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INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS,
NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Cloud Computing

Cloud computing maturity requirements and framework

Recommendation ITU-T Y.3524



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Recommendation ITU-T Y.3524

Cloud computing maturity requirements and framework

Summary

Recommendation ITU-T Y.3524 provides the functional framework and requirements for cloud computing maturity. It introduces an overview of cloud computing maturity and identifies the cloud computing maturity model including the cloud customer management module, cloud resource management module, cloud service management module and cloud security management module. Additionally, this Recommendation provides cloud computing maturity requirements derived from use cases.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Cloud computing, framework, maturity, model, requirements.

* 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.3524

Cloud computing maturity requirements and framework

1 Scope

This Recommendation specifies the cloud computing maturity requirements and framework based on relevant use cases. The scope of this Recommendation includes:

- 1) Overview of cloud computing maturity;
- 2) Cloud computing maturity framework;
- 3) Cloud computing maturity requirements;
- 4) Typical use cases of cloud computing maturity.

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 Y.3500] Recommendation ITU-T Y.3500 (2014) | ISO/IEC 17788:2014, *Information technology – Cloud computing – Overview and vocabulary*.
- [ITU-T Y.3501] Recommendation ITU-T Y.3501 (2016), *Cloud computing framework and high-level requirements*.
- [ITU-T Y.3502] Recommendation ITU-T Y.3502 (2014) | ISO/IEC 17789:2014, *Information technology – Cloud computing – Reference architecture*.
- [ITU-T Y.3517] Recommendation ITU-T Y.3517 (2018), *Cloud computing – Overview of inter-cloud trust management*.
- [ITU-T Y.3521] Recommendation ITU-T Y.3521/M.3070 (2016), *Overview of end-to-end cloud computing management*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 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.

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

3.1.3 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.

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

3.1.5 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.

3.1.6 service catalogue [ITU-T Y.3502]: A listing of all the cloud services of a particular cloud service provider.

3.1.7 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.

3.1.8 resource management [b-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.

3.1.9 architecture [b-ISO/IEC/IEEE 42010]: Fundamental concepts or properties of a system in its environment embodied in its elements, relationships and in the principles of its design and evolution.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms.

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

anti-DDoS	anti-Distributed Denial of Service
API	Application Programming Interface
BC/DR	Business Continuity and Disaster Recovery
CSC	Cloud Service Customer
CSP	Cloud Service Provider
CCMM	Cloud Customer Management Module
CRMM	Cloud Resource Management Module
CSMM	Cloud Service Management Module
CSEMM	Cloud Security Management Module
DB	Database
ETL	Extract-Transform-Load
FAQ	Frequently Asked Questions
IaaS	Infrastructure as a Service

IAM	Identity and Access Management
IOPS	Input/Output Operations Per Second
SLA	Service Level Agreement
VM	Virtual Machine

5 Conventions

In this Recommendation:

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.

6 Overview of cloud computing maturity

Cloud computing maturity is a kind of comprehensive criteria to define the effect and level in adoption of cloud computing. It describes three dimensions: technology, management and effectiveness, and covers partially cloud computing management as defined in [ITU-T Y.3521]: cloud customer management, cloud service management, and cloud resource management. Actually advanced description levels, rather than service level agreements (SLAs) are used to indicate the direction of maturity and to support different roles such as those of cloud service customers (CSCs), cloud service providers (CSPs), etc. to improve cloud computing maturity.

This Recommendation focuses on analysing the cloud maturity framework and functional requirements based on the cloud customer management, cloud service management, resource management and cloud security management.

6.1 Cloud computing maturity model

The aim of cloud computing management is to use the cloud resources efficiently, ensure cloud service stability and CSC:cloud service user flexibility. This Recommendation describes a cloud computing maturity model based on four-module and three-dimensional design that supports management processes independent of the technology used. The matrices of the cloud computing maturity model shown in Figure 6-1 are as follows:

- **Three-dimensions:** The ultimate effectiveness of cloud computing is reflected under the combined effects of technology and management. The three dimensions of cloud computing considered are technology, management and effectiveness. The requirements of maturity are derived from these three dimensions.
- **Four modules:** The model covers a cloud customer management module (CCMM), a cloud service management module (CSMM), a cloud resource management module (CRMM) and a cloud security management module (CSEMM). Each of these modules should be considered in three dimensions (technology, management and effectiveness) as stated. Each module has its own maturity requirements, and is linked to the other modules to allow construction of the overall maturity requirement framework of cloud computing.

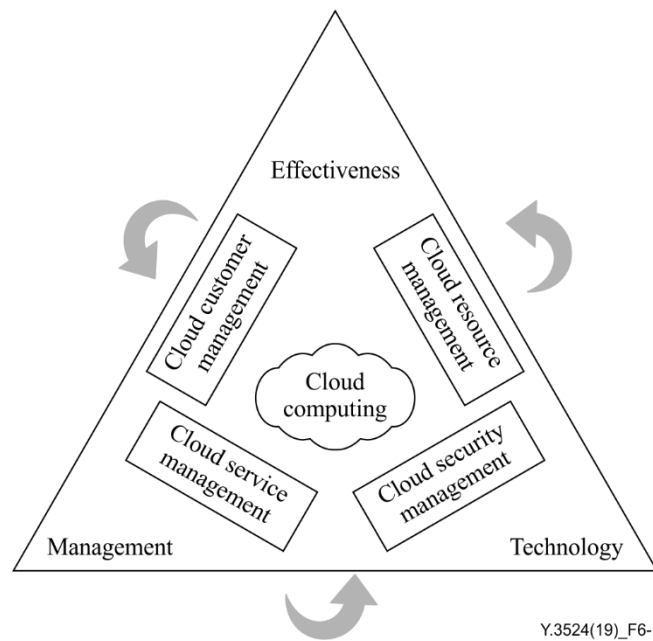


Figure 6-1 – The cloud computing maturity model

In order to evaluate the cloud computing maturity, there are several matrices in the cloud computing maturity model. Table 6-1 presents indicators used in the cloud computing maturity model. The indicators and their descriptions are as follows: "T" refers to technology indicator, "M" refers to management indicator, "E" refers to effectiveness indicator.

Table 6-1 – Indicators in cloud computing maturity model

Module	Indicator	Description	T	M	E
Cloud customer management	Resource cost utilization of cloud	It is the key measurement of capital investment and cloud resource utilization. It represents the cloud resource usage per unit cost.			√
	Cloud service design and deployment	It is the total time needed for design and deployment cloud service by CSP according to CSC's requirements.		√	
Cloud resource management	Resource sharing scale	It is the number of shared resources in resource pool providing multiple services to CSC, according to the statistics of tangible equipment entities such as physical machine, storage equipment, network equipment and other tangible entities.	√		
	Openness ability	It is the number of application programming interfaces (APIs) exposing the cloud service capabilities, including resource request, services configuration, etc.	√		

Table 6-1 – Indicators in cloud computing maturity model

Module	Indicator	Description	T	M	E
	Physical machine cluster CPU average utilization	It is the average CPU utilization of physical machines in the resource pool, which reflects the overall CPU resource usage of the cloud. It could be calculated in given period of time (e.g., monthly, daily) average and the data can be obtained from the CSP.			√
	Physical machine cluster CPU peak utilization	It is the peak CPU utilization of physical machines in the resource pool, which reflects the max resource usage of the cloud. It could be calculated in given period of time (e.g., monthly, daily) average and the data can be obtained from the CSP.			√
	Physical machine memory utilization	It is the memory utilization of physical machines in the resource pool, which reflects the overall memory resource usage of the cloud. It could be calculated in given period of time (e.g., monthly, daily) and the data can be obtained from the CSP.			√
	Average virtualization integration	It is the ratio of the total number of virtual machines to the total number of the virtualized servers in resource pool. This indicator reflects the level of virtualization application.		√	
	Resource pool virtualization	It is the ratio of host machines hosting the virtual machine to the total number of physical machines in a resource pool. This indicator reflects the virtualization degree.		√	
	Data storage pooling	It is the ratio of cloud storage resources capacity to the total storage resources capacity of the resource pool, including distributed block storage, object storage and distributed file storage, etc.		√	
	Computation resource specification	It is the specification providing the computation resource template (including QoS) according to computation unit and memory capacity, in which the resource capacity is variable and measurable.	√		
	Storage resource specification	It is the specification providing the storage resource template (including QoS) according to storage capacity, throughput or IOPS, in which the storage resource capacity is variable and measurable.	√		