



Deployment models of Cloud Computing: Challenges

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Abstract: Cloud computing is the new movement in the technology world. It is an internet based service delivery model which provides internet based services, computing and storage for users in all market including financial, health care & government. This paper discuss the characteristics and benefits of cloud Computing and services in a cloud computing. It proceeds to discuss the deployment models in a cloud computing (public, private, and hybrid), various advantages and challenges of different models.

Keywords— Cloud, Cloud computing, IAAS, PAAS, SAAS& deployment.

I. INTRODUCTION

A cloud is a place where IT resources such as computer hardware, operating systems, networks, storage, databases, and even entire software applications are available instantly, on-demand. Cloud computing is a general term for anything that involves delivering hosted services over the Internet. Instead of keeping data on your own hard drive or updating applications for your needs, you use a service over the Internet, at another location, to store your information or use its applications.



Figure 1: cloud computing

A. Characteristics of Cloud Computing:

- a. **On-demand self-service:** A user can directly access the needed computing capabilities from the source, no matter what specific resource is required [1].
- b. **Broad network access:** A user is not tied to one location but can access resources from anywhere the network (typically the Internet) is available.
- c. **Resource pooling:** Many users share the same overall set of resources from a provider, using what they need, without having to concern them selves with where those resources originate.
- d. **Rapid elasticity:** Users can quickly increase or decrease their use of a computing resource in response to their immediate needs.

- e. **Measured service:** The amount of usage by a customer is monitored by the provider and can be used for billing or other purposes.

B. Benefits of Cloud Computing:

- a. Cloud technology is paid incrementally, saving organizations money [3].
- b. Organizations can store more data than on private computer systems.
- c. No longer do IT personnel need to worry about keeping software up to date.
- d. Cloud computing offers much more flexibility than past computing methods.
- e. Employees can access information wherever they are, rather than having to remain at their desks.
- f. No longer having to worry about constant server updates and other computing issues, government organizations will be free to concentrate on innovation.
- g. Decoupling and separation of the business service from the infrastructure needed to run it (virtualization).
- h. Flexibility to choose multiple vendors that provide reliable and scalable business services, development environments, and infrastructure that can be leveraged out of the box and billed on a metered basis—with no long term contracts
- i. Elastic nature of the infrastructure to rapidly allocate and de-allocate massively scalable resources to business services on a demand basis.
- j. Cost allocation flexibility for customers wanting to move CapEx into OpEx
- k. Reduced costs due to operational efficiencies, and more rapid deployment of new business services [6].

II. THREE BASIC SERVICE MODELS:

The cloud computing service models are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

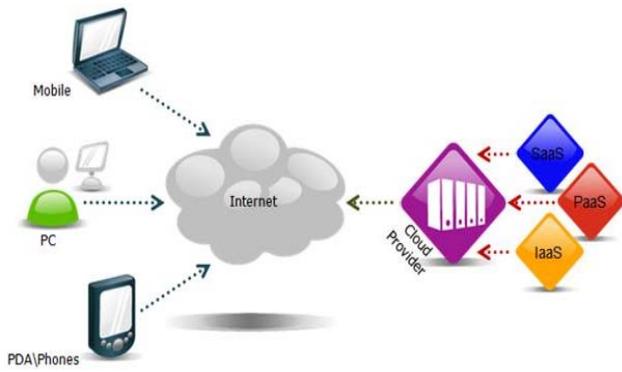


Figure 2: Service models

A. Software as a Service (SaaS):

In the SaaS model, customers use applications that the provider supplies and makes available remotely on demand, rather than using applications installed on a local workstation or server. SaaS is the most readily visible service model to the end user. In many cases, SaaS applications are accessible through hardware or software “thin clients.” They include web-based services such as Google Maps and Face book, online storage, and services such as PayPal that websites can integrate into their applications [1][3].



Figure 3: Software as a service

B. Platform as a Service (PaaS):

With PaaS, customers create applications on the provider’s infrastructure using tools, such as programming languages, supplied by the provider. One example of such an application is using PaaS to create a Web-based interface for customers. Such a platform could include hosting capability and development tools to facilitate building, testing, and launching a web application. The user controls the applications created via the platform, and the provider controls and maintains the underlying infrastructure, including networks, servers, and platform upgrades [1].



Figure 4: Platform as a service

C. Infrastructure as a Service (IaaS):

IaaS providers supply fundamental computing resources that customers can use however they wish. Customers can install, use, and control whatever operating systems and

applications they wish, as they might otherwise do on desktop computers or local servers. The provider maintains the underlying cloud infrastructure. Infrastructure is a Service (IaaS) as a viable, cost-effective, and scalable IT delivery model [1][3].



Figure 5: Infrastructure as a service

III. DEPLOYMENT MODELS

Three standard models, or types, of cloud computing that can be implemented to satisfy varying needs of users or providers. Those models public, private and hybrid-vary in where the hardware is located, what entity is responsible for maintaining the system, and who can use system resources[1].

A. Public cloud:

In *public cloud* (sometimes called an *external cloud*) computing, a provider supplies one or more cloud computing services to a large group of independent customers, such as the general public. Customers use the service over the Internet through web browsers or other software applications. Providers usually sell those services on a metered basis, an approach that is sometimes called “utility computing.” Some common examples of services using a public cloud model include Internet backup and file synchronization and web-based media services. Public clouds may have price and flexibility advantages over other deployment models, but security and other concerns could restrict federal use. The public cloud is a series of computing services available on the public Internet. It includes Software as a Service applications such as Salesforce.com or Google’s Gmail, software development Platforms as a Service, such as Microsoft’s Azure, and Infrastructures as a Service from a wide range of vendors [1][5].



Figure 6: public cloud

B. Benefits of the public cloud:

- a. Reduce costs
- b. It can improve cash flow by converting capital investments to operating expenses
- c. It is highly scalable
- d. It provides universal accessibility, and
- e. Applications and data are automatically backed up and upgraded [5].

C. Disadvantages:

- a. **Lack of control:** Due to the fact that third party providers are in charge of the data systems, many organizations feel as if they don't have enough control over their personal data with a public cloud service^{[2][4]}.
- b. **Slow speed:** Public cloud services are based on Internet connections, meaning the data transfer rate is limited to that of the Internet Service Provider. If an organization is storing and transferring large amounts of data and needs, a public cloud service may not be the best bet.
- c. **Lack of investment:** Although a great cost saving method by reducing the need to invest upfront, renting the service from an outside provider also means that there is little capital gained.
- d. **Perceived weaker security:** Perceived weaker security sometimes is viewed as the main disadvantage in public cloud service [2][4].

D. Private cloud:

A private cloud (sometimes called an internal cloud) works like public cloud computing, but on a private network controlled and used by a single organization. Private clouds may provide services that are similar to those provided by public cloud providers, but with fewer purported risks. Potential disadvantages include cost and logistical challenges associated with purchasing and managing the required hardware and software. Private clouds can provide internal services such as data storage as well as external services to the public or other users. Private clouds are those that are built exclusively for a single business. For many companies considering cloud computing, private clouds are a good starting point [7]. They allow the organization to host applications, development environments, and infrastructure in a cloud. Two models for cloud services can be delivered in a private cloud: Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). With IaaS, you can use infrastructure resources (compute, network, and storage) as a service, while PaaS provides a complete application platform as a service[1][5].



Figure 7: private cloud

E. Advantages:

- a. **Greater control:** Due to the fact that the hardware is on-site, organizations have more control over their data. The organization is in charge of monitoring and maintaining the data giving them complete oversight of their data.
- b. **More security:** Because private cloud services are dedicated to a single organization, the hardware, data storage, and network can be designed to assure high levels of security that cannot be accessed by other clients in the same data center.
- c. **Higher performance:** The private cloud is deployed inside the firewall on an organization's

intranet, meaning that transfer rates are dramatically increased versus using the Internet.

- d. **Customizable:** Hardware performance, network performance, and storage performance can be specified and customized in the private cloud since it's owned by the company[2][4].

F. Disadvantages:

- a. **Higher cost:** Private cloud services are in general more expensive than public ones because they require both hardware and maintenance personnel. To build a private cloud service, an organization needs to invest in hardware or use already existing systems whereas a public cloud service is all handled off site. Private clouds also require system administrator's leads to higher administration costs.
- b. **On-site Maintenance:** Since the private cloud is hosted at the company's site, the organization needs to provide adequate power, cooling, and general maintenance.
- c. **Capacity Ceiling:** There will always be a capacity ceiling due to the limitations of the physical hardware in the organization's data center. There can only be so much space available within a company's environment to deploy a certain amount of hardware servers [2][4].

G. Hybrid cloud:

A hybrid cloud uses a combination of internal (private or community) and external (public) providers. For example, a user could employ a private or community cloud to provide applications and store current data but use a public cloud for archiving data. The flexibility of this deployment model may make it particularly attractive to many organizations [1].



Figure 8: hybrid cloud

H. Advantages:

- a. Cost Savings
- b. Business Agility

I. Hybrid cloud challenges:

- a. Consistent policy enforcement and capabilities for firewalls, security, and application delivery [8].
- b. Layer 2 network connectivity to support VM migration.
- c. A common view of virtual applications and resources across the data center and cloud service provider.
- d. Support for multiple hypervisor environments and related infrastructures software.
- e. Virtual network overlays designed to integrate with evolving frameworks for SDN.

IV. CONCLUSION

To summarize, the private cloud is an attempt to utilize the benefits of cloud along with retaining control of the data.

Private cloud is mostly controlled by the company only, who has to maintain trained staff for administration. Public cloud is the cloud data resides on vendor's remote servers, and software, resources, etc., are available on demand. Public cloud is able to use big data technology to generate useful business insights. Some businesses, there's a practical need to maintain some data on-premise and yet benefit from cloud computing so, for them the hybrid cloud is the way to go, as it allows them to set up data-exchange programs that enable multiple deployments to work together.

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