls).

3.1.14 infrastructure capabilities type [ITU-T Y.3500]: Cloud capabilities type in which the cloud service customer can provision and use processing, storage or networking resources.

3.1.15 inter-cloud computing [ITU-T Y.3511]: The paradigm for enabling the interworking between two or more cloud service providers.

NOTE – Inter-cloud computing is also referred as inter-cloud.

3.1.16 network as a service (NaaS) [ITU-T Y.3500]: Cloud service category in which the capability provided to the cloud service customer is transport connectivity and related network capabilities.

3.1.17 party [ITU-T Y.3500]: Natural person or legal person, whether or not incorporated, or a group of either.

3.1.18 platform as a service (PaaS) [ITU-T Y.3500]: Cloud service category in which the cloud capabilities type provided to the cloud service customer is a platform capabilities type.

3.1.19 resource management [ITU-T Y.3520]: The most efficient and effective way to access, control, manage, deploy, schedule and bind resources when they are provided by service providers and requested by customers.

3.1.20 role [ITU-T Y.3502]: A set of activities that serves a common purpose.

3.1.21 service level agreement (SLA) [ITU-T Y.3500]: Documented agreement between the service provider and customer that identifies services and service targets.

NOTE 1 – A service level agreement can also be established between the service provider and a supplier, an internal group or a customer acting as a supplier.

NOTE 2 – A service level agreement can be included in a contract or another type of documented agreement.

3.1.22 virtual desktop [ITU-T Y.3503]: An environment for accessing end user's desktop functions remotely.

NOTE – Examples of end user's desktop functions can include desktop interface functions for applications, data access functions for multimedia data, and control functions for input/output (I/O) devices.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 trusted cloud service: A cloud service that satisfies a set of requirements such as transparency for governance, management and security so that a cloud service customer (CSC) can be confident in using the cloud service.

NOTE 1 – The set of requirements will vary depending on the involved cloud service customer, the nature of the cloud service and the governing jurisdiction.

NOTE 2 – The set of requirements could also be related to additional cross-cutting aspects [ITU-T Y.3502] such as performance, resiliency, reversibility, SLAs, etc.

NOTE 3 – Transparency means that the cloud service provider (CSP) should commit to the CSC that they have appropriate and clear control and reporting mechanisms for governance, management and security, such as SLA commitments, online announcements, data handling policies, etc.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Programming Interface
BDaaS	Big Data as a Service
CaaS	Communication as a Service
CPU	Central Processing Unit
CSC	Cloud Service Customer
CSN	Cloud Service Partner
CSP	Cloud Service Provider
DaaS	Desktop as a Service
HD	High Definition
IaaS	Infrastructure as a Service
NaaS	Network as a Service
PaaS	Platform as a Service
PII	Personally Identifiable Information
QoE	Quality of Experience
QoS	Quality of Service
SaaS	Software as a Service
SDK	Software Development Kit
SLA	Service Level Agreement
VLAN	Virtual Local Area Network
VM	Virtual Machine

5 Conventions

In this Recommendation:

The keywords "**is required**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "**is recommended**" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "**can optionally**" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

In the body of this document and its appendixes, the words shall, shall not, should and may sometimes appear, in which case they are to be interpreted, respectively, as is required to, is prohibited from, is recommended and can optionally. The appearance of such phrases or keywords in an appendix or in material explicitly marked as informative are to be interpreted as having no normative intent.

For readability, the short titles are attached to the requirements for referring to use cases in Appendix I.

6 General requirements for cloud computing

The general requirements for cloud computing derived from the use cases in clause I.1 are as follows:

- **Service life-cycle management:** It is required that the cloud service provider (CSP) supports automated service provisioning, modification and termination during the service life-cycle;
- **Regulatory:** It is required that all applicable laws and regulations be respected, including those related to the protection of personally identifiable information (PII);
- **Security:** It is required that the cloud computing systems provided by the CSP be appropriately secured to protect the interests of all involved parties (e.g., persons and organizations);
- **Accounting and charging:** It is recommended that cloud service provided by the CSP supports various accounting and charging models and policies;
- **Efficient service deployment:** It is recommended that cloud service provided by the CSP enables efficient use of resources for service deployment;
- **Interoperability:** It is recommended that cloud service provided by the CSP complies with appropriate specifications and/or standards for allowing these systems to work together;
- **Portability:** It is recommended that cloud service provided by the CSP supports the portability of software assets and the data of cloud service customers (CSCs) with minimum disruption;
- **Service access:** The CSP is recommended to provide CSCs with access to cloud services from a variety of user devices. It is recommended that CSCs be provided with a consistent experience when accessing cloud services from different devices;
- **Service availability, service reliability and quality assurance:** It is recommended that the CSP provides end-to-end quality of service assurance, high levels of reliability and continued availability of cloud services according to the service level agreement (SLA) with the CSC.

7 General requirements for IaaS

The general requirements for infrastructure as a service (IaaS) derived from the use cases in clause I.2 are as follows:

- **Configuration, deployment and maintenance of resources:** The IaaS CSP is recommended to configure, deploy and maintain processing, storage and/or networking resources with specific SLAs and charging models to CSCs;
- **Use and monitoring of resources:** The IaaS CSP is recommended to provide the capability for CSCs to use and monitor processing, storage and/or networking resources so that they are able to deploy and run arbitrary software.

NOTE – Functional requirements for IaaS are provided in [ITU-T Y.3513].