

Cloud Computing

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1 General Information

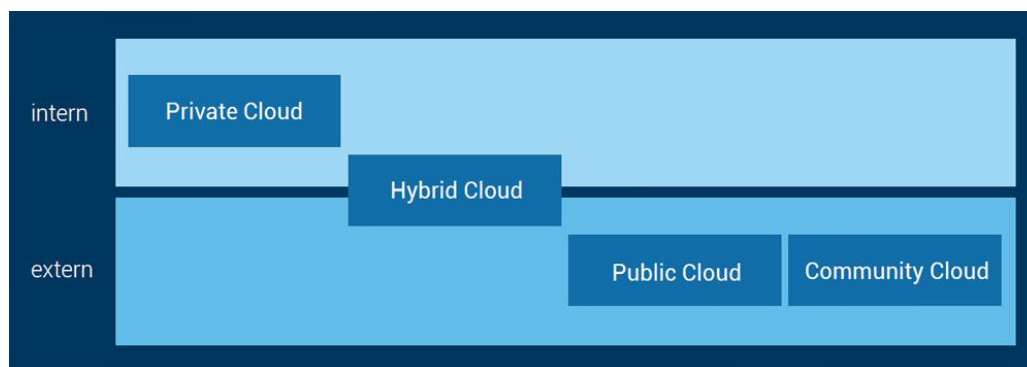
Cloud computing, or sometimes called “the cloud” is the term for the consumption of computer resources mainly over the internet. This means that data is stored centralized for example in remote servers of a provider.

With cloud computing **processing power**, **memory** and also **software** can be hired at the size it is needed. So companies can focus on their main target, without getting limited by the IT sector. For example if you want to create a database, you can fully focus on it without caring about hardware, processing power, etc. by just using the resources of a cloud supplier. Furthermore the hired resources are almost everywhere available over the internet. Cloud computing can be compared for example with a utility like the electricity grid.

Due to this facts cloud computing is also good for the environment because not so much hardware is needed. Also the demand of cloud computing rises by about 50% annually.

2 Different usage models

Overall, there are three models of cloud systems, which are public, private and hybrid clouds. A special form is a so called community cloud.



Public Clouds

They are operated by external providers and have many users, e.g. Facebook, Dropbox, etc.

Private Clouds

They are operated by only one company and are used internal. An example is the Dropbox alternative ownCloud which can be installed on an own webserver.

Hybrid Clouds

A hybrid cloud is a combination of two or more clouds. An example for it is, when IT companies use public clouds to meet temporary needed capacities which cannot be met by the private cloud.

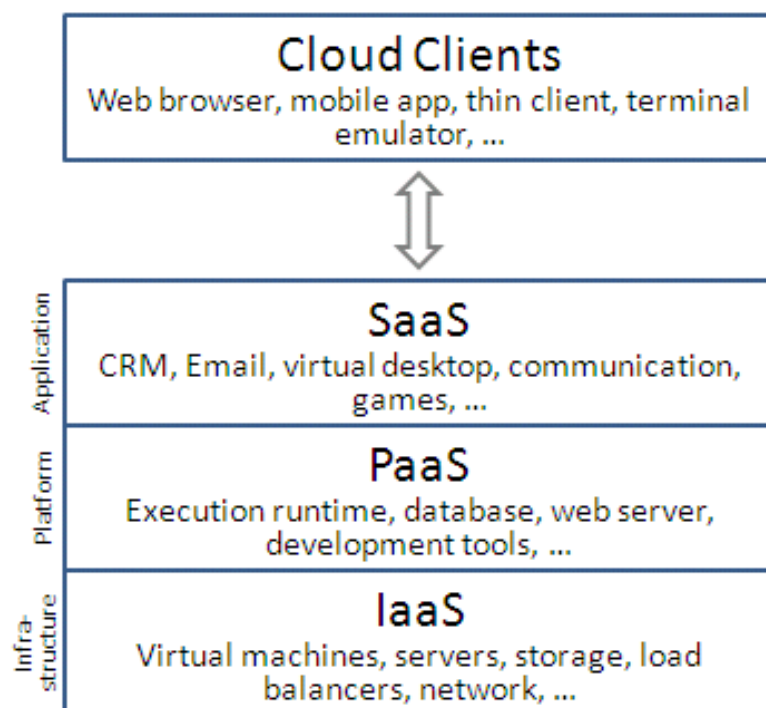
Community Clouds

A special usage model is the community cloud. This is when a private cloud is used by more companies. It is a good example for a cluster (economic speaking).

Furthermore, there are a few more models which are not so important.

3 Service models

Beside the usage models, clouds can also be distinguished by their service model. Basically, there are three different service models, which are SaaS (Software as a service), PaaS (Platform as a service) and IaaS (Infrastructure as a service).



3.1 Description

Infrastructure as a service

Here, only a minimal package is provided including processing-, storage- and network-infrastructure (like a computer). In most cases, these are provided in the form of virtual machines. However, the client is responsible for all the software, sometimes including even the operating system. Hence this system has to be used like an internal server or computer in a company.

Sometimes additional resources like firewalls, VLANs or software bundles are offered by IaaS clouds.

Platform as a service

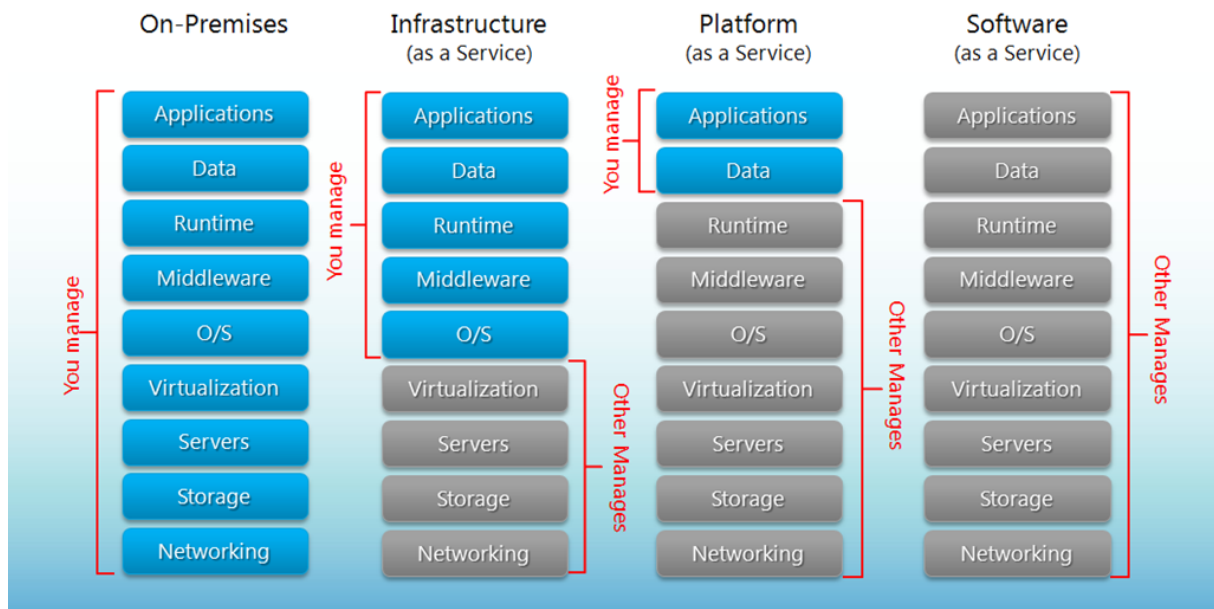
PaaS is nice for creating user specific applications or services which can be scaled randomly. The provider delivers a computing platform which typically includes operating system, program language environment, database and webserver. So application developers can develop their software solutions without caring about the underlying computer and resources, since they scale automatically to the application demand. An example for a PaaS and also for an IaaS is Microsoft Azure.

Software as a service

SaaS is when finished applications and databases are delivered by the provider. Hence, a company is able to outsource their hardware and software maintenance to the cloud provider, which reduces hardware, software and personal costs and the company can meet other goals better. An example for a SaaS in the sector CRM (which means customer relationship management) is Salesforce. An example for a SaaS provider which is much used by private people is Dropbox.

The difference of these three service models is also simply explained in the graphic on the following page.

Separation of Responsibilities



4 Advantages / Disadvantages

4.1 Advantages

- Pay per use: Only the resources which are used have to be paid.
- Cost saving: personal, hardware, software
- Scalable: Needed resources can be "booked" on demand.
- Flexibility
- Future-proof: Single computers in datacenters can be replaced or updated without stopping a system.
- Efficiency: Bigger datacenters are more efficient than many smaller local systems, for example because the workload is more constant.

4.2 Disadvantages

- The internal data and maybe also the know-how of a company is stored and managed externally.
- Dependence: For example, if a provider goes bankrupt and has to stop his business, the stored data could be lost.
- Internet-access: Logically, an internet-access is always needed to get access to the “outsourced” data. A failure could happen at the provider’s or the client’s side.
- Management: As cloud systems are very complex, little mistakes can lead to data loss or block the access.
- Failures: Huge amounts of data have to be saved at different locations. Thus there is a higher risk of failures.
- Safety and data privacy: Since there is probably lots of important data stored in a cloud system, the amount of attacks is bigger. Therefore such systems need a sophisticated encoding and data security.

5 Security

Due to the last point of the disadvantages, an excellent security system is required.

Moreover, all cloud providers are able to access the data which is stored at any time. Thus, data could be altered or even deleted accidentally. Furthermore, many providers are able to share information with third parties if it is necessary for a purpose of law and order even without warrant.

5.1 **Recommended practices**

The following measures are advisable for a safe use of cloud computing systems.

- **Encoding** of all your stored data
- Protocol all your activities
- Set a password to very important data
- Encoding of all hits (https)

6 **Different cloud providers**

It is also very important, to care about a few facts when deciding which cloud provider fits best. Some of these facts are the following:

- What kind of cloud and which provider is the cheapest for the company or private person.
- In which country are the data stored?
- Is all the data encoded?
- What privacy policy has the country where the data is stored?