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Information technology — Cloud computing — Cloud service metering elements and billing modes

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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 38, *Cloud computing and distributed platforms*.

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

As the adoption of cloud computing expands and the market grows, cloud service providers (CSPs) offer many different cloud services that can be classified as infrastructure, platform or application capabilities types. CSPs, in designing solutions to meet the needs of cloud service customers (CSCs), put together diverse metering elements and billing modes that complement the cloud services offered to cloud service customers (CSCs). It is challenging for CSCs to determine the differences among many diverse metering elements and billing modes from various CSPs as they navigate their journey to adopt cloud computing.

Measured service is one of the key characteristics of cloud computing (ISO/IEC 17788). The characteristic is that usage is monitored, controlled, reported, and billed for the delivered cloud service. To this end, it is necessary that usage can be monitored, controlled, reported, and billed for the delivered cloud service. Metering elements can be classified according to its cloud capabilities type. Transparent and scientific metering and billing results can be easily achieved if common operation practices apply.

The purpose of this document is to provide basic clarity and guidance through a sample set of cloud service metering elements and billing modes for different cloud capabilities types. Clause 5 includes a discussion of the billing functional component, of which metering is a major sub-component. Clause 6 introduces a sample set of metering elements. These examples can help a CSP better describe its billing and metering practices and can help CSCs to better understand the metering and billing of their cloud services in order to make informed decisions. Clause 7 explores some baseline guidance on cloud service metering and billing.

Information technology — Cloud computing — Cloud service metering elements and billing modes

1 Scope

This document describes a sample set of cloud service metering elements and billing modes.

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 17788, *Information technology — Cloud computing — Overview and vocabulary*

ISO/IEC 17789, *Information technology — Cloud computing — Reference architecture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 17788, ISO/IEC 17789 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
metering unit
unit of measure for a *metering element* (3.2)

3.2
metering element
characteristic of a cloud service that is subject to being metered

4 Abbreviated terms

API	Application Programming Interface
CSP	Cloud Service Provider
CSC	Cloud Service Customer
CPU	Central Processing Unit
IOPS	Input/Output Operations Per Second
IP	Internet Protocol
QoS	Quality of Service
SLA	Service Level Agreement

5 Cloud service metering and billing concepts

According to ISO/IEC 17789, the billing functional component contains metering, rating, pricing schedules and invoicing, as shown in Figure 1.

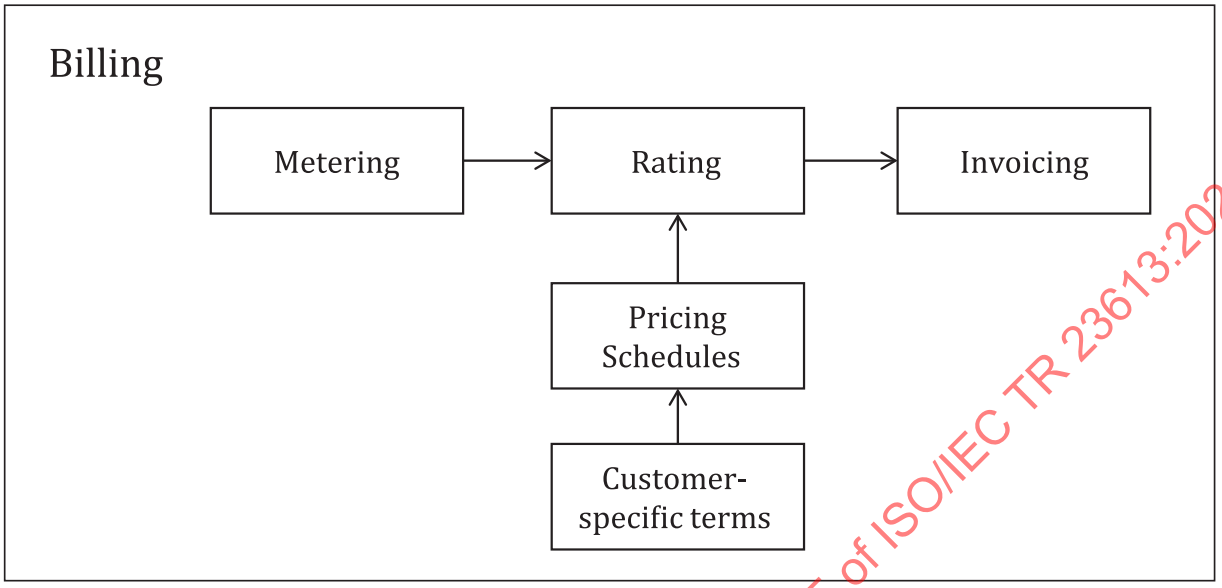

Figure 1 — Cloud service metering and billing concepts

Generally, there are two fundamental billing modes: billing by subscription and billing by usage. Billing by subscription means billing according to contractual indicators within typically periodic time boundaries, while billing by usage means billing according to actual usage of the cloud service, often within a given time period for calculating the fees. In practice, these two modes can be used separately or combined. For example, a subscription mode applies until reaching the upper boundary for monthly usage; above that, usage mode applies.

Metering is the measurement of the consumption of cloud services by each CSC. Rating is the application of pricing schedules to the metering data. The form of the metering data depends on the nature of the cloud service. The pricing schedules can involve customer-specific terms (e.g. discounts) and can require algorithmic application against the metering data.

The generation of invoices is based on the charges for the use of cloud services created by the metering and rating function or generated from subscription data. Invoices are transmitted by the CSP to the CSC.

6 Metering elements

6.1 Cloud service metering elements for infrastructure capabilities type

Infrastructure capabilities types include the provision and use of:

— processing resources,

— storage resources, or

— networking resources.

These resources are provided individually or in combination by a particular cloud service.

Processing resources can be offered in the form of:

— bare metal machine,

— virtual machine (VM), or

— container.

Storage resources can be offered in the form of:

— file storage service,

— object storage service, or

— block storage service.

Network resources can be offered in the form of:

— cloud access networking, or

— intra-cloud networking.

These resources are described in detail in ISO/IEC TS 23167.

Table 1 provides examples of metering elements that apply to infrastructure capabilities type.

The Table 1 "Service classification" rows and associated "Metering element"s are examples from today's cloud computing marketplace. It is possible that they will evolve with changes in technology and market opportunities.

Table 1 — A sample set of infrastructure capabilities type cloud service metering elements

Service classification	Metering element	Description	Metering unit
Virtual machine	CPU core count	Number of CPU cores assigned to each virtual machine instance.	N/A*
	Memory capacity	Main memory size for each virtual machine instance.	Byte
	Storage capacity	Persistent data storage size for each virtual machine instance.	Byte
	Operating time	Total running time of each virtual machine instance.	Second
VM image	VM image size	Each VM image size.	Byte
	Keep-live time	The time the CSP keeps the given VM image at active storage. Beyond this time limit, the VM image can be archived on tape or other longer-term storage medium.	Second
Storage	Storage capacity	Total storage size.	Byte
	Storage IOPS	Rate of input/output operations.	Operations/second
	Throughput rate	Amount of data transferred per unit time.	Byte/second
Snapshot	Snapshot size	Snapshot is a real-time capture of a running VM current status, configuration, etc., as a file in the host machine. It can be used as a checkpoint for VM recovery. Snapshot size refers to the size of the file.	Byte

Table 1 *(continued)*

Service classification	Metering element	Description	Metering unit
Private virtual network	Private network IP address count	Total number of private IP addresses.	N/A*
	Private network bandwidth	Amount of data transmitting through the private network per unit time.	bits/second
	Private network flow	Total amount of data sent or received over the private network.	Byte
Public network	Public network IP address count	Total number of public IP addresses.	N/A*
	Public network bandwidth	Amount of data transmitting through the public network per unit time.	bits/second
	Public network flow	Total amount of data sent or received over the public network.	Byte
Virtual firewall	Virtual firewall throughput	Amount of data traversing a virtual firewall per unit of time.	bits/second
	Virtual firewall count	Total number of virtual firewalls.	N/A*
Virtual load balancer	Virtual load balancer number	Number of virtual load balancer instances.	N/A*
	Virtual load balancer throughput	Amount of data traversing through each virtual load balancer per unit of time.	bits/second
	Virtual load balancer IP count	Number of IP addresses supported by each virtual load balancer.	N/A*
	Virtual load balancer maximum connection count	Maximum number of connections supported by each virtual load balancer.	N/A*
*N/A Not Applicable. Counting numbers does not need a metering unit.			

6.2 Cloud service metering elements for platform capabilities type

Table 2 provides examples of metering elements that apply to platform capabilities type.

The Table 2 "Service classification" rows and associated "Metering element"s are examples from today's cloud computing marketplace. It is possible that they will evolve with changes in technology and market opportunities.

Table 2 — A sample set of platform capabilities type cloud service metering elements

Service classification	Metering element	Description	Metering unit
Message-oriented middleware	Message service instance number	Number of process instances of the message-oriented middleware.	N/A*
	Instance log storage size	Amount of memory space occupied by instance logs.	Byte
	Processed message count	Number of messages successfully sent/received using message service.	N/A*
	Outbound message volume	Volume of data transmitted in outbound messages.	Byte
Caching service	Cache size	The size of the cache provided.	Byte

Table 2 *(continued)*

Service classification	Metering element	Description	Metering unit
Application runtime	Instance count	Total number of independently running applications/services deployed by a tenant using application server service.	N/A*
	Instance using time	Total instance running time.	Second
	Processed requests	Total number of instance requests.	N/A*
	Instance throughput	Total amount of data in and out of an instance.	Byte
	Instance memory usage	Memory occupied by instance.	Byte
	Instance log memory size	Memory size occupied by instance log.	Byte
Database	Independently running database instances	Total number of independently running application/service instances deployed by tenant using application server service.	N/A*
	Instance running time	Each instance running time.-	Second
	Processed requests	Total number of requests	N/A*
	Instance throughput	Total data in and out.	Byte
	Instance memory usage	Memory occupied by instance.	Byte
	Instance log memory size	Memory size occupied by instance log.	Byte
	Connection count	The maximum number of database connections an instance keeps.	N/A*
	Memory size	Applied memory size.	Byte
*N/A Not Applicable. Counting numbers does not need a metering unit.			

6.3 Cloud service metering elements for application capabilities type

Table 3 provides examples of metering elements that apply to application capabilities type.

The Table 3 "Service classification" rows and associated "Metering element"s are examples from today's cloud computing marketplace. It is possible that they will evolve with changes in technology and market opportunities.

Table 3 — A sample set of application capabilities type cloud service metering elements

Service classification	Metering element	Description	Metering unit
API usage	API call number	Total number of API calls.	N/A*
	API call frequency	Number of API calls per unit time.	Number/ second
	Data set size	The amount of data being processed.	Byte