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## A Study on Cloud Computing Models

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**ABSTRACT:** Cloud computing refers to manipulating, configuring and accessing the hardware and software resources remotely which offers online data storage, infrastructure, and application. Hence, the Cloud Computing is making the business applications mobile and collaborative. It is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. In this paper we are presenting the characteristics, cloud models and several advantages and disadvantages of cloud computing.

**KEYWORDS:** CLOUD COMPUTING, CHARACTERISTICS, CLOUD MODELS, ADVANTAGES, DISADVANTAGES.

### I. INTRODUCTION

Cloud computing recently received substantial attention, as a promising approach for delivering Information and Communication Technologies (ICT) services. With the fast development of processing, storage technologies, the sensation of the Internet, and computing resources have become cheaper, more powerful and more universally available than ever before. This technological trend has enabled the realization of a new computing model called cloud computing. The resources like CPU and storage are provided as general utilities to the users on-demand based through internet. The traditional cloud computing service provider is divided as the infrastructure providers who supervise cloud platforms and lease resources according to a pay-per-use based model, and service providers, who rent resources from more infrastructure providers to serve the end users. From the past few years, the cloud computing has made a tremendous impact on the Information Technology (IT) industry [1].

### II. NEED OF CLOUD COMPUTING

- A. *Software as a Subscription:* In a cloud, software resides on a service provider's servers external to a user's computer.
- B. *Reduced Software Maintenance:* By keeping the software in the 'clouds' users can reduce the amount of maintenance on their computers.
- C. *Increased Reliability:* The cloud runs on systems that are extremely reliable and provide some form of redundancy.
- D. *Cost Reduction:* Capital expenditures are reduced because a lot of the load and storage will be shifted over to the service provider who can provide that service at a lower cost.
- E. *Environment Friendly:* One of the greatest advantages of cloud computing is the increased longevity and use of older hardware used by datacenters.
- F. *Matches Current Computing Trends:* The introduction of the e-books has moved a lot of sales from computers and laptops with more powerful processors and extended capabilities to less powerful and more efficient platforms.
- G. *Portability/Accessibility:* The availability of files and software anywhere
- H. *Efficient Use of Computer Resources:* The advent of virtualization has provided companies with ways to efficiently use their computer resources. Users no longer require separate servers for different applications. With virtualization, multiple server technologies can run from a single server. This shift supports the growth of cloud computing due to the increased capabilities of servers.
- I. *Version-less Software:* It says that the changes and updates to software would be constant and version numbers would be transparent to the user and all the users would see it as an added functionality.

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## III. CLOUD SERVICE MODELS

Cloud service models are commonly divided into SaaS, PaaS and IaaS that revealed by a given cloud infrastructure. Fig.1. Shows the cloud clients and various cloud service models SaaS, PaaS and IaaS.

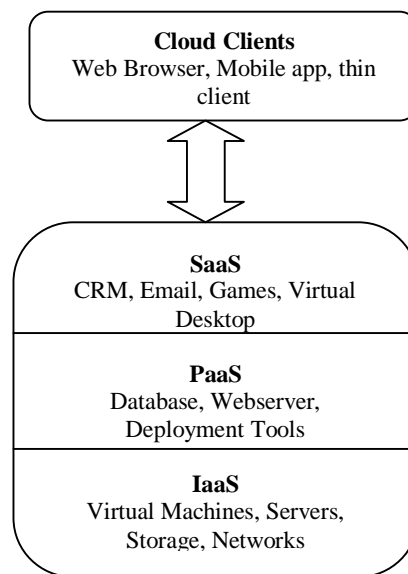


Fig.1. Cloud Service Models

### A. SOFTWARE AS A SERVICE (SAAS)

Cloud consumers liberate their applications in a hosting environment, which can be accessed through networks from various clients (e.g. Web browser, PDA, etc.) by application users. Cloud consumers do not have control over the cloud infrastructure that often employs multi-tenancy system architecture, namely, different cloud consumers' applications are organized in a single logical environment in the SaaS cloud to attain economies of scale and optimization in terms of speed, security, availability, disaster recovery and maintenance.

### B. PLATFORM AS A SERVICE (PAAS)

PaaS is a development platform sustaining the full "Software Lifecycle" which allows cloud consumers to develop cloud services and directly on the PaaS cloud. Hence, the difference between SaaS and PaaS is that SaaS only hosts completed cloud applications whereas PaaS offers a development platform that hosts both.

### C. INFRASTRUCTURE AS A SERVICE (IAAS)

Cloud consumers directly use IT infrastructures provided in the IaaS cloud. Virtualization is extensively used in IaaS cloud in order to put together physical resources in an ad-hoc manner to meet growing or shrinking resource demand from cloud consumers. The basic tactic of virtualization is to set up independent virtual machines (VM) that are isolated from both the underlying hardware and other VMs. Notice that this strategy is different from the multi-tenancy model, which aims to transform the application software architecture so that multiple instances can run on a single application (i.e. the same logic machine).

The above classification is well accepted in the industry. [9]

David Linthicum describes a more granular classification on the basis of service provided. These are listed below:

1. Storage-as-a-service
2. Database-as-a-service

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3. Information-as-a-service
4. Process-as-a-service
5. Application-as-a-service
6. Platform-as-a-service
7. Integration-as-a-service
8. Security-as-a-service
9. Management/Governance-as-a-service
10. Testing-as-a-service
11. Infrastructure-as-a-service

## IV. CLOUD DEPLOYMENT MODELS

Depending on the organizational structure, the provisional location and also based on their specific business, operational, and technical requirements the cloud services can be deployed in different ways. Fig.2. shows the four primary cloud deployment models they are:

- Public Cloud
- Private Cloud
- Community Cloud
- Hybrid Cloud

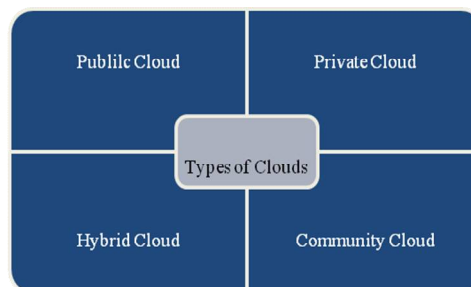


Fig.2. Cloud Deployment Models

### A. **PUBLIC CLOUD:**

The public cloud deployment model signifies true cloud hosting. In this model services are rendered over a network that is open for public use. Here service can be provided by a vendor free of charge or on the basis of a pay-per-user license policy. In this model cloud infrastructure is available to the general public and is owned by a third party cloud service provider (CSP). This model is best suited for business requirements, utilize provisional infrastructure for developing and testing applications. It condenses capital expenditure and brings down operational IT costs.

### B. **PRIVATE CLOUD**

A private cloud deployment model is owned by a single organization. In this model cloud infrastructure operated exclusively for a single organization, managed internally or by a third-party, and is hosted either internally or externally. Private cloud makes use of virtualization solutions and focus on consolidating distributed IT services often within data centers belonging to the company. In this model the enterprise retains full control over corporate data, security guidelines and system performance.

### C. **COMMUNITY CLOUD**

In this model cloud infrastructure is procured jointly by several agencies or programs that share specific needs such as security, compliance, or jurisdiction. It is a generalization of a private cloud, as private cloud is being accessible by one certain organization.



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## D. HYBRID CLOUD

Hybrid cloud is a composition of two or more clouds that remain distinct entities but are bound together, offering the benefits of multiple deployment models. Hybrid cloud can also mean the ability to connect collocation, manage dedicated services with cloud resources. Hybrid deployment models are complex and require careful planning to execute and manage especially when communication between two different cloud deployments is necessary.

## V. CLOUD COMPUTING ADVANTAGES AND DISADVANTAGES

### A. ADVANTAGES OF CLOUD COMPUTING

Speaking about advantages of Cloud Computing we present below the main benefits for businesses in general, focusing at some points on examples for small businesses:

1. *Cost efficiency:* Cloud computing is probably the most cost efficient method to use, maintain and upgrade, as explained in [12]. Traditional desktop software costs companies a lot, in terms of finance. Adding up the licensing fees for multiple users can prove to be very expensive for the establishment concerned. The cloud, on the other hand, is available at much cheaper rates and hence, can significantly lower the company's IT expenses. Besides, there are many one-time-payments, pay-as-you-go and other scalable options available, which make it very reasonable for the company in question. Paper [5] adds up that it lowers the cost for smaller firms which intend to apply the compute-intensive techniques.
2. *Almost Unlimited Storage:* Storing information in the cloud gives you almost unlimited storage capacity.
3. *Backup and Recovery:* Since all the data is stored in the cloud, backing it up and restoring the same is relatively much easier than storing the same on a physical device. Furthermore, most cloud service providers are usually competent enough to handle recovery of information. Hence, this makes the entire process of backup and recovery much simpler than other traditional methods of data storage.
4. *Automatic Software Integration:* In the cloud, software integration is usually something that occurs automatically. This means that Cloud users don't need to take additional efforts to customize and integrate their applications as per own preferences. This aspect usually takes care of itself.
5. *Easy Access to Information:* Once the users register in the cloud, they can access the information from anywhere, where there is an Internet connection. This convenient feature lets users move beyond time zone and geographic location issues.
6. *Quick Deployment:* Lastly and most importantly, Cloud computing gives the advantage of quick deployment. Once opting for this method of functioning, the entire system can be fully functional in a matter of a few minutes. Of course, the amount of time taken here will depend on the exact kind of technology that is needed for the business.
7. *Easier scale of services:* It makes it easier for enterprises to scale their service according to the demand of clients.
8. *Deliver new service:* It makes possible new classes of applications and deliveries of new services that are interactive in nature.

### B. DISADVANTAGES OF CLOUD COMPUTING

In spite of its many benefits, as mentioned above, Cloud computing also has its disadvantages. Businesses, especially smaller ones, need to be aware of these aspects before going in for this technology. The main risks involved in Cloud Computing are:

1. *Technical Issue:* Though it is true that information and data on the Cloud can be accessed any time and from anywhere, there are moments when the system can have some serious malfunction. Businesses should be aware of the fact that this technology is always prone to outages and other technical issues. Even the best Cloud service providers run into this kind of trouble, in spite of keeping up high standards of maintenance.
2. *Security in the Cloud* The other major issue of Cloud is represented by security. Before adopting this technology, beneficiaries should know that they will be surrendering all their company's sensitive information to a third-party cloud service provider. This could potentially impose a great risk to the company. Hence, businesses need to make sure that they choose the most reliable service provider, who will keep their information totally secure. Switching to the cloud can actually improve security for a small business, as mentioned by Michael Redding, managing director of Accenture Technology Labs. "Because large cloud computing companies have more resources, he says, they are often able to offer levels of security an average



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- small business may not be able to afford implementing on its own servers" (Outsource IT Headaches to the Cloud (The Globe and Mail)).
3. *Prone to attack* Storing information in the cloud could make the companies vulnerable to external hack attacks and threats; therefore there is always the lurking possibility of stealth of sensitive data.
  4. *Possible downtime* Cloud computing makes the small business dependent on the reliability of their Internet connection.
  5. *Cost* At first glance, a cloud computing application may appear to be a lot cheaper than a particular software solution installed and run in-house. Still, the companies need to ensure that the cloud applications have all the features that the software does and if not, to identify which are the missing features important to them. A total cost comparison is also required. While many cloud computer vendors present themselves as utility-based providers, claiming that they only charge for what customers use, Gartner says that this isn't true; in most cases, a company must commit to a predetermined contract independent of actual use. Companies need to look closely at the pricing plans and details for each application.
  6. *Inflexibility* Choosing a Cloud computing vendor often means locking the business into using their proprietary applications or formats. For instance, it is not possible to insert a document created in another application into a Google Docs spreadsheet. Furthermore, a company needs to be able to add and/or subtract Cloud computing users as necessary as its business grows or contracts.
  7. *Lack of support* Anita Campbell (OPEN Forum) writes, "Customer service for Web apps leaves a lot to be desired - all too many cloud-based applications make it difficult to get customer service promptly – or at all. Sending an email and hoping for a response within 48 hours is not an acceptable way for most of us to run a business". The New York Times writes: "The bottom line: If you need handholding or if you are not comfortable trying to find advice on user forums, the cloud probably is not ideal" Thinking About Moving to the Cloud? There Are Trade-Offs.

## VI. CONCLUSION

Cloud computing is a new paradigm of computing utilities that promises to provide more flexibility, less expense, and more efficiency in IT services to end users. This paper presents the Cloud computing architecture and types of cloud models and the advantages and disadvantages of cloud computing.

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## BIOGRAPHY

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