Cloud Computing

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# Definition

Peter Mell and Timothy Grance from the National Institute of Standards and Technology, who are responsible for developing standards and guidelines, defines cloud computing as an evolving paradigm. Their standards aim is to provide baseline for discussion for what cloud computing is, and what is the best use of cloud computing, and not constrain any particular method of deployment, delivery or operation.(2011,1.)

The NIST(National Institute of Standards and Technology) document defines cloud computing as “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources … that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell & Grance. 2011,2).

Their cloud model is composed of five essential characteristics:

**On-demand self-service.** Consumer should be able to provide computing capabilities unilaterally automatically, without human interaction with each service provider.

**Broad network access.** Capabilities are available over the network and accessed by mechanisms that promote use by heterogeneous client platforms

**Resource Pooling.** The providers computing resources are pooled to serve multiple consumers with resources dynamically assigned and reassigned according to demand. Customer has no control or knowledge over the exact location of the resource, but can get location info of a higher level of abstraction such as a country for example.

**Rapid elasticity**. Capabilities can be elastically released or provisioned according to demand. To the consumer the capabilities often appear unlimited and any quantity can be appropriated at any time.

**Measured service.** Systems automatically optimize resource use metered according to a level of abstraction appropriate to the service. Resource usage can be monitored, controller and reported for transparency.

These service models:

**Software as a Service.** The capability provided is to use the provider’s applications running on a cloud. The applications are accessible through various devices running either a web browser, or similar thin client interface, or a program interface. The consumer has no control over the cloud or even individual applications.

**Platform as a Service.** Consumer-created or acquired applications can be deployed onto the cloud infrastructure, but the consumer does not control the cloud infrastructure. The consumer however has control over the deployed applications.

**Infrastructure as a Service.** Provides the consumer with fundamental computing resources where the consumer can deploy and run software. The consumer does not control the cloud infrastructure but has control over operating systems, storage and deployed applications. The consumer might have limited control of some networking components such as a firewall.

And these deployment models:

**Private cloud.**  The cloud is meant for exclusive use. This can be for example a single organization comprising multiple business units. The organization can own, manage or operate the cloud or it can be a third party, or some combination. The location does not matter.

**Community cloud.** The cloud is meant for a community. It may be owned managed and operated by any, or multiple, of the organizations in the community, or even a third party. Combination is also possible. The location does not matter.

**Public cloud**. The cloud is for open use by the public. It can be run by a business, academic, or government organization. It exists on the premises of the provider.

**Hybrid cloud.** The cloud is a combination of multiple cloud infrastructures. The clouds that consist this hybrid also remain unique entities. They are bound together by technology that enables data and application portability.

(Mell & Grance. 2011,2-3.)

# Benefits of using the cloud

Reduced investments and proportional costs for organizations who are acting as public cloud providers. They can mass-acquisition IT resources, utilizing the powerful cloud infrastructure without actually purchasing said infrastructure, that can then be offered to consumers through leasing packages. This elimination of up-front financial expenditure allows businesses to start small and increase the resources if required. “The most common economic rationale for investing in cloud-based IT resources is in the reduction or outright elimination of up-front IT investments”. Major cloud providers take many steps to reduce costs, such as carefully choosing the location of their data center and the wage of the professionals they hire, resulting in decreased capital and operational costs. Another example for why a company can save money is that they can use 100 servers for one hour and the cost would be the same as using one server for 100 hours. This elasticity would not be possible without steep initial investments if it wasn’t made possible by a cloud provider.(Puttini R, Mahmood Z & Erl T 2013. Chapter 3, Goals and Benefits.)

As hinted in the previous section, increased scalability is another clear benefit of using cloud computing. By providing pools of IT resources clouds can dynamically allocate said resources to consumers, on-demand or by consumer’s configuration. This enables the consumer to scale their IT resources to account for fluctuations and peaks either automatically or manually. (Puttini et al. 2013.) If an organizations demand for the IT resources they provide are as in figure 1, they can set their IT resources, like bandwidth, to match the needs of 3000 users during hours 0-8. Later on the day when users increase in number, they can either manually set their configurations correctly or let it happen automatically. Since the measurable peak never goes over 10 000 users, it’s safe to say they could configure the IT resources for 11 000 people, while keeping the automatic increase on as a safeguard, saving money that way.

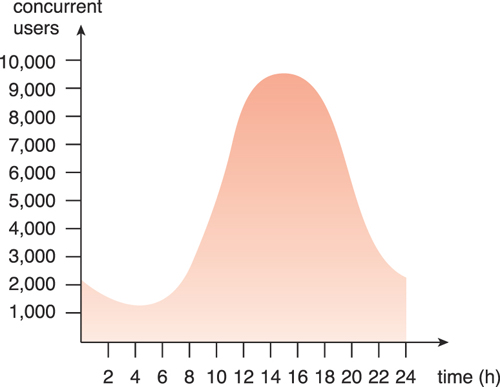


FIGURE 1. An example of changing demand for an IT resource (Puttini et al. 2013).

Using cloud computing also provides the organization with increased availability and reliability. Both are directly associated with business benefits. Outages mean that the resource is no longer *open for business* meaning decreased usage and revenue generating potential. Runtime failures can have an even more significant impact for example during peak usage times. Customers can not use your service and that can, besides loss of revenue, cause a decrease in customer confidence. Outages can be minimized or eliminated using cloud computing. Typically cloud providers offer *resilient* resources with high availability, but Not all cloud providers are capable of offering high levels of availability and reliability. It depends on the guarantees made in their Service-level agreement. (Puttini et al. 2013.)

References

Mell, P & Grance. T. 2011. The NIST Definition of Cloud Computing: Recommendations of the National Institute of Standards and Technology. Cited 6.1.2018, http://faculty.winthrop.edu/domanm/csci411/Handouts/NIST.pdf

Puttini R, Mahmood Z & Erl T. 2013. Cloud Computing: Concepts, Technology, Architecture. Cited 7.1.2018. Internal source, https://www.safaribooksonline.com/library/view/cloud-computing-concepts/9780133387568/