

Cloud Computing: Emergence, Relevance and Future in India

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Abstract

This paper broadly covers Cloud Computing – its emergence in India, how is it relevant against the backdrop of the emerging Indian market and how can this technology be tapped so that its potential is leveraged to capacity for technological growth in the country. Cloud computing as a concept has been around for quite some time, but the recent years have seen it being utilized in various walks of life. India is gradually becoming the forerunner in use and propagation of Cloud technology. This paper aims at outlining the crux of this technology and to look for areas of improvement where the technology can be used.

Keywords: *Cloud, emergence in India, relevance in India.*

I. INTRODUCTION

Cloud computing broadly describes off-premise, on-demand computing where the end-user is provided, computing resources, and services (including operating systems and infrastructure) by cloud services provider via the Internet. The hosting industry came out of the need for software and computing services that were managed internally, but were made more economical and accessible through the economies of scale of a hosted implementation. Cloud computing 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.[1]

Cloud computing typically uses the internet to deliver off premises where the user of the services is only involved in usage rather than knowing and understanding how exactly these services function. The emergence of cloud over the years has brought into the picture a paradigm switch where the consumer inclination is more towards how to harness the capability of a technology rather than being involved in the technical know-how of it. It has also brought about a new model wherein the consumer tries to reduce the initial cost of setting by opting for the more feasible and easier pay-as-you-go costing model.

Brief History:

Cloud might seem like a relatively new term, but its gradual evolution had begun back in the 1950s with the onset of mainframe computing where multiple users could use the computing capabilities of a single central computer through dumb terminals. This was a far economical option than purchasing multiple mainframes.

In the 1970s, the concept of virtualization came into existence. Using virtualization software like the VMware, it was possible to run multiple operating systems in isolated environment. This took mainframe shared resource concept

to the next level by provisioning multiple virtual computers within a single physical resource.

In the 1990s, evolution of cloud computing took another leap in the form of virtualized private network. Before VPN came into being, the telecommunication service providers offered services on a point-to-point basis. The emergence of VPN allowed having the same quality of data services as a dedicated connection but at a reduced cost. With VPN, telecommunication service providers were spared the cost of investing in physical infrastructure for more users, instead they could not harness the existing infrastructure by providing shared access.

Over the years, cloud computing has taken on a more sophisticated role going from Grid computing, utility computing to Software as a Service; providing anywhere, anytime access to IT services.

II. MODELS OF CLOUD COMPUTING

Cloud Computing is based on two basic models – Service Model and Deployment Model, which in turn can be classified further as under:

SERVICE MODELS:

Cloud Computing Services are provided in 3 fundamental service models:

1. Infrastructure as a Service: (IaaS)

In this model, the role of the service provider is to provide the basic infrastructure necessary for hosting cloud applications. The subscriber has control over the processing, storage and platform related choices. This is the most basic form of cloud computing where the end user still controls most of the resources. This model is best suited for applications where the end user only needs infrastructural resources from the cloud. Common examples can be: Rackspace Cloud, Amazon Cloud formation.

2. Platform as a Service: (PaaS)

In this model, the consumer seeks related to infrastructure as well as operating system and storage from the service provider. The consumer uses these resources for deploying consumer created or acquired applications. This model puts the consumer in control of only the application without having to worry about the platform and the infrastructure that is being used for deployment of the application. Examples include: Amazon Engine, Windows Azure, etc.

3. Software as a Service (SaaS):

This model is what can be described as leveraging cloud potential to capacity. In this model, the consumer uses the application provided by the service provider. The consumer does not control infrastructure, platform or the software. The consumer only uses the software as an end product and pays as per the usage. Examples are Microsoft Office 365, Google Apps, Salesforce.com.

III. DEPLOYMENT MODEL

Deployment Models in Cloud:

1. Private Cloud:

The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers.

2. Community Cloud:

The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g. mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.

3. Public Cloud:

The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them.

4. Hybrid Cloud:

The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g. cloud bursting for load balancing between clouds) [2].

Benefits of Cloud Computing – An Architectural Perspective:

Benefits of cloud vary subjectively depending upon each enterprise's need to incorporate the cloud model into the way the usage of IT resources is being carried out. It also fluctuates due to emerging new verticals and horizontal opportunities as well as newer platforms and ecosystems coming into picture.

But speaking in a broad sense of way, the benefits of cloud computing can be stated as:

1. Cost:

The cost of imbibing the cloud model is much less than having an on-premise infrastructural model. The benefits in this area are tangible.

- No hardware or computing resources lingering on balance sheet
- No depreciation
- No need for lengthy justification
- No monthly review of system utilization
- No need to refactor computing resources after project completion

2. Scale:

Cloud computing provides the flexibility in terms of scale. You can increase or decrease usage as per the demand curve. This ensures that estimated and actual usage as per demand is a flexible curve.

Initially, when IT resources are purchased, they are as per the demand. When the demand increases, more resources are purchased. When the demand goes down, there is no way to reduce these resources. Therefore, there is an observed underutilization of the resources. With cloud, when the demand becomes lean, the services can be scaled down. Conversely, it can also be scaled up as and when required.

3. Scale:

One of the key differentiators for a company relates to its ability to be first to market, such differentiators correlate to speed of execution for which I provide a few examples below:

- Virtual resources adapt more easily to business objectives requirements
- Rapid expansion of bandwidth speed as needed
- Access to solid-state drive (SSD) technology on-demand enhances application speed
- No red tape—cloud effortlessly adapts to technology landscape changes

4. Integration:

Within five years, the major cloud providers will create an interconnected Internet super highway on which data will travel, communicate and collaborate interactively in the delivery of services that cannot be fathomed today. Cloud will help to enable this by:

- Providing countless application programming interfaces (APIs) for the consumption of third party services.
- Think of OData, JSON, JSONP, XML for API data access.
- Providing flexible access to traditional SQL or No SQL databases.
- Provide analytic platforms for countless business needs.

5. Audit and compliance

Audit and compliance is probably one of the biggest burdens on any IT organization. Fortunately, cloud can help in the following ways:

- Cloud vendors' service level agreements (SLAs) ensure that all audits and compliance activities are logged, monitored and audited to your satisfaction
- Regardless of business security requirements, most cloud vendors abide to industry standards to support Sarbanes & Oxley, ISO2001, ITIL, SAE116, SaS Type I & II, HIPAA, PCI and more
- Cloud providers are regularly audited by third party organizations to ensure that security standards are met

6. Business Continuity Planning (BCP)

BCP truly showcases one of the many benefits of cloud and how it can serve as an extension of IT and your business. BCP enables:

- Disaster recovery with cold or hot backup
- Disaster recovery with high-failover or high-redundancy
- Data deduplication and backup
- Testing and verification of recovery procedures

IV. CLOUD COMPUTING IN INDIA

India is growing at faster pace in information technology sector thereby showing a great potential for the cloud computing services. According to Springboard Research report (Jan 2009) SAAS India i.e. software as a service in India will register a compounded annual growth rate of 76% in the time period of 2007-2011. Cloud computing services has huge opportunity in Indian market due to the large number of Small and Medium businesses (SMBs) which is at around 35 million and they want easy to use, reliable and scalable application that helps them to grow and expand their business. This makes India as the fastest growing SAAS market in Asia Pacific region.

With the statistics showing upward trends, India is a market that is as profitable as promising. It provides a place for coming up with innovations and provides ample scope for pioneering path breaking applications.

A. Applications of Cloud Computing in India

1. Social Impact

It is officially the age of micro blogging and social networking Twitter, Google, Facebook are testimonies that cloud is penetrating the very fabric of everyday living in India Young Indians are well apprised about usage of these platforms. These social media sites are now being used as a platform for various social and political activities. In its own way, cloud technology is playing a role in connecting India.

2. Education

Educational institutions have been quick to realize the advantages of cloud technology and have been eagerly adopting it for several reasons, including:

- Ability for the students to access data anywhere, anytime, to enroll in online classes and to participate in group activities
- Ability to collaborate enabling learning round the clock erasing demographical boundaries.

3. Development

Cloud technology also offers other benefits to developing countries since they no longer have the burden of investing in costly infrastructures and can tap into data and applications that are readily available in the cloud.

Take as an example the telecom industry, where the developing countries are tapping into the potential of cloud by coming up with economical solutions for telecommunication connections

4. Health

There are many reasons why using cloud technology in the healthcare industry is gaining pace. Some examples include: managing non-siloed patient data and sharing it among different parties such as medical professionals or patients checking their own status and treatment follow-ups; reducing operational costs such as data storage; accessing this data through pervasive devices such as mobile phones and going beyond the traditional intranet; implementing a quick solution in a secure environment that is compliant with the Health Insurance Portability and Accountability Act regulations.

While there may be challenges in integrating old or current tools with new technologies and the corresponding level of services, the benefits will outweigh the inhibition to move to the cloud. According to the industry, healthcare will be a growing market in the coming years, running into the billions [3].

V. FUTURE OF CLOUD COMPUTING IN INDIA

One of the striking features of cloud computing is that it presents benefits to every aspect of Indian economy including but not limited to SMEs, the education system and the Government of India.

Cloud computing is becoming all pervasive and when implemented in conjunction with mobile technology, it sets stage for having power of cloud with the convenience of mobility. This model is already coming into picture with apps. Future of cloud computing lies in making the cloud model go completely on pay as you go basis not only for enterprise applications but for apps in handheld devices.

1. Proactive Application Monitoring

Proactive application monitoring technology is currently available, but predictive technology and software will soon make this more robust and accurate. Companies will be able to foresee disaster and avert it, mitigating damage to their systems. This will prevent downtime and make the company safer.

2. Technology to Ensure Uptime

With low-power processors, data centers will become more affordable, allowing companies to acquire seven to ten data centers around the world in different time zones and thereby allowing them to guarantee 99.9 percent

uptime. This will keep companies from losing money and falling prey to their competitors. Windows Azure already is providing 99.99% SLA by providing data redundancy across various data centers in the world

3. The Ability to Validate Identities through Trusts

In the future, cloud security systems will be able to validate identities through a “centralized trust.” Identity-based security is thought to be more secure than current forms of security. More people will begin to trust cloud computing when this happens.

4. Mobile Optimization for Cloud Services

Mobile commerce is on the rise. Cloud computing applications require fewer resources and are recommended for mobile devices. Accessibility is increased because fewer resources are required. This is why cloud computing is recommended for business and personal applications.

5. Cloud Computing Will Help Businesses Optimize Their Investments

Cloud computing can help companies optimize investments and scale operations. In the future, new low-power processors and other chip technology will help businesses operate to their full IT capacity. With more innovation, greater revenue potential is possible. Companies can re-invest in their products and services with higher profit margins. Scaling investments will also lead to greater operational agility.

VI. CONCLUSION

Cloud Computing is here to stay. The technology has plenty to offer in terms of infrastructure cost saving, it caters to the needs of an audience that needs everything on the go, it provides an uptime through replication and provides impeccable service in terms of processing speed managed through sophisticated load balancing techniques. It sticks close to the demand curve and reduces underutilization tangibly. When these considerations are put in a business scenario, they spell high ROI and low risks. Cloud Computing and its contribution to development and making technology available to all is going to be the highlight of this decade’s technology.

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