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STUDY AND REVIEW CLOUD COMPUTING FACILITIES AND MODELS DEPLOYMENT

MANGESHKUMAR S SHEGOKAR, PRAVIN G THAKRE

1. Department of Geology, RTM Nagpur University, Nagpur-440 001, India.
2. Collage of Engineering and Technology, Akola, University SGB Amravati, (MS) India.
3. P.G. Students Department of Geology, RTM Nagpur University, Nagpur-440 001

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Abstract: Cloud computing is associated with a new paradigm for the provision of computing infrastructure and services. It represents a shift away from computing as a product that is purchased, to computing that is delivered as a service to consumers over the Internet from large scale data centers or clouds. Clouds provide an infrastructure for easily usable, scalable, virtually accessible and adjustable IT resources that need not be owned by an entity but can be delivered as a service over the Internet. The cloud concept eliminates the need to install and run middleware and applications on users own computer by providing Infrastructure, Platform and Services to users, thus easing the tasks of software and hardware maintenance and support. A cloud computing platform dynamically provisions, configures, reconfigures, and de-provisions servers as needed. Servers in the cloud can be physical machines or virtual machines. It was found that Cloud computing is changing the way we provision hardware and software for on-demand capacity fulfillment and changing the way we develop web applications and make business decisions.

Keywords: Grid, Cloud, Utility Computing, IaaS, SaaS, PaaS.

Corresponding Author: B. S. MANJARE

Co Author: - S. M. TALE

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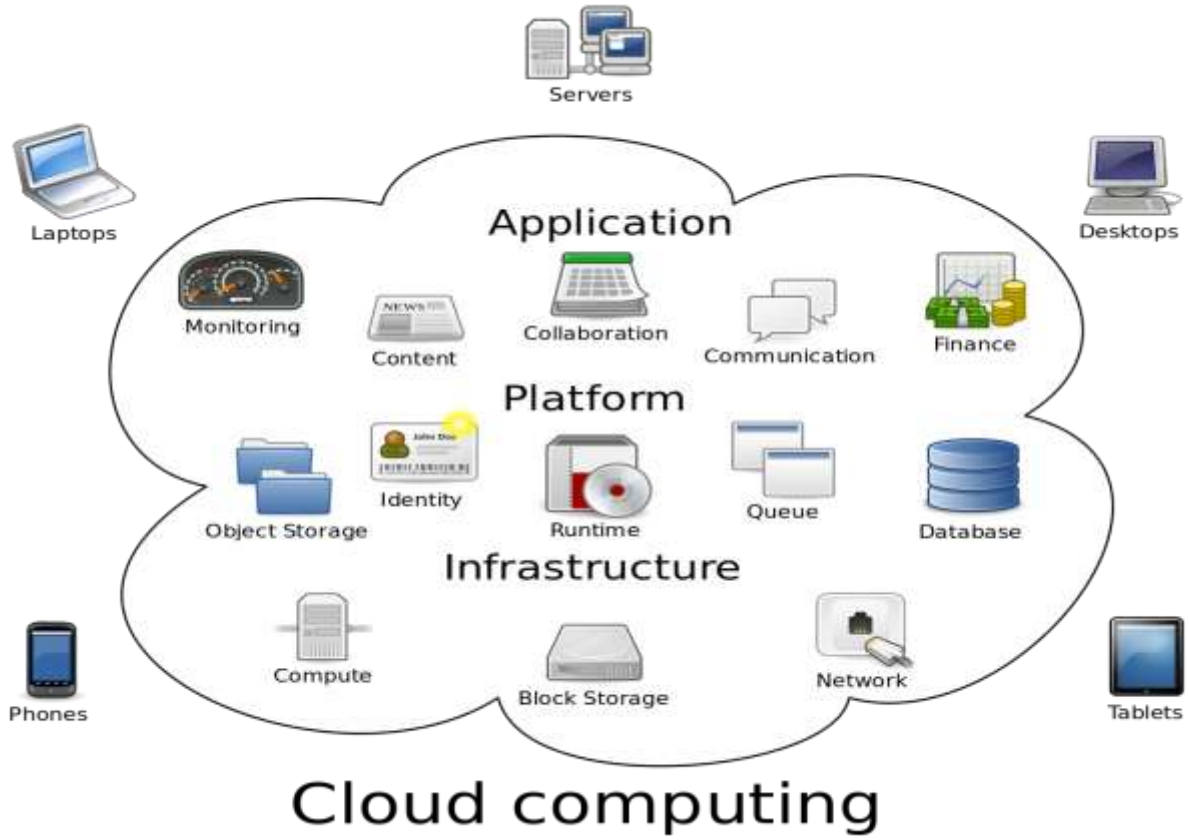
INTRODUCTION

The Cloud Computing, which was coined in late of 2007, currently emerges as a hot topic due to its abilities to offer flexible dynamic IT infrastructures; Amazon.com played a key role in the development of cloud computing by modernizing their data centers after the dot-com bubble and, having found that the new cloud architecture resulted in significant internal efficiency improvements, providing access to their systems by way of "Amazon Web Services" in 2002 on a utility computing basis. 2007 saw increased activity, with Google, IBM, and a number of universities embarking on a large scale Cloud Computing research project, around the time the term started gaining popularity in the mainstream press. Cloud computing is a term used to describe both a platform and type of application. A cloud computing platform dynamically provisions, configures, reconfigures servers as needed. Servers in the cloud can be physical machines or virtual machines. Virtualization, or virtual machines, is a technique for making one computer into many. It offers Web applications, such as a contact manager for sales, a document manager for storage, version tracking of files, work spaces for sharing information over the Internet, and project management software. Moreover, companies with large batch-oriented tasks can get results as quickly as their programs can scale, since using 1000 servers for one hour costs no more than using one server for 1000 hours. This elasticity of resources, without paying a premium for large scale, is unprecedented in the history IT.



2. EXISTING SYSTEMS

Autonomic computing — "computer systems capable of self management"

Client–server model – client–server computing refers broadly to any distributed application that distinguishes between service providers (servers) and service requesters (clients)

Grid computing — "a form of distributed computing and parallel computing, whereby a 'super and virtual computer' is composed of a cluster of networked, loosely coupled computers acting in concert to perform very large tasks"
Mainframe — powerful computers used mainly by large organizations for critical applications, typically bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and financial transaction processing.
Utility computing — the "packaging of computing resources, such as computation and storage, as a metered service similar to a traditional public utility, such as electricity";
Peer-to-peer – distributed architecture without the need for central coordination, with participants being at the same time both suppliers and consumers of resources (in contrast to the traditional Client–server model)

3. NEW COMPUTING TECHNOLOGY – CLOUD COMPUTING
DEFINITION: Cloud computing is using the internet to access someone else's software running on someone else's hardware in someone else's datacenter. Cloud computing refers to accessing computing resources that are typically owned and operated by a third-party provider on a consolidated basis in one, or usually more, data center locations". They feature on-demand provisioning and pay-as-you go resource billing, with minimal upfront investment. It is aimed at delivering cost-effective computing power over the Internet, including virtual private networks (VPN). From the perspective of a reasonable cloud proponent, cloud services minimize capital expense of computing, tie operating expense to actual use, and reduce staffing costs.

4. SERVICE MODELS
 Software as a Service (SaaS). The traditional model of software distribution, in which software is purchased for and installed on personal computers, is sometimes referred to as Software-as-a-Product. Software-as-a-Service is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet. SaaS is becoming an increasingly prevalent delivery model as underlying technologies that support web services and service-oriented architecture (SOA) mature and new developmental approaches become popular. SaaS is also often associated with a pay-as-you-go subscription licensing model. Mean-while, broadband service has become increasingly available to support user access from more areas around the world. Examples are Google's Gmail and Apps, instant messaging from AOL, Yahoo and Google.

 Platform as a Service (PaaS). Cloud computing has evolved to include platforms for building and running custom web-based applications, a concept known as Platform-as-a-Service. PaaS is an outgrowth of the SaaS application delivery model. The PaaS model makes all of the facilities required to support the complete life cycle of building and delivering web applications and services entirely available from the Internet, all with no software downloads or installation for developers, IT managers, or end users. Examples include Microsoft's Azure and Salesforce's Force.com.

 Infrastructure as a Service (IaaS). The capability provided to the consumer is the provision of grids or clusters or virtualized servers, processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems. The highest profile example is Amazon's Elastic Compute Cloud (EC2) and Simple Storage Service, but IBM and other traditional IT vendors are also offering services, as is telecom-and-more provider Verizon Business.

 Communication-as-a-Service (CaaS) [7]: A CaaS model allows a CaaS provider's business customers to selectively deploy communications features and services throughout their company on a pay-as-you go basis for service(s) used. CaaS is designed on a utility-like pricing model that provides users with Comprehensive, flexible, and (usually) simple-to understand service plans.

5. DEPLOYMENT MODELS

Public cloud: Public cloud or external cloud describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned on a fine-grained, self-service basis over the Internet, via web applications/web services from an off-site third-party provider who bills on a fine-grained utility computing basis. The cloud infrastructure is made available to the general public or a large industry group, and is owned by an organization selling cloud services. Examples: Amazon Elastic-Compute-Cloud, IBM's Blue- Cloud, Sun Cloud, Google AppEngine.

Community cloud: A community cloud may be established where several organizations have similar requirements and seek to share infrastructure so as to realize some of the benefits of cloud computing. With the costs spread over fewer users than a public cloud (but more than a single tenant) this option is more expensive but may offer a higher level of privacy, security and/or policy compliance. Examples of community cloud include Google's "Gov Cloud".

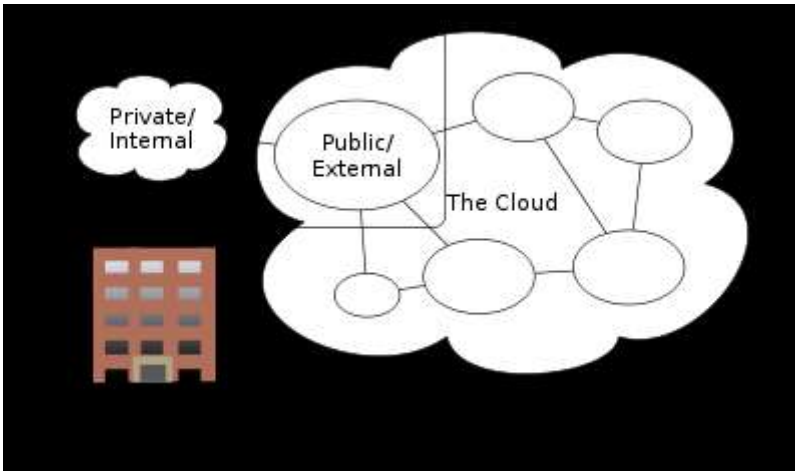


Fig: Structure of Community cloud

Hybrid cloud:

The term "Hybrid Cloud" has been used to mean either two separate clouds joined together (public, private, internal or external), or a combination of virtualized cloud server instances used together with real physical hardware. The most correct definition of the term "Hybrid Cloud" is probably the use of physical hardware and virtualized cloud server instances together to provide a single common service. Two clouds that have been joined together are more correctly called a "combined cloud". A hybrid storage cloud uses a combination of public and private storage clouds. Hybrid storage clouds are often useful for archiving and backup functions, allowing local data to be replicated to a public cloud.

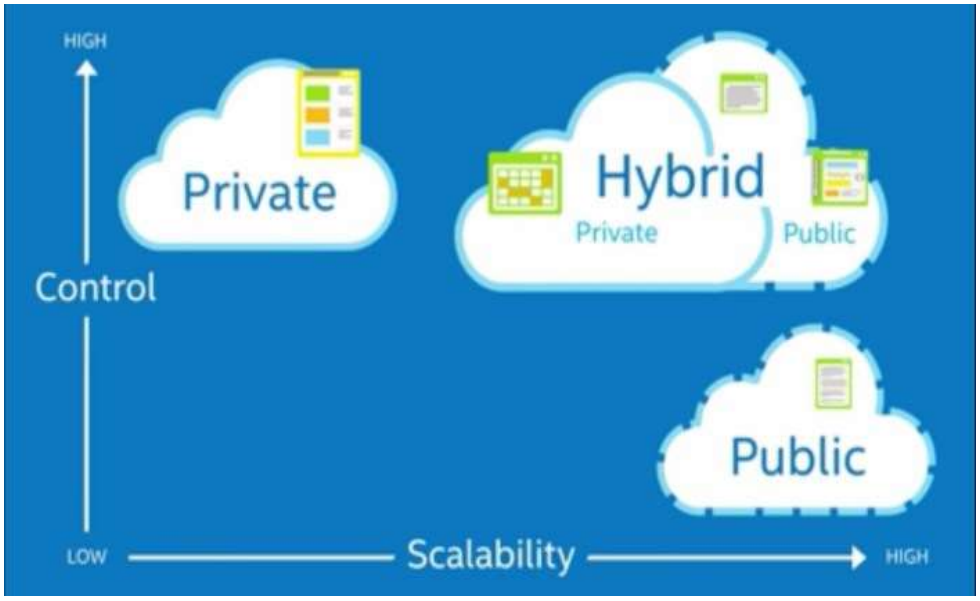


Fig: Structure of Hybrid cloud.

Private cloud:

A private cloud is a particular model of cloud computing that involves a distinct and secure cloud based environment in which only the specified client can operate. As with other cloud models, private clouds will provide Computing power as a service within a virtualized environment using an underlying pool of physical computing Resource. However, under the private cloud model, the cloud (the pool of resource) is only accessible by a single Organization providing that organization with greater control and privacy.The possible dependencies between CaaS, SaaS, PaaS & IaaS is as follows:

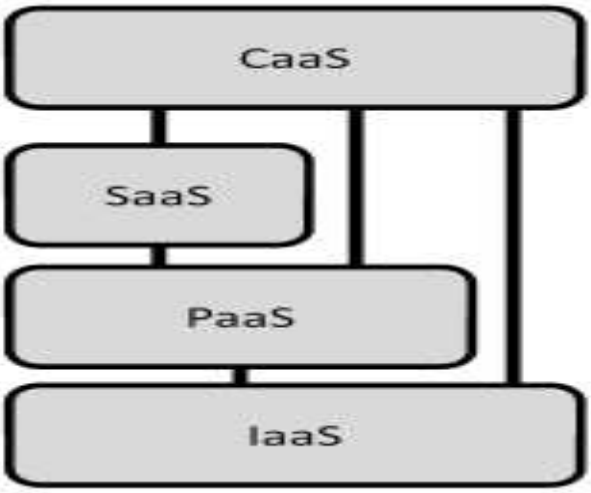


Fig: Showing dependencies between CaaS, SaaS, PaaS and IaaS.

6. SECURITY IN CLOUD

Cloud computing security (sometimes referred to simply as "cloud security") is an evolving sub-domain of computer security, network security and more broadly, information security. It refers to a broad set of policies, Technologies, and controls deployed to protect data, applications, and the associated infrastructure of cloud

computing. Organizations use the Cloud in a variety of different service models and deployment models.[7]The technology analyst and consulting firm Gartner lists seven security issues which one should discuss with a cloud-computing vendor:

Privileged user access—Inquire about who has specialized access to data, and about the hiring and management of such administrators.

*Regulatory compli*ance—Make sure that the vendor is willing to undergo external audits and/or security certifications.

Data location—does the provider allow for any control over
the location of data?

Data segregation—Make sure that encryption is available at all stages, and that these encryption schemes were designed and tested by experienced professionals.

Recovery—Find out what will happen to data in the case of a disaster. Do they offer complete restoration? If so, how long would that take?

Investigative support—Does the vendor have the ability to investigate any inappropriate or illegal activity?

Long-term viability—what will happen to data if the company goes out of business? How will data be returned, and in what format?

Determining data security is harder today, so data security functions have become more critical than they have been in the past.

Cloud Security Controls

Cloud security architecture is effective only if the correct defensive implementations are in place. Efficient cloud security architecture should recognize the issues that will arise with security management. [5] The security management addresses these issues with security controls. These controls are put in place to safeguard any weaknesses in the system and reduce the effect of an attack. While there are many types of controls behind cloud security architecture, they can usually be found in one of the following categories: [6]

Deterrent Controls

These controls are set in place to prevent any purposeful attack on a cloud system. Much like a warning sign on a fence or a property, these controls do not reduce the actual vulnerability of a system.

Preventative Controls

These controls upgrade the strength of the system by managing the vulnerabilities. The preventative control will safeguard vulnerabilities of the system. If an attack were to occur, the preventative controls are in place to cover the attack and reduce the damage and violation to the system's security.

Corrective Controls

Corrective controls are used to reduce the effect of an attack. Unlike the preventative controls, the corrective controls take action as an attack is occurring.

Detective Controls

Detective controls are used to detect any attacks that may be occurring to the system. In the event of an attack, the detective control will signal the preventative or corrective controls to address the issue.

7. CONCLUSION

Cloud computing is an emerging computing paradigm that is increasingly popular. Leaders in the industry, such as Microsoft, Google, and IBM, have provided their initiatives in promoting cloud computing. But still there are many question have left without an answer and indeed the most important one is security. IT technicians are spearheading the challenge, while academia is bit slower to react. Several groups have recently been formed, such as the Cloud Security Alliance or the Open Cloud Consortium, with the goal of exploring the possibilities offered by

cloud computing and to establish a common language among different providers. New technologies and capabilities may result in a further evolution of the cloud computing model. Companies presently considering such a move must weigh the advantages against the potential drawbacks, and decide if they are ready to launch their data into the cloud. Before doing so, a consultation with an experienced cloud computing provider is the best way to determine an effective course of action.

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