

Cloud Deployment Model

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Abstract— Cloud computing has become the embraced of the computer world. Cloud Computation is the process of creating a virtual computing environment. Deployment in the cloud provides organizations with flexible and scalable virtual computing resources. A cloud deployment model is the type of architecture in which a cloud system is deployed. These models differ in terms of administration, ownership, access control, and security protocols. This paper describes the different types of cloud computing service models and deployment models. There are six types of Deployment Models, from them five are main: Private Cloud, Public Cloud, Hybrid Cloud, Community Cloud, Inter-Cloud. Inter-Cloud has two types of clouds: Federated Clouds, Multi-clouds. The cloud deployment model identifies the specific type of cloud environment based on ownership, scale, and access, as well as the cloud's nature and purpose. The location of the servers you're utilizing and who controls them are defined by a cloud deployment model. It specifies how your cloud infrastructure will look, what you can change, and whether you will be given services or will have to create everything yourself. Relationships between the infrastructure and your users are also defined by cloud deployment types. Different types of cloud computing deployment models are: Public cloud, Private cloud, Hybrid cloud, Community cloud, Multi-cloud.

Keywords: Cloud Computing

I. INTRODUCTION

The Greek myths tell of creatures plucked from the surface of the Earth and enshrined as constellations in the night sky. Something similar is happening today in the world of computing. Data and programs are being swept up from desktop PCs and corporate server rooms and installed in "the compute cloud". In general, there is a shift in the geography of computation. Like other definitions of topics like these, an understanding of the term cloud computing requires an understanding of various other terms which are closely related to this. While there is a lack of precise scientific definitions for many of these terms, general definitions can be given.

Cloud computing is an emerging paradigm in the computer industry where the computing is moved to a cloud of computers. It has become one of the buzz words of the industry. The core concept of cloud computing is, quite simply, that the vast computing resources that we need will reside somewhere out there in the cloud of computers and we connect to them and use them as and when needed. Computing can be described as any activity of using and/or developing computer hardware and software. It includes everything that sits in the bottom layer, i.e., everything from raw compute power to storage capabilities. Cloud computing ties together all these entities and delivers them as a single integrated entity under its own sophisticated management.

Cloud is a term used as a metaphor for the wide area networks (like internet) or any such large networked environment. It came partly from the cloud-like symbol used

to represent the complexities of the networks in the schematic diagrams. It represents all the complexities of the network which may include everything from cables, routers, servers, data centers and all such other devices. Computing started off with the mainframe era. There were big mainframes and everyone connected to them via dumb terminals. This old model of business computing was frustrating for the people sitting at the dumb terminals because they could do only what they were authorized to do. They were dependent on the computer administrators to give them permission or to fix their problems. They had no way of staying up to the latest innovations.

The personal computer was a rebellion against the tyranny of centralized computing operations. There was a kind of freedom in the use of personal computers. But this was later replaced by server architectures with enterprise servers and others showing up in the industry. This made sure that the computing was done and it did not eat up any of the resources that one had with him. All the computing was performed at servers. Internet grew in the lap of these servers. With cloud computing we have come a full circle. We come back to the centralized computing infrastructure. But this time it is something which can easily be accessed via the internet and something over which we have all the control.

II. CLOUD COMPUTING-THE CONCEPT

A definition for cloud computing can be given as an emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet. Cloud computing is a way of providing various services on virtual machines allocated on top of a large physical machine pool which resides in the cloud. Cloud computing comes into focus only when we think about what IT has always wanted – a way to increase capacity or add different capabilities to the current setting on the fly without investing in new infrastructure, training new personnel or licensing new software. Here 'on the fly' and 'without investing or training' becomes the keywords in the current situation. But cloud computing offers a better solution. We have lots of compute power and storage capabilities residing in the distributed environment of the cloud. What cloud computing does is to harness the capabilities of these resources and make available these resources as a single entity which can be changed to meet the current needs of the user. The basis of cloud computing is to create a set of virtual servers on the available vast resource pool and give it to the clients. Any web enabled device can be used to access the resources through the virtual servers. Based on the computing needs of the client, the infrastructure allotted to the client can be scaled up or down. From a business point of view, cloud computing is a method to address the scalability and availability concerns for large scale applications which involves lesser overhead. Since the resource allocated to the client can be varied based on the

needs of the client and can be done without any fuss, the overhead is very low.

One of the key concepts of cloud computing is that processing of 1000 times the data need not be 1000 times harder. As and when the amount of data increases, the cloud computing services can be used to manage the load effectively and make the processing tasks easier. In the era of enterprise servers and personal computers, hardware was the commodity as the main criteria for the processing capabilities Department of Computer Science & Engineering Institute of Technology, Pithoragarh. Depended on the hardware configuration of the server. But with the advent of cloud computing, the commodity has changed to cycles and bytes – i.e. in cloud computing services, the users are charged based on the number of cycles of execution performed or the number of bytes transferred. The hardware or the machines on which the applications run are hidden from the user. The amount of hardware needed for computing is taken care of by the management and the client is charged based on how the application uses these resources.

III. INTRODUCTION OF CLOUD COMPUTING

Cloud computing is perhaps the most flamboyant technological innovation of the 21st century. This is because it has seen the fastest adoption into the mainstream than any other technology in the domain. This adoption has been fueled mainly by the ever-increasing number of smartphones and mobile devices that can access the internet. Cloud computing is not just for organizations and businesses; it's also useful for the average person as well. It enables us to run software programs without installing them on our computers; it enables us to store and access our multimedia content via the internet, it enables us to develop and test programs without necessarily having servers and so on. Cloud computing is a 21st-century marvel that holds its importance in almost every field you can think of. Cloud computing has been around for approximately two decades and despite the data pointing to the business efficiencies, cost-benefits, and competitive advantages it holds, a large portion of the business community continues to operate without it. According to a study by the International Data Group, 69% of businesses are already using cloud technology in one capacity or another, and 18% say they plan to implement cloud-computing solutions at some point. At the same time, Dell reports that companies that invest in big data, cloud, mobility, and security enjoy up to 53% faster revenue growth than their competitors. As this data shows, an increasing number of tech-savvy businesses and industry leaders are recognizing the many benefits of the cloud-computing trend. But more than that, they are using this technology to more efficiently run their organizations, better serve their customers, and dramatically increase their overall profit margins.

A. What are the Advantages of Cloud Computing?

Cloud computing operates on a similar principle as web-based email clients, allowing users to access all of the features and files of the system without having to keep the bulk of that system on their own computers. In fact, most people already use a variety of cloud computing services without even realizing it. Gmail, Google Drive, TurboTax, and even

Facebook and Instagram are all cloud-based applications. For all of these services, users are sending their personal data to a cloud-hosted server that stores the information for later access. And as useful as these applications are for personal use, they're even more valuable for businesses that need to be able to access large amounts of data over a secure, online network connection. For example, employees can access customer information via cloud-based CRM software from their smartphone or tablet at home or while traveling, and can quickly share that information with other authorized parties anywhere in the world. Still, there are those leaders that are remaining hesitant about committing to cloud-computing solutions for their organizations.

- 1) **Cost Savings:** Once you're on the cloud, easy access to your company's data will save time and money in project start-ups. And, for those who are worried that they'll end up paying for features that they neither need nor want, most cloud-computing services are pay as you go. This means that if you don't take advantage of what the cloud has to offer, then at least you won't have to be dropping money on it. The pay-as-you-go system also applies to the data storage space needed to service your stakeholders and clients, which means that you'll get exactly as much space as you need, and not be charged for any space that you don't. Taken together, these factors result in lower costs and higher returns. Half of all CIOs and IT leaders surveyed by Bit glass reported cost savings in 2015 as a result of using cloud-based applications.
- 2) **Flexibility:** Your business has only a finite amount of focus to divide between all of its responsibilities. If your current IT solutions are forcing you to commit too much of your attention to computer and data-storage issues, then you aren't going to be able to concentrate on reaching business goals and satisfying customers. On the other hand, by relying on an outside organization to take care of all IT hosting and infrastructure, you'll have more time to devote toward the aspects of your business that directly affect your bottom line.
- 3) **Mobility:** Cloud computing allows mobile access to corporate data via smartphones and devices, which, considering over 2.6 billion smartphones are being used globally today, is a great way to ensure that no one is ever left out of the loop. Staff with busy schedules, or who live a long way away from the corporate office, can use this feature to keep instantly up to date with clients and co-worker.
- 4) **Insight:** As we move ever further into the digital age, it's becoming clearer and clearer that the old adage "knowledge is power" has taken on the more modern and accurate form: "Data is money." Hidden within the millions of bits of data that surround your customer transactions and business process are nuggets of invaluable, actionable information just waiting to be identified and acted upon. Of course, sifting through that data to find these kernels can be very difficult, unless you have access to the right cloud-computing solution.
- 5) **Sustainability:** Given the current state of the environment, it's no longer enough for organizations to place a recycling bin in the breakroom and claim that they're doing their part to help the planet. Real sustainability requires solutions that address wastefulness

at every level of a business. Hosting on the cloud is more environmentally friendly and results in less of a carbon footprint.

B. Disadvantages of Cloud Computing

- 1) Security and confidentiality: Though security could improve due to centralization of data and increased security-focused resources, it does pose the risk of increased security threats. If a company is adopting this technology, it will be surrendering all its sensitive information to a third-party cloud service provider. This could potentially put the company at great risk and the company can also be vulnerable to external hack attacks.
- 2) Technical issues: This technology is always prone to outages and other technical issues. Besides, a person will need a very good Internet connection to be logged onto the server at all times. He will invariably be stuck in case of network and connectivity problems.
- 3) Latency: Latency is the amount of time it takes for your computer to interact with the servers in the cloud. It's possible that latency could be a major issue with cloud computing depending on the quality of the service and the location of the cloud servers and geographical proximity

IV. CLOUD DEPLOYMENT MODELS

In cloud computing, we have access to a shared pool of computer resources (servers, when you require them. Getting resources up and running quickly is a breeze thanks to the clouds. It is possible to release resources that are no longer necessary. This method allows you to just pay for what you use. Your cloud provider is in charge of all upkeep. It functions as a virtual computing environment with a deployment architecture that varies depending on the amount of data you want to store and who has access to the infrastructure.

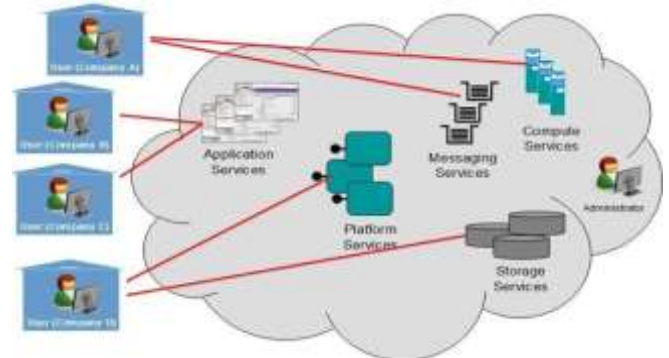
A. Deployment Models

The cloud deployment model identifies the specific type of cloud environment based on ownership, scale, and access, as well as the cloud's nature and purpose. The location of the servers you're utilizing and who controls them are defined by a cloud deployment model. It specifies how your cloud infrastructure will look, what you can change, and whether you will be given services or will have to create everything yourself. Relationships between the infrastructure and your users are also defined by cloud deployment types.

1) Public Cloud

The public cloud makes it possible for anybody to access systems and services. The public cloud may be less secure as it is open for everyone. The public cloud is one in which cloud infrastructure services are provided over the internet to the general people or major industry groups. The infrastructure in this cloud model is owned by the entity that delivers the cloud services, not by the consumer. It is a type of cloud hosting that allows customers and users to easily access systems and services. This form of cloud computing is an excellent example of cloud hosting, in which service providers supply services to a variety of customers. In this arrangement, storage backup and retrieval services are given for free, as a subscription, or on a per-use basis. Example:

Amazon Elastic Compute Cloud (EC2), Microsoft Azure, IBM's Blue Cloud, Sun Cloud, and Google Cloud are examples of the public cloud.



a) The Advantages of a Public Cloud

- Minimal Investment: Because it is a pay-per-use service, there is no substantial upfront fee, making it excellent for enterprises that require immediate access to resources.
- No setup cost: The entire infrastructure is fully subsidized by the cloud service providers, thus there is no need to set up any hardware.
- Infrastructure Management is not required: Using the public cloud does not necessitate infrastructure management.
- No maintenance: The maintenance work is done by the service provider (Not users).
- Dynamic Scalability: To fulfill your company's needs, on-demand resources are accessible.

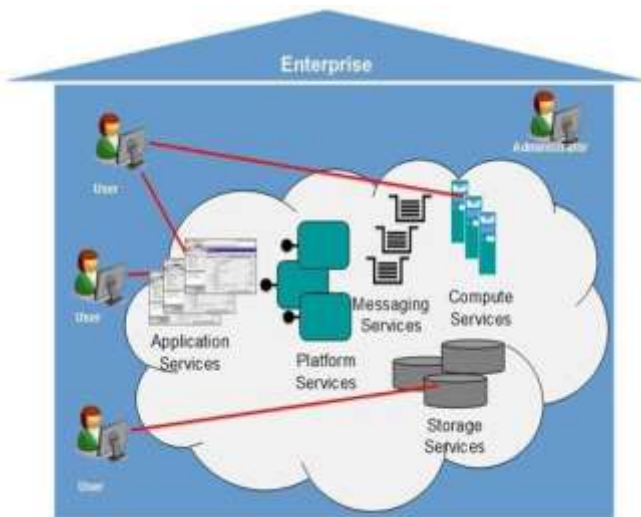
b) The Disadvantages of a Public Cloud

- Compromised reliability. That same server network is also meant to ensure against failure But often enough, public clouds experience outages and malfunction, as in the case of the 2016 Salesforce CRM disruption that caused a storage collapse.
- Data security and privacy issues give rise to concern. Although access to data is easy, a public deployment model deprives users of knowing where their information is kept and who has access to it.
- The lack of a bespoke service. Service providers have only standardized service options, which is why they often fail to satisfy more complex requirements.

2) Private Cloud

The private cloud deployment model is the exact opposite of the public cloud deployment model. It's a one-on-one environment for a single user (customer). There is no need to share your hardware with anyone else. The distinction between private and public cloud is in how you handle all of the hardware. It is also called the "internal cloud" & it refers to the ability to access systems and services within a given border or organization. The cloud platform is implemented in a cloud-based secure environment that is protected by powerful firewalls and under the supervision of an organization's IT department. The private cloud gives the greater flexibility of control over cloud resources. Multiple public cloud service providers, including Amazon, IBM, Cisco, Dell and Red Hat, also provide private solutions.

HP Data Centers, Microsoft, Elastra-private cloud, and Ubuntu are the example of a private cloud.



- a) Advantages of the Private Cloud Model:
- Better Control: You are the sole owner of the property. You gain complete command over service integration, IT operations, policies, and user behavior.
 - Supports Legacy Systems: This approach is designed to work with legacy systems that are unable to access the public cloud.
 - Customization: Unlike a public cloud deployment, a private cloud allows a company to tailor its solution to meet its specific needs.

b) Disadvantages of a Private Cloud
Cost: The major disadvantage of the private cloud deployment model is its cost, as it requires considerable expense on hardware, software and staff training. That is why this secure and flexible computing deployment model is not the right choice for small companies.

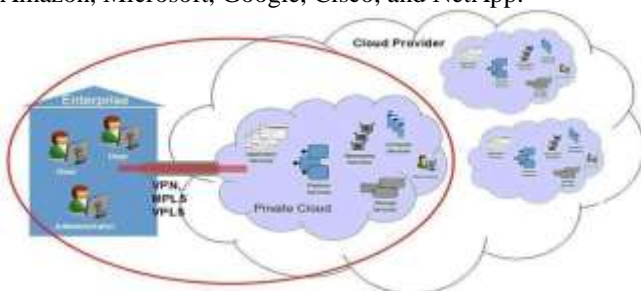
Data Security and Privacy: It's suitable for storing corporate information to which only authorized staff have access. By segmenting resources within the same infrastructure, improved access and security can be achieved.

Supports Legacy Systems: This approach is designed to work with legacy systems that are unable to access the public cloud.

3) Hybrid Cloud

By bridging the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the best of both worlds. With a hybrid solution, you may host the app in a safe environment while taking advantage of the public cloud's cost savings. Organizations can move data and applications between different clouds using a combination of two or more cloud deployment methods, depending on their needs.

The best hybrid cloud provider companies are Amazon, Microsoft, Google, Cisco, and NetApp.

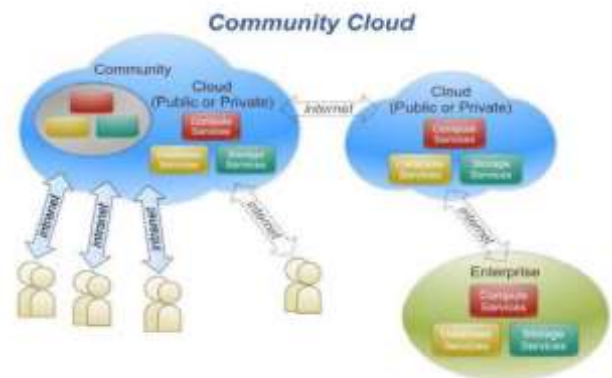


- a) Advantages of the hybrid cloud model:
- Flexibility and control: Businesses with more flexibility can design personalized solutions that meet their particular needs.
 - Cost: Because public clouds provide for scalability, you'll only be responsible for paying for the extra capacity if you require it.
 - Security: Because data is properly separated, the chances of data theft by attackers are considerably reduced.

- b) Disadvantages of hybrid cloud:
- Infrastructure Dependency: In case of an outage, the organization has to rely on the internal IT for any support to handle the outages in the hybrid environment
 - Security compliance: Ensuring that all the cloud services; both public and private, are compliant with the company's security policies and more importantly, abiding the regulations set by their respective governed bodies.
 - Networking: Having a network setup which ensures fluid and effortless transfer of data is the key in Hybrid model. The involvement of public and private cloud would invariably make networking in the organization quite complex, which needs to be handled in the most effective manner possible.

4) Community Cloud

It allows systems and services to be accessible by a group of organizations. It is a distributed system that is created by integrating the services of different clouds to address the specific needs of a community, industry, or business. The infrastructure of the community could be shared between the organization which has shared concerns or tasks. It is generally managed by a third party or by the combination of one or more organizations in the community.



- a) Advantages of the community cloud model:
- Cost Effective: It is cost-effective because the cloud is shared by multiple organizations or communities.
 - Security: Community cloud provides better security.
 - Shared resources: It allows you to share resources, infrastructure, etc. with multiple organizations.

- b) Disadvantages of the community cloud model:
- Data Is Accessible Between Organizations: Because data is housed in the same location, any data stored there might be accessible by others. For example, the systems of one group may have to adhere to the regulations of all the other organizations as well.

- Not a "One-Size-Fits-All": As a relatively new and unique cloud deployment, community clouds are not a great fit for many organizations and should be looked at on a case-by-case basis.

5) Multi-Cloud

We're talking about employing multiple cloud providers at the same time under this paradigm, as the name implies. It's similar to the hybrid cloud deployment approach, which combines public and private cloud resources. Instead of merging private and public clouds, multi-cloud uses many public clouds. Although public cloud providers provide numerous tools to improve the reliability of their services, mishaps still occur. It's quite rare that two distinct clouds would have an incident at the same moment. As a result, multi-cloud deployment improves the high availability of your services even more.



a) Advantages of a multi-cloud model:

You can mix and match the best features of each cloud provider's services to suit the demands of your apps, workloads, and business by choosing different cloud providers.

- **Reduced Latency:** To reduce latency and improve user experience, you can choose cloud regions and zones that are close to your clients.
- **High availability of service:** It's quite rare that two distinct clouds would have an incident at the same moment. So, the multi-cloud deployment improves the high availability of your services.

b) Disadvantages of the community cloud model:

- **Range:** The wider the range of cloud services an enterprise uses, the more complex it gets to manage.
- **Cost:** Failure to manage the system adequately can increase the cost of using such a system and could affect the business agility.
- **Security:** One critical area which need to be managed effectively is security in multi-cloud.
- **Redundancy:** Final issue with multi cloud is how to manage redundancy and high availability effectively.

V. WHAT ARE CLOUD SERVICE MODELS?

Cloud Computing is a model that offers convenient, on-demand network access to a pool of shared resources. This may include data storage, databases, servers, networking, tools, or any other resources that can be accessed through the

internet. Speaking of cloud server models, cloud computing is offered in various service models, each of which satisfies unique business requirements. These servers are mainly of three types: Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS), about which you will read in detail below

A. Software-as-a-service (SaaS)

Software-as-a-Service (SaaS) is a way of delivering services and applications over the Internet. Instead of installing and maintaining software, we simply access it via the Internet, freeing ourselves from the complex software and hardware management. It removes the need to install and run applications on our own computers or in the data centers eliminating the expenses of hardware as well as software maintenance. SaaS provides a complete software solution which you purchase on a pay-as-you-go basis from a cloud service provider. Most SaaS applications can be run directly from a web browser without any downloads or installations required. The SaaS applications are sometimes called Web-based software, on-demand software, or hosted software.

B. Platform as a service (PaaS)

PaaS is a category of cloud computing that provides a platform and environment to allow developers to build applications and services over the internet. PaaS services are hosted in the cloud and accessed by users simply via their web browser. A PaaS provider hosts the hardware and software on its own infrastructure. As a result, PaaS frees users from having to install in-house hardware and software to develop or run a new applications. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

C. Infrastructure as a service (IaaS)

Infrastructure as a service (IaaS) is a service model that delivers computer infrastructure on an outsourced basis to support various operations. Typically IaaS is a service where infrastructure is provided as an outsource to enterprises such as networking equipment's, devices, database and web servers. Infrastructure as a service (IaaS) is also known as Hardware as a service (HaaS). IaaS customers pay on a per-use basis, typically by the hour, week or month. Some providers also charge customers based on the amount of virtual machine space they use. It simply provides the underlying operating systems, security, networking, and servers for developing such applications, services, and for deploying development tools, databases, etc.

D. Mobile "backend" as a service (MBaaS)

In the mobile "backend" as a service (m) model, also known as backend as a service (BaaS), web app and mobile app developers are provided with a way to link their applications to cloud storage and cloud computing services with application programming interfaces (APIs) exposed to their applications and custom software development kits (SDKs). Services include user management, push notifications, integration with social networking services and more. This is

a relatively recent model in cloud computing, with most BaaS start-ups dating from 2011 or later but trends indicate that these services are gaining significant mainstream traction with enterprise consumers.

VI. CONCLUSION

To conclude, Cloud computing is the latest technology that promises immense benefits however there is lot of research which is still required in this area as many of the concerns related to security and privacy issues are not been answered by the experts and remains open. However, there are lot of research and investment in the area by the Information technology giants like Microsoft, Google, Cisco, IBM in this area and the day is not far when the cloud will widespread adopted and all the security and privacy issues will be handled. This report discussed about the various types of cloud service models and the risk associated with each of that. Apart from it, famous DDOS attack of 2013 also discussed and weakness of application layer is leading to attacks. I would like to say that I look forward for these types of discussion where I get a platform to gain more from the knowledge and experiences of people around me. It is expected that the use of cloud computing would increase in the coming team.

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