

## A REVIEW PAPER ON CLOUD COMPUTING

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**Abstract** - The major goal of this paper is to provide in-depth knowledge on cloud computing technologies. IT organizations have been spending money to move their businesses to the cloud since the technology was first introduced. More than 45 percent of IT investment on system infrastructure, software infrastructure, and application software is expected to transition to cloud by 2024, according to estimates. In the wake of the COVID-19 pandemic, working from home has become the new standard for all employees. People may interact with clients, produce products, and collaborate with coworkers as if they were meeting and working in an office thanks to cloud computing. Many of today's success stories may be traced back to cloud computing.

**Key Words:** IT, Work-From-Home, Cloud Computing.

### 1. INTRODUCTION

Data backup, virtual desktops, disaster recovery, software development, email, big data analytics, and online apps are just a few of the use cases that organizations of all types are embracing the cloud for. Cloud computing represents a significant shift in how businesses think about IT resources. Even if you aren't aware of it, you are currently using cloud computing. If you use any of the programs to send email, edit documents, watch movies or TV, listen to music, play games, or save files, cloud computing is likely to be at the heart of everything. Although the initial cloud computing services were only launched a decade ago, businesses of all sizes, from small startups to large multinationals, government agencies to non-profits, are adopting this technology for a variety of reasons. The Virtual Machine (VM), which allowed users to run different operating systems on a single physical computer at the same time in the 1970s, served as a predecessor to Virtual Desktop Infrastructures (VDIs). Instead of accessing many desktops from a server, they might all be accessible from the same computer. In 1995, clouds first emerged in network diagrams, and they appeared to be too sophisticated for non-technical people to comprehend.

### 2. EVOLUTION OF CLOUD COMPUTING

Cloud computing is the use and rental of computing services over the internet. Distributed systems and their peripherals, service orientation, virtualization, utility computing, and web 2.0 are five technologies that have

played an important role in the development of this technology. It evolved primarily from various computing technologies such as grid computing, utility computing, parallel computing, and virtualization. With mainframe computing in the 1950s, it allowed multiple users to connect to a central computer via access points. ARPANET (Advanced Research Project Agency), the predecessor to the Internet, was created in the 1960s. It was originally intended to be a communication and compute resource sharing tool for four institutions, but it evolved into what we now know as the internet. Virtualization was a necessity on a local level in the 20<sup>th</sup> century, prior to the introduction of UNIX-based operating systems. The term "client-server" was also coined to describe the compute model of "clients accessing data and applications from a central server via a local area network." Salesforce.com was the first company to make enterprise applications available through a website when it launched in 1999. A few other websites, such as google.com and Netflix.com, were also launched. Web 2.0 was born in 2003. It was accompanied by rich multimedia, user-generated content, and dynamic interfaces. Cloud computing began to take off when ISPs began to provide significant bandwidth to the masses at the beginning of the 21<sup>st</sup> century.

### 3. SERVICES OF CLOUD COMPUTING AND ITS BENEFITS

#### 3.1 Software as a Service (SaaS)

Users can access SaaS via the internet and browsers. The user can access the software over the internet rather than installing it on his machine. It frees the user from having to deal with sophisticated software and hardware. Users of SaaS do not have to purchase, maintain, or upgrade software or hardware. The only requirement for the user is an internet connection.

#### 3.2 Platform as a Service (PaaS)

PaaS provide a full life cycle of web based application development and hosting. We can purchase and maintain hardware, software, and hosting as part of this type of service. Users create applications and migrate them to public and private clouds. Application server (Java, .Net framework) and database server (MySQL, Oracle) are two examples of servers that users can utilize to create their own programs. Web applications can be developed on a

computing platform fast and easily, reducing software complexity, cost, and maintenance.

### 3.3 Infrastructure as a Service (IaaS)

On a pay-per-use basis, IaaS delivers computing resources such as hardware, network, storage, operating system, and storage devices. IaaS is essentially a set of virtual servers that a customer rents from another company that operates a data center. This solution gives the end user flexibility when it comes to hosting custom-built apps or standard software, as well as a general data center for storage.

## 4. TYPES OF CLOUD

### 4.1 Public Cloud

The complete computing infrastructure is housed on the premises of cloud service providers who provide cloud-based services over the internet. For those individuals or companies who do not want to invest in IT infrastructure, this is the most cost-effective choice. The resources in a Public Cloud environment are shared among several users, referred to as "Tenants." The cost of using Cloud services is determined by the amount of IT resources used.

### 4.2 Private Cloud

Individuals and organizations who choose for the Private Cloud benefit from specialized infrastructure. When using a private cloud, the level of security and control is at its utmost. The costs are borne solely by an individual/organization and are not shared with anybody else. The user is responsible for managing the Private Cloud, and the cloud service provider does not offer cloud management services.

### 4.3 Hybrid Cloud

The properties of both public and private clouds are combined in the hybrid cloud deployment paradigm. This enables apps and data to be shared between public and private cloud environments. Organizations often utilize Hybrid Cloud when their on-premise infrastructure requires greater scalability, and they take use of public cloud scalability to fulfil business demands. Organizations may retain sensitive data on their Private Cloud while benefiting from the Public Cloud's capabilities.

## 5. POSITIVE IMPACTS ON BUSINESS ORGANISATIONS

Cloud computing has a favorable impact on businesses since it raises income and helps them reach their objectives. Rather than constructing their own infrastructure, businesses opt to leverage the cloud's services. The following are some of the advantages of

cloud computing technologies that encourage businesses to shift from on-premises infrastructure to the cloud.

### 5.1 Reduced Costs

Cloud computing lowers a company's costs because resources are only purchased when they're needed and only paid for when they're used because the billing model is based on consumption and there's no up-front fee. Because the infrastructure is not purchased, the upfront costs and maintenance costs are reduced.

### 5.2 Unlimited Scalability

This is a major advantage of cloud technology since it allows the client to scale up or down according to the organization's needs. Companies do not need to be concerned about future demands because they may readily obtain extra services at any moment. Furthermore, as a company expands over time, the cloud can easily scale to meet the additional demand.

### 5.3 Flexibility

Clients benefit from a great deal of freedom with cloud computing. The cloud allows for simple testing and deployment of services. Customers are able to choose which services they require and pay for them. By delivering a variety of services, cloud services can better satisfy changing corporate expectations. We have the ability to switch to another cloud if any cloud-based application fails to meet our needs.

### 5.4 Better Mobility

Cloud customers can access cloud services from a range of devices at any time and from anywhere. They can log in and use the services whenever they have a working internet connection. This benefit of cloud computing provides employees with a flexible work ethic, allowing them to execute their jobs from anywhere without having to be physically present at the company headquarters.

### 5.5 Improved Communication

Having access to instant messaging, conference, and video conferencing options through cloud computing promotes staff communication and cooperation. They can collaborate on papers and projects together, resulting in greater cohesion and teamwork. This is made possible by data centralization and real-time cloud server updates.

### 5.6 Reliability

Cloud services are available at all times and can be accessed from anywhere. This technology is also more dependable because of the backup and recovery management.

## 6. OPEN CHALLENGES IN CLOUD MIGRATION

### 6.1 Interoperability

One of the major challenges in cloud migration is interoperability. This is about the ability of devices to communicate with one another. In cloud community technology, it refers to the ability to develop code that works with multiple cloud service providers at the same time, regardless of the differences between the cloud providers. As a result, if we migrate the business to the cloud and want to be a part of the cloud environment, it must be compatible with more than one service provider. It means that an application on one platform should be able to use services from other platforms. It is made possible by web services but, developing such web services is extremely difficult.

### 6.2 Cloud Security and Privacy

The most serious threat in the current market is cloud security. When we use cloud technology, we are migrating sensitive data to cloud servers, giving us less control over the data. It is then the cloud provider's responsibility to ensure data security and privacy. Because cloud services are accessed via the internet, there is a risk of hackers breaking in and causing damage. As a result, it is critical to carefully select the cloud provider and validate the methods and tools used by the cloud to ensure the security and privacy of our data.

### 6.3 Portability

Portability means that applications should be able to migrate easily from one cloud to another. The software we want to move must be compatible with the other cloud environment. Because cloud providers use different standard languages for their respective platforms, portability is difficult to achieve. There should be no vendor lock-in.

### 6.4 Performance

Data-intensive cloud applications necessitate a large amount of network bandwidth, which comes at a high cost. Low bandwidth does not meet the computing performance requirements of a cloud application. When a company migrates to the cloud, it becomes reliant on the service providers. The following significant challenges of moving to cloud computing build on this collaboration. Nonetheless, this collaboration frequently provides businesses with innovative technologies that they would not otherwise be able to access. The performance of the organization's BI and other cloud-based systems, on the other hand, is also linked to the performance of the cloud provider when it falters. Over the last few years, all the major cloud players have experienced outages that is leading to significant loss.

### 6.5 Private Cloud

Although building a private cloud is not a top priority for many organizations, for those who are likely to implement such a solution, it quickly becomes one of the most significant challenges confronting cloud computing – private solutions should be carefully addressed. Having all the data in-house is a significant benefit of establishing an internal or private cloud. However, IT managers and departments will have to face the challenge of building and gluing it all together on their own, making one of the challenges of moving to cloud computing extremely difficult. It is obvious that developing a private cloud is not an easy task, but some organizations have managed to do so and plan to do so in the coming years.

### 6.6 Organizational aspects

When a business adopts cloud technology, it will experience significant changes in its internal operations, mission, funding, and personnel, among other things. As the company migrates to the cloud, administration and operational staff will face new challenges. As the data is stored on a remote server, new security and privacy issues will arise. Employees of the company should be confident in the new technology in order to explore its benefits and overcome its drawbacks. The overall organizational structure will change, and employees at all levels should welcome this positive impact in order to reach new business heights.

## 7. SOLUTIONS TO OVERCOME THESE CHALLENGES

Despite the numerous benefits of cloud computing, there is a low migration rate due to the various challenges that businesses face. The following are some solutions that a businesses should consider in order to overcome the challenges of cloud migration.

### 7.1 Using Encryption Techniques

Encrypting data while sharing it between business networks and cloud devices is the best way to prevent snooping. The data is always transferred in an encrypted format from the local server to the cloud server, so that even if it is hacked, it appears to them as trash. Having a stringent security protocol in place for the cloud solution. Developing a corporate culture that protects data.

### 7.2 Alternate Backups

Companies should maintain regular backups on their local storage devices or with a different cloud provider. There are numerous cloud providers that provide storage as a service to their customers.

### 7.3 Educating Users

Companies should educate their employees about the goals of new technology in order to help learners cope with the new technology that has been adopted. Once users are sufficiently informed about the positive effects of technology, they will be able to contribute fully to its success in all aspects.

### 7.4 Cloud Provider Selection

There are numerous cloud service providers competing in the market, and the company should select a service provider after conducting a thorough investigation of the provider's track record. Organizations should verify the cloud provider's tools and techniques and select the best one to meet their business needs. Before migrating data to the cloud, the company should ask the cloud provider a series of questions about the security and privacy measures in place, such as firewall configuration, antivirus, testing methods, and so on, to ensure that data security and privacy are not jeopardized in the future.

### 7.5 Cloud auditor

Third-party oversight or organizations should be present to audit cloud services and other performance metrics, including security. As a reference guide, the Cloud Auditor should develop an audit plan that includes policies and procedures.

### 7.6 Migration of business applications

The company should first decide which applications to migrate to the cloud and which to keep on local devices. Before migrating, they must determine whether the application is finance-related, customer-related, or business-related, as not all applications are cloud-compatible. Pre-migration testing should be done that focuses primarily on migration-related requirements. Setting a realistic project deadline and budget while keeping migration hassles in mind. Using cloud service providers who specialize in migration projects.

## 8. CONCLUSION

It is no secret that cloud computing is reshaping the IT industry. Businesses of all sizes are reaping the benefits of cloud computing as adoption grows at an exponential rate. The benefits of using the cloud are especially significant for startups and small to medium-sized businesses (SMEs) that cannot afford costly server maintenance but may need to scale overnight. Business intelligence (BI) and the cloud are a perfect match because the former delivers the right information to the right people and the latter provide a flexible way to access BI applications. Organizations clearly have a lot of work ahead of them, especially since cloud adoption is becoming a business standard that will grow exponentially. Cloud computing is not a quick fix, but a

strategic approach, management details, and professional involvement can help reduce potential risks, costs, and flaws in the implementation process. The future of cloud computing is dependent on the adoption of industry standards that will aid in the resolution of regulatory, management, and technological issues. Cloud computing is still a work in progress. The epidemic of COVID has changed the way businesses are operated. Digitalization and automation have been adopted by many industries. This transition was made possible thanks to the cloud. Because it has revolutionized the working style in commercial organizations, the post-pandemic world will rely on the cloud even more than before.

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