

Cloud Computing in Nutshell

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Abstract—Cloud computing is a new paradigm that is helping world to get faster, easy, efficient, effective access to infrastructure, software and platform services. It has high performance, low cost, low maintenance, secure environment which is a big demand as a technology as the data for the users in the world has moved to Exabyte's in total. What all user need is, web browser to access all the services that cloud offers with no maintenance of infrastructure, software updates, human resources and power management. This paper includes 3 sections. In first section past will be revealed and need to shift to cloud and its benefits are elaborated. In second section definition and characteristics is explained, its deployment models are mentioned, architecture and applications are explained, and leading cloud providers and their services are described. In last section challenges faced by companies to move to cloud and security issues are discussed. Finally latest developments and attacks are presented with future work possible.

Keywords: Cloud computing, service and deployment model, security, development, attacks.

1. INTRODUCTION

The cloud computing is a new generation computing model which comes from:

Grid Computing

Inter connected computer systems where the machines utilize the same resources collectively. It consists of one main computer that distributes information and tasks to a group of networked computers to accomplish a common goal, often used to complete complicated or tedious mathematical or scientific calculation [1].

Distributed Computing

Computer systems networking arrangement is, in which not just the information programs and storage of joined machines is imparted yet their information processing capacity is likewise pooled. In this scheme unpredictable or huge issue problem is divided in to hundreds of machines connected through the web.

Each machine's processing capacity is utilized just when it is on yet free, for example, when its client is reading or writing. This system saves enormous expense sparing from purchasing supercomputers and it is more reliable on the grounds as it is

unaffected by failure even when substantial rate of connected machines fails.

Parallel computing

It is the concurrent utilization of numerous compute resources to tackle a computational issue. An issue is broken into discrete parts that can be resolved simultaneously, each section is further separated to a progression of instructions and instructions from each one section execute all the while on distinctive processors. A general control/coordination mechanism is utilized.

Virtualization technology

It intends to make a virtual version of device or resource, for example, a server, network and operating system where the structure partitions the resources into one or more execution environments. The fundamental objective of virtualization is to oversee workloads by drastically changing conventional processing to make it more adaptable.

Utility computing

Utility computing is the procedure of giving computing service through an on-interest, pay-per utilization charging strategy. Utility processing is a figuring plan of action in which the supplier possesses, operates and manages the computing infrastructure and resources, and the subscriber's gets to it as and when needed on a rental or metered premise.

Advantages like large scale computation and data storage, virtualization, high expansibility, high reliability and low price service makes it really attractive [2].

The definition of cloud computing provided by National Institute of Standards and Technology (NIST) says that:

Cloud Computing is a model for empowering convenient, on-interest system access to an participated pool of configurable resources (e.g., systems, servers, storage, applications and services) that can be quickly provisioned and delivered with negligible management job or service provider interaction.

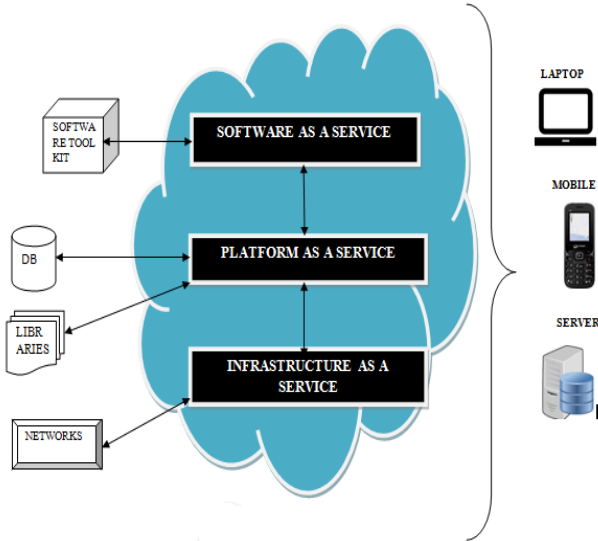


Fig. 1: Overview of Cloud Computing Technology

Cloud computing technology can be partitioned into two areas: the client end and the back end. They both are joined with one another through a network, typically the web. Client side is the thing that the customer sees though the back end is the cloud framework. Client end has the customer's machine and the application needed to get to the cloud and the back end has the cloud computing services like different machines, servers also information storage. Checking of traffic, regulating the framework and customer requests are controlled by a main server. It follows certain guidelines i.e., protocols and uses a unique programming called the middleware. Middleware permits arranged machines to correspond with one another [3].

2. HISTORY

Cloud computing is a type of parallel and distributed system comprising of a gathering of interconnected and virtualized machines that are dynamically provisioned and displayed as one or more bound together processing resources focused around service level agreement made through negotiation between the provider and customers. [4]

- Everything started in 1950s when Herb Grosch anticipated that "one day the whole world would work on dumb terminals controlled by as few as fifteen mega data centres" [5].
- Idea took place in 1960s when John McCarthy said "computation may someday be organized as a public utility".
- Thought occurred in 1960s when John McCarthy said "calculation may someday sorted out as an open utility.
- In 1966, a visionary Douglas Parkhill wrote book "The challenges of the computer utility". It describes all the characteristics of modern day cloud computing.

- Cloud computing implementation was patent and put to use by Hardy Schloer in England and Germany termed system as "one page web".
- It was invented by AT & T in 1994 and became popular in 2006 when Amazon launched Amazon Web Services.
- It was followed by Microsoft-Azure, Google- Compute Engine, oracle-oracle cloud, IBM Smart Cloud, apple-icloud. Eucalyptus became the first open source platform for deploying private clouds.

3. NEED

End-users: User can run applications and access data from any place, time and machine without any desktop or server installation, up gradation and troubleshooting.

System administrators: He doesn't have to install applications on a PC, upgraded periodically, have patches applied whenever available and reinstall when the user moves to a new desktop or when the old one crashes. He need not manage hundreds of desktops, remote devices, servers, storage arrays and other equipments anymore, thanks to cloud.

Software developers: Cloud applications are not present on desktops makes up gradation of applications convenient and continuous as they take place on back end, patches fixed automatically without waiting for the upgrade to come in over the Internet, and then re-boot the system for it to take effect. User doesn't need any intervention, attention, patience or action for enhancements.

IT buyers, corporate and federal: Cloud saves cost, resources, efforts and time by providing complete infrastructure, software that might be too expensive or unavailable for small companies. All the effort which developers and administrators have to apply is not required anymore due to easy installation, up gradation and development saving manpower. No need to spend thousands of dollars on servers and other hardware which allows companies to focus more on strategies to improve and expand. Cloud provide more secure environment than what companies can implement for itself. Large companies will save millions and mid-sized organisations will gain confidence to compete in the market [6].

4. BENEFITS

Reduced Cost: The charging model is pay according to utilization; the infrastructure is not purchased thus lowering maintenance. Starting cost and repeating costs are much lower than traditional computing.

Increased Storage: Cloud have made maintenance of huge infrastructure and large volume of data possible.

Flexibility: Cloud computing focuses on getting applications deployed to market very quickly, by using the most appropriate building blocks.

Easy Management: The maintenance of the infrastructure, hardware and software is simplified, reducing efforts for the IT team. Also applications that are quite storage extensive is easier to use in the cloud environment compared to the same when used by the organization by its own. Also at the user level, what you mostly need is a simple web browser with internet connectivity.

Uninterrupted Services: Lower outages are provided by cloud computing services, thus providing uninterrupted services to the user. However, some occurrences of outages have occurred in the past, like the Gmail outage in 2009. Also other cloud vendors like EC2 have failed at some point of time, but however, they are much more dependable compared to the infrastructure installed on the organization.

Disaster Management: In case of disasters, an offsite backup is always helpful. Keeping crucial data backed up using cloud storage services is the need of the hour for most of the organizations. Also cloud storage services not only keep your data off site, but they also ensure that they have systems in place for disaster recovery.

Green Computing: Harmful emissions due to extensive use of systems in organizations, electronic waste generated as the time passes and energy consumption is the main disadvantage of the present day computing systems. This can be reduced to some extent by using cloud computing services. This leads to environment preserving. Also the e-waste is generated to minimum extent.

Higher Security and Interoperability: Cloud experiences real security issues, to a great extent in light of the fact that vendors are executing different and dubious security models. Cloud platforms give a common, demonstrated security model. Cloud platforms provide a common, proven security model. If cloud software uses the platform, then it is inherently secure. [6]

5. CHARACTERISTICS

According to National Institute of Standards and Technology (NIST) identifies “five essential characteristics of cloud computing:

On-demand self-service: A client can singularly procurement processing capabilities for example, server time and storage on network as required without obliging human interaction with each provider.

Broad network access: Capabilities are accessible across the network and use through standard method which can be heterogeneous like mobiles, laptops, pads etc.

Resource pooling: The provider’s processing resources are pooled to serve different customer utilizing a multi-tenant model, with distinctive physical and virtual assets alertly allocated and reassigned based on client’s interest. There is a feeling of location autonomy in that the client for the most part has no control or information over the precise area of the resources yet may have the capacity to determine area at a larger amount of reflection (e.g., nation, state, or data center). Illustrations of resources are storage, processing, memory, and bandwidth capacity.

Rapid elasticity: Capabilities can be flexibly provisioned and released to scale rapidly with changing demand. To consumer, capabilities available for provisioning often appear unlimited and can be provided in any quantity at any time.

Measured service: Cloud frameworks naturally control and improve resources use by leveraging a metering capability to the sort of services used (e.g., storage, processing, transfer speed, and dynamic client accounts). Resources utilization can be checked, controlled, and reported, giving straightforwardness for both the supplier and consumer of the used services.

Deployment Models

Public Cloud/External Cloud

This model permits cloud environment as publically approachable. A public cloud permits clients' right to gain entrance to the cloud by means of interfaces utilizing standard web browsers. It's ordinarily focused around a pay-per utilization model. [7] [8] All clients have the same framework pool with restricted design, security insurances, and accessibility changes. One of the focal points of a Public cloud is that they may be bigger than an undertakings cloud, subsequently giving the capacity to scale flawlessly, on interest. [9] These aides in diminishing the operation costs on IT consumption. Public cloud are less secure contrasted with other cloud models as all the applications and information on the public cloud are more inclined to security attacks. The answer for this can be that security checks be executed through approval on both sides, by cloud vendor and client.

Private Cloud/Internal Cloud

Private cloud is constructed particularly to give the services inside an organization itself for keeping up the security and protection. In the private cloud, scalable resources and virtual applications gave by the cloud seller are pooled together and accessible for cloud clients to impart and utilization. It varies from people in general cloud in that all the cloud assets and

applications are handled by the organization itself. Usage on the private cloud can be significantly more secure than that of the public cloud in light of its indicated interior exposure. Just the organisation and assigned stakeholders may have admittance to work on a particular Private cloud [10].

Hybrid Cloud/Virtual Private Cloud Model

This model have both private and open cloud models where distributed computing environment is facilitated and oversaw by third party ,yet some devoted resources are secretly utilized just by an organization.

Community Model: It permits the cloud computing environment which is imparted or handle by number of related associations.

6. SERVICE MODELS

Computing services are offered to consumers varies according to abstraction level:

Infrastructure as a service: In lowest level, IaaS provides both hardware and software that powers everything – servers, data storage, systems, operating system. It coordinates fundamental services, for example, virtual servers, information storage, and databases into one stage for conveying and running your application. Example Go Grid, Flexiscale, Amazon EC2, Layered Technologies, Joyent and Mosso/Rack space.

empowers developers to construct and send web applications on a hosted infrastructure and permits them to use the apparently unending computer resources of a cloud framework. Example GAE, Microsoft’s Azure.

Software as a service: Finally, SaaS applications are intended for end-clients, conveyed over the web. It gives system based access to commercially accessible software’s and it can expand development rate of software, quicker client adoption of software, ease in execution and redesigns. Example SalesForce.com, Net Suite, Oracle, IBM and Microsoft. [11] [12].

7. APPLICATIONS

There are various IT Vendors serving Customer in every sector of life possible. Some of the innovative services that are provided to customers are Face book, Google+and Twitter, social networking implemented on Cloud; SalesForce.com providing CRM services to Companies. Google Drive, Drop Box provides free space on cloud to every signed up client. Amazon, Microsoft, Apple, Google is providing best Competitive services to small and large scale Companies. Sectors in which cloud has been implemented is Technology, Media and entertainment, public sector, education, finance, communication and media, manufacturing, insurance, banking, health care, social collaboration, big data and analytics.

8. SECURITY CHALLENGES IN CLOUD COMPUTING

According to a report by Gartner, the consumers should raise seven specific security issues before selecting a cloud vendor [13]:

- Ask the providers to supply data with respect to the employing and supervision of administrator and the controls over their right to gain entrance.
- Check whether cloud computing suppliers are eager to experience outer reviews and security affirmations.
- Verify whether the cloud suppliers are eager to permit their customers to control the area of information store and processing.
- Find out about what is carried out to isolate
- Information very still furthermore check the unwavering quality of the encryption plans used to secure information.
- Ask cloud supplier about information and administration recovery if there should arise an occurrence of a disaster furthermore the time needed for recovery.
- Check the seller's capacity to explore any illicit action.
- Make beyond any doubt that information stays accessible considerably after the cloud supplier organization goes bankrupt.

CLOUD COMPUTING: SERVICE MODEL

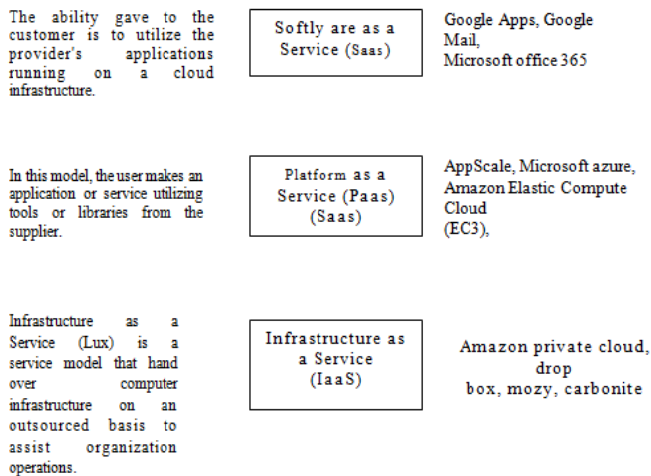


Fig. 2: Service Models of Cloud Computing

Platform as a service: In next level, PaaS provides services & tool intended to make coding and deploy those applications in a faster and effective way. PaaS is one of a kind in that, it

In 2014, security was cited as an issue by 49% of the respondents.

9. DEVELOPMENTS

Indian Companies like Infosys, TCS, Wipro and HCL, and Global Companies are Amazon, Google, IBM, Microsoft, Oracle, SAP, Salesforce.com, and VMware are competing to give best Cloud offerings to Indian market.

- *January 30, 2014:* IBM said it will contribute more than \$1.2 billion to develop to 15 new server farms over five main lands to grow its cloud administrations and reach new customers and markets. The new cloud focuses will be in Washington DC, Mexico City, Dallas, China, Hong Kong, London, Japan, India and Canada, with arrangements to extend in the Middle East and Africa in 2015. IBM said the speculation will raise its server farm number to 40 not long from now and twofold cloud limit for Soft layer, which rents online storage room to organizations and was obtained by IBM a year ago for \$2 billion.
- *September 28, 2014:* Infosys said it had consented to an association arrangement with Huawei Technologies Co Ltd to offer undertaking clients distributed computing administrations. Infosys additionally said it had extended existing distributed computing associations with Microsoft Corp and a Hitachi Ltd unit. These are relied upon to help Infosys over to the front line of India's \$100 billion IT outsourcing industry.

10. STATISTICS

The annual survey result for year 2014 is given below. These numbers clearly shows where we are going with the cloud.

- 49% organisations are using cloud for revenue Generation and product development activities.
- 35% more innovation and competitive advantage due to cloud.
- SaaS has leaped from 13% (2011) to 72% (2014), PaaS from 7% to 41% and IaaS from 11% to 56%.
- Cloud has implemented in sales and marketing by 52% companies, 44% in customer service and 44% in business analytics.
- Cloud has conquered 63% web presence, 54% communication and 47% disaster recovery.
- Privacy grew from 25% in 201 to 31% in 2014.
- Interoperability concerns drooped by 45% relatively over the past two years.
- Reliability concerns dropped from 30% to 16% over last 4 years.
- 66% of the data is on cloud today and it will reach to 73 % in 2 years. [14]

11. HACKS

Even hackers have keen interest in cloud computing. Several attacks are faced by big companies in past years:

- Amazon EC2 face Distributed Denial of service attack which is used to hack the Cloud Server, this is due to anonymity of customer for vendors. [15]. Web-based SVN and Git hosting provider Code Spaces waved the white flag after a devastating denial of service attack, while two weeks later CRM provider Auto task went down after a capacity spike.
- Microsoft Azure faced a problem of outage when one Customer remained online than usual time limit and some services went offline [16].
- As per Kaspersky, cybercriminals are using Google Cloud Messaging as a command and control (C&C) server for their malware [17].
- August 31, 2014, a gathering of nearly 500 private pictures of different famous people and with numerous containing nudity, were posted on the web. The pictures were accepted to have been gotten by means of a break of Apple's cloud services suite iCloud.

12. RELATED TECHNOLOGY

Mobile Cloud Computing is recent technology emerging at accelerating speed giving tremendous features to the mobile customers willing to avail cloud feature on their small handset. MCC faces more challenges than Conventional Cloud Computing like small battery life, small screen size, less processing speed, lesser memory size and memory size [18]. Many Cloud Vendors are still proficient to give best suited features on Mobiles. Android phone are rage in the market and that using Google Cloud and almost every third person is using this Google Cloud. Mobile Cloud Computing faces Security Issues too, which is the big research area to work upon. [19] Apart from Security issue MCC has to face following issues: Device energy, Bandwidth Utilization Cost, Network Connectivity, Mobility, Context Awareness, Location Awareness, Bandwidth, and Security

13. CONCLUSION

The journey to the cloud marks a momentous evolution in the IT industry. It is changing the way we all work and manage our systems, regardless of industry or size. It even has made its place at individual level allowing backup of private data on clouds. Factors that prevent adoption of cloud are data sovereignty and privacy, physical control, application model, existing infrastructure, geographic proximity, integration with existing systems and vendor lock in. Increased collaboration, pricing flexibility, no upfront investment, convenience for development teams, IT efficiency, ability to grow and shrink IT capacity on demand, ability to rapidly launch new products and services, operational cost savings, hardware and software

cost savings and hardware utilisation makes it irresistible. Expense, scalability and agility have made cloud computing vital to business achievement. Anyhow cloud reception additionally altogether expand business complexity. To grasp the full key capability of the cloud, executive teams must find better approaches to affirm the fundamental business controls to address dependability, provisioning, security and administrative and compliance needs.

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