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An Approach to Storage of Data on Cloud Computing and Challenges Involved

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Abstract: ***Cloud is a term that is used for a large number of developments. It is not an invention, but more of a "practical innovation" that combines several earlier inventions into something new and compelling. Much like the Walkman and a portable hard disks are comprised of several existing concepts and technologies, cloud computing merges several already existing technologies such as browser interfaces, Web 2.0 interactivity, high bandwidth networks, time sharing, and virtualization. Cloud computing enables tasks that are to be assigned to a combination of software's and services over a network. Advanced clouds include other computing resources such as: network equipment, storage area networks (SANs), several security devices and firewall.***

Keywords: Cloud Architecture, Types of cloud deployment model, motivating factors & Data challenges, Data Security

1. Introduction

The term Cloud Computing has been around since the early 2000s, but the concept of computing-as-a-service has been around for much longer - as far back as the 1960s, when computer agencies would allow companies to rent time on a mainframe, rather than have to buy one themselves. These 'time-sharing' services were largely overtaken by the rise of the PC which made owning a computer much more affordable, and then henceforth by the rise of corporate data centres where companies would store vast amounts of data.

But the concept of renting access to computing power has resurfaced again and again -- in the application service providers, utility computing, and grid computing of the late 1990s and early 2000s. This was followed by cloud computing, which really took hold with the emergence of software as a service and hyper scale cloud computing providers such as Amazon Web Services.

The exact benefits will differ according to the type of cloud services that are being used but, fundamentally using cloud services means companies won't have to buy or maintain their own computing infrastructure. No more buying of servers, updating applications or operating systems, or decommissioning and disposing of hardware's or software when they are out of date, as these are all taken care of by the supplier. For commodity applications such as email, it will be preferable to switch to a cloud provider, rather than rely on in-house skills. A company that specializes in running and securing these services is likely to have better skills and more experienced staff than a small business could afford to hire, and hence cloud services might be capable enough to deliver a more secure and efficient service to end users.

Using cloud services means companies can move faster on projects and test out concepts without lengthy procurement and big upfront costs, as firms will only have to pay for the resources they consume. This concept of business agility is often termed by cloud advocates as a key benefit. The ability to spin up new services without the time and effort associated with traditional Information Technology procurement should mean that is easier to get going with new applications faster. And if a new application turns out to be a wildly popular then the elasticity of the cloud means it is easier to scale it up fast.

Virtualization in Cloud Computing is making a virtual platform of server operating system and **storage** devices or we can we define it as Virtualization is the creation of virtual servers, infrastructures, devices and computing resources. This will help the users by providing multiple machines at the same time and it also allows sharing a single physical instance of resource or an application to multiple users. Cloud Virtualizations also manages the workload as it transforms the traditional computing and make it more scalable, economical and efficient.

Virtualizations in Cloud Computing rapidly integrating the fundamental ways of computing. One of the important features of virtualization is that it allows sharing of applications to multiple customers and companies at a time.

Cloud Computing can also be called as services and application delivered to help the virtualized environment. This environment can be either **public** or **private**. With the help of virtualization, a customer can maximize the resources and reduces the physical system as and when required.

2. Anatomy of Cloud Computing

2.1 Definition of Cloud computing

Cloud computing has two meanings. The most common refers to running workloads remotely over the internet in a commercial provider's data centre, also known as the "public cloud" model. Popular public cloud offerings—such as Amazon Web Services (AWS), Salesforce's CRM system, and Microsoft Azure—all exemplify this familiar notion of cloud computing. Today, most of the businesses take a multicloud approach, which simply means that they use more than one public cloud service.

The public cloud lets customers to gain new capabilities without investing in new hardware or software. Instead, they only pay their cloud provider a subscription fee, or pay for only the resources they use. Simply by filling in web forms, users can set up their accounts and spin up virtual machines or provision new applications. More users or computing resources can be added on the fly—the latter in real time as

workloads demands those resources and thus, thanks to a feature known as auto scaling.

2.2 Cloud Architecture

Cloud computing is a set of IT services that are provided to a user over a network on a leased basis and with the ability to scale up or down their service requirements. Usually, cloud computing services are delivered to a customer by a third party provider who owns the infrastructure. Some of its advantages include scalability, resilience, flexibility, efficiency and out sourcing non-core activities. Cloud computing offers an innovative business model for organizations to adopt IT services without upfront the investment. There are two basic cloud models discussed: first the Cloud service model and the second is Cloud Deployment model.

A. Cloud Service Model

Cloud computing is delivery of computing where massively scalable IT-related capabilities are provided ―as a service across the internet to numerous external clients. This term effectively reflects the different features of the Cloud Computing paradigm which can be found at different infrastructure levels. Cloud Computing has been classified into three services: ―IaaS", "PaaS" and "SaaS". Cloud Computing have some different utility services.

SaaS (Software as a service)

This type of public cloud computing delivers applications over the internet through the browsers like Chrome, Firefox, etc. The most popular SaaS applications for business can be found in Microsoft's Office 365 and Google's G Suite; among the enterprise applications, Salesforce leads the pack. But virtually, all the enterprise applications, including ERP suites from Oracle and SAP, have adopted the SaaS model. Typically, SaaS applications offer an extensive configuration options as well as the development environments that enable customers to code their own modifications and additions.

IaaS (Infrastructure as a service)

At a basic level, IaaS public cloud providers offer the storage and compute services on a pay-per-use basis. But the full array of services offered by all major public cloud providers is staggering: highly scalable databases, virtual private networks, big data analytics, developer tools, machine learning, application monitoring, and so on. Amazon Web Services was the first IaaS provider and still remains the leader, followed by Microsoft Azure, Google Cloud Platform and IBM Cloud.

PaaS (Platform as a service)

PaaS provides sets of services and workflows that specifically target developers, who can use shared tools, processes, and APIs to accelerate the development, testing, and deployment of applications. Salesforce's Heroku and Force.com are popular public cloud PaaS offerings; Pivotal's Cloud Foundry and Red Hat's Open Shift can be deployed on premises or accessed through the major public clouds. For enterprises, the PaaS can ensure that developers have ready access to resources, follow certain processes, and use only a specific array of services, while operators maintain the underlying infrastructure.

FaaS (Functions as a service)

FaaS, the cloud version of server less computing, adds another layer of abstraction to PaaS, so that developers are completely insulated from everything in the stack below their code. Instead of fitting with virtual servers, containers, and application runtimes, they upload narrowly functional blocks of code, and set them to be triggered by a certain event (such as a form submission or uploaded file). All the major clouds offer FaaS on top of IaaS like IBM OpenWhisk, Azure Functions, AWS Lambda, Google Cloud Functions, and. A special benefit of FaaS applications is that they do not consume IaaS resources until an event occurs, reducing pay-per-use fees.

Cloud Service Delivery Models Models	Services Available	Used By	Why Use It	Examples
I A A S	Create platforms for service and application test, development integration and deployment	System manager	Create platform for service and application test, development, integration	Amazon EC2, Simple Storage Service (S3),
P A A S	Services, applications test, development, integration and deployment	Developers and deployers	Create or deploy applications and services for users	Google Application Engine, Microsoft Azure , Force.com, Yahoo Developer Network
S A A S	Email,office automation,website testing,wiki,virtu al desktop, blog,CRM	Business users	To complete business tasks	Salesforce.com, Animoto,Oracle on demand,

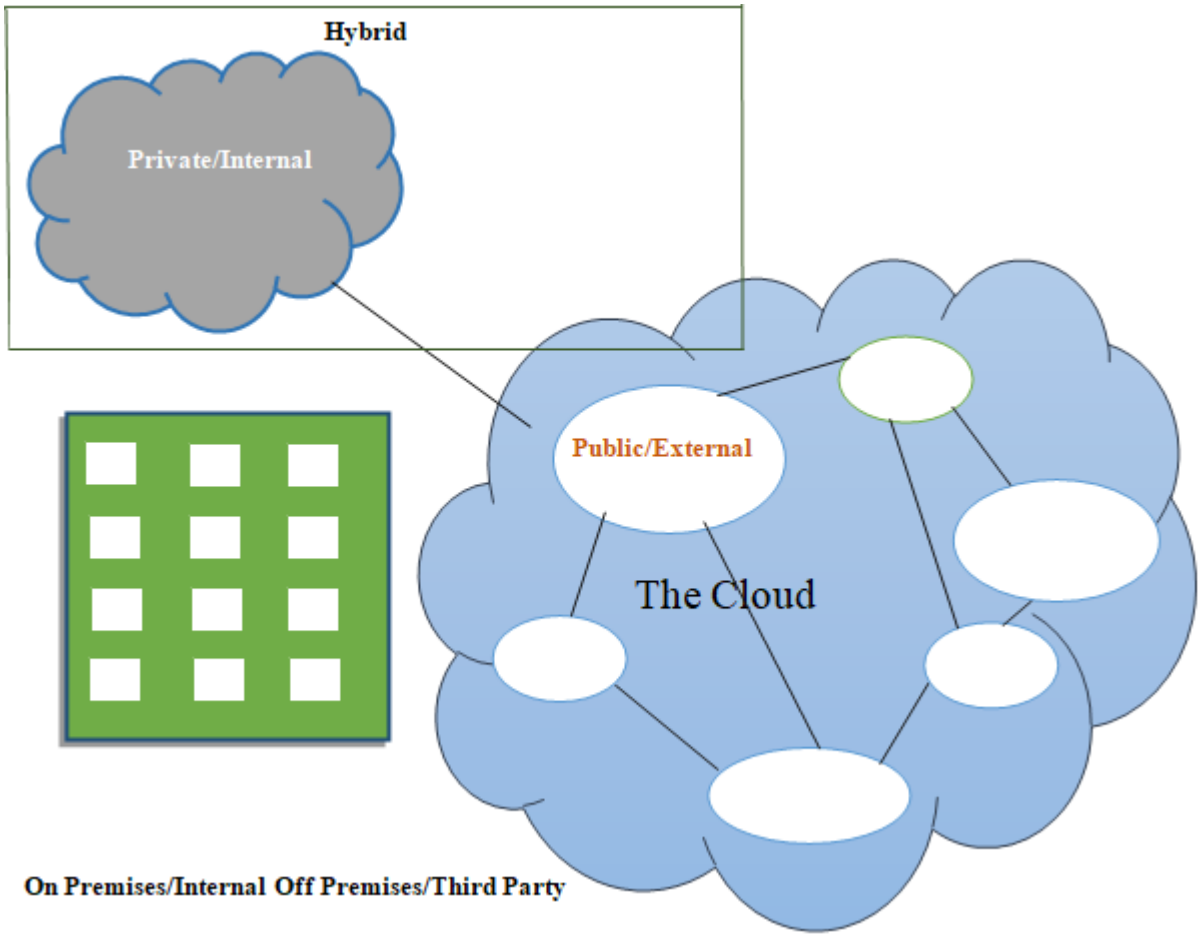

Figure: Types of Cloud Deployment Model

1) ***Public cloud/external cloud:*** It is a **cloud** solution that exists outside of an organization's physical boundaries. A Public cloud can be private, **public** or community-based, as long as it is not located on an organization's property. **External cloud** and **public cloud are similar**, but they differ in implementation.
2) ***Private cloud/internal cloud:*** A private cloud downsizes the technologies used to run IaaS public clouds into software that can be deployed and operated in a customer's data centre. As with a public cloud, internal customer can provision his own virtual resources to build, test, and run applications, with metering to charge back departments for resource consumption. For administrators, the private cloud amounts to the ultimate in data centre automation, minimizing manual provisioning and the management. VMware's "Software Defined Data Centre" stack is the most popular commercial private cloud software, while on the other hand OpenStack is the open source leader.
3) ***Hybrid cloud/virtual private cloud model:*** This model is comprised of both the private and the public cloud models where cloud computing environment is hosted and managed by third party (off-premise) but some dedicated resources are privately used only by an organization.
4) ***Community model:*** Community Model allows the cloud computing environment which is shared or managed by number of related organizations.

3. Motivating Factors and Challenges

Cloud systems are not just another form of resource provisioning infrastructure but it also has multiple opportunities from the principles for cloud infrastructures that will enable further types of applications, reduced development and provisioning time of different services. Cloud computing has particular characteristics which distinguish it from the classical resource and services provisioning environments.

- Infinitely (more or less) Scalable
- Cost saving/less capital expenditure
- Higher resource Utilization
- Business agility
- Disaster recovery and Back up
- Device and Location Independence
- While reducing up-front IT cost or capital expenditure is one of the crucial reason for the adoption of cloud computing. There are also some other factors that encourage various organizations for adopting cloud computing. Participation of various factors for encouraging the adoption of cloud computing. In the static resource, allocation configurations inevitably exists a trade-off between capacity deployment and resource demand. Cloud computing shifts the location of resources to the cloud in order to reduce the costs associated with over-provisioning (i.e. having too many resources), under-utilization (i.e. not using resources adequately) and under-provisioning (i.e. having too little resources). It also reduces time required to provision

resources to minutes, allowing applications to quickly scale under-utilization both up and down as the workload changes. Therefore, cloud computing is particularly well suited for applications with a variable workload that experiences hourly, daily, weekly or monthly variability in the utilization of resources. One example of such applications is online shops, which have to handle their peak loads at Diwali time. Another example is the university websites, which have to handle their peak loads during the exam result time. In traditional environments i.e. non-cloud, over provisioning and under-utilization can hardly be avoided. According to an observation, in many companies the average utilization of application servers ranges from 5 to 20 percent, meaning that many resources like CPU and RAM are idle at no peak times. On the other hand, if the companies shrink their infrastructure to reduce over-provisioning and under-utilization, the risk of under-provisioning will gradually increase. While the costs of over-provisioning and under-utilization can easily be calculated, the costs of under-provisioning are more difficult to calculate because under-provisioning can lead to a loss of users and zero revenues. Virtualization technology is also one of the primary reason of popularity of cloud computing as it provides a way to increase capacity or add capabilities on the fly without investing in new infrastructure, training new personnel, or licensing a new software and virtualization technology play the key delivery technology. Through Virtualization, cloud computing removes the dependencies between software and hardware that runs it.

- As we know, cloud computing has various motivating factors according to the perspective of adoption but still, there is a long way for cloud computing to prove itself according to the organization's trust level. There are various reasons that warn us for not adopting cloud computing.

Security

Security issue has played the most important role in hampering Cloud computing acceptance. Various security issues in cloud computing are: availability, integrity, confidentiality, data access, data segregation, privacy, recovery, accountability, multi-tenancy issues and so on. The ultimate solution to various cloud security issues vary through cryptography, particularly public key infrastructure (PKI), use of multiple cloud providers, standardization of APIs, improving virtual machines support and legal support.

Difficult to migrate

It's not very easy to move an application from an enterprise to cloud computing environment or even within different cloud computing platforms because different cloud providers support different application architectures which are also not similar from enterprise application architectures.

Internet dependency – performance and availability

Cloud computing services completely rely on the availability, speed, quality and performance of internet as it works as carrier in between consumer and service provider.

Downtime and service level

In business applications, downtime is a very common concern because every minute of downtime is minute in which important business application can't be performed which degrades the performance of an organization as well as the reputation. Scalability is the best solution to in order to increase and maintain the application's performance in cloud computing environments. But one of the main technological challenge of cloud environment is vertical scalability, because in cloud environment elastic scalability is not only currently restricted to horizontal scaling, but also not so efficient as it tends to resource over usage due to limited scale down capabilities and complete replication of instances rather than only of the essential segments. Horizontal scaling is the scaling through the addition of more machines or devices to the computing platform in order to handle the increased demand. Vertical Scaling, on the other hand, is the ability to scale the size of a server i.e. in this scaling; the size of a server is scaled either by resizing the server or by replacing that server to a bigger one. Vertical scaling can handle most sudden temporary peaks in the application demand on cloud infrastructures. Traditionally, most of the businesses have best served using vertical scaling methods as long as possible and then scaling individual parts of application horizontally. But in Cloud environment the scenario has changed and most businesses firstly served by using horizontally because the most common operating systems do not support on-the-fly changes on the available CPU or memory to support this vertical scaling .Vertical scaling typically involves making significant changes to a server's core configuration as required. Therefore, it's better to perform such changes manually and when trying to set up scalable server arrays for auto scaling purposes, and then cannot change an existing server's configuration. When the horizontal scaling is used along with vertical scaling together, it ends up with an infrastructure that makes the most efficient use of computing resources.

4. Conclusion

Cloud computing have several benefits over traditional environment and has the capability to handle most sudden, temporary peaks in application demand on cloud infrastructures. Virtualization technology provides good support to achieve the aim of Cloud Computing like higher resource utilization, elasticity, reducing IT cost or capital expenditure in order to handle temporary loads as well as cloud computing have various flexible service and deployment models which is also one of the main issue for adopting this computing paradigm. Virtualization concepts have open shared nature which is responsible for the violation of laws and security policies as well as degrades their performance and computing reputation. So it is very much important to focus on the privacy and solutions of various security issues in order to maintain the trust level of the organization for deploying the cloud computing without any hesitation and also a need oftechnical support for elastic scalability in order to serve by vertical scaling approach which is currently restricted to only horizontal scaling.

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