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**Aakash Goyal**  
School of Computer Science  
Engineering, Vellore Institute  
of Technology, Chennai, Tamil  
Nadu, India

## A useful survey on cloud computing from user's perspective

**Aakash Goyal**

### Abstract

The advancement of our modern society, the information and knowledge society, is dependent on technological advancements that have long been predicated on enhancing the performance of various equipment while simultaneously miniaturising them. The goal of modern computer technology solutions shrunk is to integrate all of its computing power into a single device, which necessitates the use of an external source, allowing cloud computing to arise. The abstract introduces the research's goal and expected contribution. Outsourcing all of the features that a computer can provide complements the idea of cost-cutting and, not surprisingly, is effective in education. Because cloud technologies make teaching, research, and development more efficient and sustainable, educational institutions should explore implementing these solutions. This study examines the current technologies used in cloud computing as well as enterprise systems. Cloud computing can be looked at from two perspectives. The first is cloud infrastructure, which serves as the foundation for up-layer cloud applications. The cloud application is the alternative option. There are three basic aspects of cloud computing infrastructure. First, the infrastructure is based on big-scale clusters with a huge number of low-cost PC servers. Second, the applications are co-designed with the basic infrastructure so that computer resources can be utilised to their full potential. Third, rather of relying on hardware alone, the entire system's reliability is ensured by software built on top of redundant hardware.

**Keywords:** Cloud computing, internet of things, smart era, smart applications

### 1. Introduction

The cloud computing technology<sup>[1, 2]</sup> can be used in all aspects of life, including education, where cloud-based e learning solutions promote a new way of learning. A period of education in which lectures and labs are no longer required. Through virtualization, it is based on a cloud platform. A wide range of Teachers and students can access a wealth of information. Cloud-based services are available to students, and these services can be accessed at any time, from any location, and on any device. Any type of device Providing educational opportunities, on the other hand, is a win-win situation. The use of cloud computing technology allows for a variety of services. They will be able to obtain the abilities they will need in the global marketplace. Society of information in many universities have started to do so. Accept this initiative, and there is proof of a positive outcome. As a result of implementation, there has been a significant reduction in costs. The influence of cloud computing on business and end users is impossible to overstate: the ubiquitous presence of software that operates on cloud networks has altered many elements of daily life. Organisations can save costs and expand their offerings by utilising cloud computing instead of purchasing and managing all of the necessary hardware and software. Independent developers now have the ability to create apps and internet services that are available worldwide. Researchers can now share and evaluate data at scales previously only available to large-scale operations. Furthermore, internet users may instantly access software and storage to produce, exchange, and store digital media in quantities much exceeding their personal computing power.

Cloud computing refers to the provision of computing resources as a service, with the cloud provider owning and managing the resources rather than the end user<sup>[3, 4, 5, 6]</sup>. Browser-based software applications (such as Tik Tok or Netflix), third-party data storage for photos and other digital media (such as iCloud or Dropbox), and third-party servers used to support the computing infrastructure of a business, research, or personal project are all examples of these resources. Prior to the widespread adoption of cloud computing, businesses and regular computer users had to purchase and maintain the software and hardware they needed.

**Corresponding Author:**  
**Aakash Goyal**  
School of Computer Science  
Engineering, Vellore Institute  
of Technology, Chennai, Tamil  
Nadu, India

Businesses and consumers now have access to a multitude of on-demand computing resources as internet-accessed services, thanks to the expanding availability of cloud-based apps, storage, services, and devices. By moving away from on-premise software and hardware and toward networked distant and distributed resources, cloud customers can avoid investing the time, money, and skills required to purchase and manage these computing resources. This unprecedented access to computing resources has given rise to a new wave of cloud-based businesses, changed IT practices across industries, and transformed many everyday computer-assisted practices<sup>[7, 8]</sup>. With the cloud, individuals can now work with colleagues over video meetings and other collaborative platforms, access entertainment and educational content on demand, communicate with household appliances, hail a cab with a mobile device, and rent a vacation room in someone's house.

Regarding to define cloud services There have been misunderstandings, even among professors, who believe that cloud computing refers to all Internet-based services that are not hosted by their university. On the other hand, there is some debate regarding what Web 2.0 actually entails. Web 2.0 applications include tools like blogs, wikis, and social bookmarking, which are used to engage. They can be hosted on-site by an institution or accessed via the Internet and used from the cloud.

Cloud computing takes all the heavy lifting involved in crunching and processing data away from the device you carry around or sit and work at. It also moves all of that work to huge computer clusters far away in cyberspace. The Internet becomes the cloud, and voilà—your data, work, and applications are available from any device with which you can connect to the Internet, anywhere in the world. Cloud computing can be both public and private<sup>[9, 10]</sup>. Public cloud services provide their services over the Internet for a fee. Private cloud services, on the other hand, only provide services to a certain number of people. These services are a system of networks that supply hosted services. There is also a hybrid option, which combines elements of both the public and private services.

## 2. Advantages, Possible Uses of Cloud Computing

The pace of innovation—and the need for advanced computing to accelerate this growth—makes cloud computing a viable option to advance research and speed up new product development. Cloud computing can give enterprises access to scalable resources and the latest technologies without needing to worry about capital expenditures or limited fixed infrastructure. What is the future of cloud computing? It's expected to become the dominant enterprise IT environment. If your organization experiences any of the following, you're probably a good candidate for cloud computing:

- High business growth that outpaces infrastructure capabilities.
- Low utilization of existing infrastructure resources.
- Large volumes of data that are overwhelming your on-premises data storage resources.
- Slow response times with on-premises infrastructure.
- Delayed product development cycles due to infrastructure constraints.
- Cash flow challenges due to high computing infrastructure expenses.

- Highly mobile or distributed user population.

These scenarios require more than traditional data centres can provide. The use of cloud computing in teaching is a good idea. The technology they use is based on the services they provide.

### Architecture and implementation

As a result, from the standpoint of/ in terms of services, the following can be mentioned:

- Platform as a service (PaaS), which offers a variety of services. software used in the creation of applications;
- Software as a service (SaaS), which allows users to access software remotely. cloud software given by cloud admins who Observe them;
- IaaS (Infrastructure as a Service), which is the foundation.

In Cloud Computing, there is a model. The cloud can be used after the method of implementation has been determined. Whether it's public, private, or a hybrid, there's a Microsoft Company already efforts in the field of cloud computing with the Windows operating system Azure is a platform as a service (PaaS) that is offered to users. Note that IaaS (Infrastructure as a Service) is a Public Cloud service.

In terms of learning technologies, web-based learning has a number of advantages over traditional classroom learning. The most significant benefit is related to the low cost and ease of use. Use learning content whenever and wherever you want. Learning It is simple to maintain and update the material; it may be used in a variety of ways. use multimedia information to aid comprehension concepts. The teacher's role and the student-centred approach. The use of creativity in the creation of educational materials is encouraged<sup>[11, 12, 13]</sup>. Some schools use low-level cloud services for data storage, but cloud computing in education has a number of advantages, including:

- cost savings (pay only for what you use);
- elasticity of use (given the ability to start with small services);
- increased availability (Google offers approximately 100% for educational applications and is on track to exceed this target);
- end-user satisfaction because cloud-based applications include the most up-to-date tools and features from innovative companies such as Microsoft and Google; users can use free office applications without having to purchase, install, or maintain these applications on their computers; enhanced collaboration opportunities; their data is not lost because it is stored in the cloud for free use and accessible from any location or device.

Learning Management Systems (LMS) such as Blackboard or Moodle are another application of cloud computing in education. And E-learning is now widely used at all levels of education, including lifetime learning, corporate training, and academic courses. There are many different elearning options available, ranging from open source to commercial. Students can access courses, exams, and transmit online projects since there are at least two entities involved in the elearning system: students and trainers. Trainers can manage content, administer tests, and evaluate these tests, homework, or projects for students, as well as connect with

them<sup>[14]</sup>. Cloud computing trends cannot be ignored in the creation of e-learning solutions. Which<sup>[17, 21]</sup> categorise into five levels:

- the level of hardware resources: created by using operating systems and middleware technology, it enables software developers to realise more applications, including the incorporation of e-learning applications in the cloud;
- the level of software resources: created by using operating systems and middleware technology, it enables software developers to realise more applications, including the incorporation of e-learning applications in the cloud;
- resource management level: with an important role in poor coupling of hardware and software resources what enable a constant on demand software distribution for various hardware resources;
- the services level (IaaS, PaaS, SaaS), which allows customers use of different cloud resources such as software resources, hardware resources and infrastructure resources to achieve their applications;
- the business application level, which enables the creation and delivery of content, as well as the platform for education, assessment, and management education; this level differs from all other layers in the e-learning cloud-based architecture because it serves as the e-learning business logic and framework for extending the e-learning components group.

### 3. Developments and Differences in e-cloud computing

According to authors<sup>[15, 16, 17]</sup>, the development of e-learning in a cloud computing environment is characterised by the following characteristics:

- the services are accessed through the Web, which means they can be accessed from anywhere and at any time;
- does not require client-side software, which means lower costs for the institution in terms of installation, software maintenance, and server administration, including IT staff costs;
- SaaS system can support several educational institutions;
- all user data is on the SaaS server, and security is provided by the SaaS provider;
- virtualization enables rapid replacement of a compromised server cloud without major costs or damages because it is easy to create a clone of a virtual machine, so idle times are reduced significantly;
- monitoring data access becomes easier, as only one location must be overseen, rather than hundreds of computers distributed across a vast geographical area;
- security upgrades can be readily evaluated and implemented, since the cloud provides a single point of entry for all customers<sup>[19, 20]</sup>.

### The five key properties of cloud computing, according to NIST, are

- Self-service on demand: Cloud resources can be accessed or deployed without the need for human intervention. Consumers can get quick access to cloud services after signing up with this strategy.
- Organizations can also set up systems that allow employees, customers, or partners to use internal cloud services on demand based on established logics without

having to go via IT.

- Users with permission can access cloud services and resources from any device and from any networked location.
- Resource pooling: Multiple tenants share cloud provider resources while keeping individual clients' data secret from other clients.
- Rapid elasticity: Unlike on-premise hardware and software, cloud computing resources can be rapidly increased, decreased, or otherwise modified based on the cloud user's changing needs.
- Measured service: Usage of cloud resources is metered so that businesses and other cloud users need only pay for the resources they use in any given billing cycle.

### Risks, Costs, and Ethics in Cloud Computing

Though the cloud offers many benefits, it also comes with its own set of risks, costs, and ethical questions that should be considered. Some of these issues are relevant to all cloud users, while others are more applicable to businesses and organizations that use the cloud to store customers' data:

#### 4. Considerations for all cloud users

- **Security:** Given the use of APIs, cloud-based credentials, and on-demand services, cloud resources may have additional security weaknesses that make it easier for attackers to get unauthorised access. Learn what steps the cloud service provider takes to protect client data from theft and other types of threats, as well as what practises or additional services consumers may use to protect their data.
- **Data loss:** Cloud services, like physically owned or managed devices, might lose stored data permanently due to physical disasters, bugs, unintentional synchronisation, user-generated errors, or other unforeseen issues. When using cloud services, find out what backup services the supplier offers, and keep in mind that these may not be given automatically or for free. You can also choose to do your own backups.
- **Data persistence:** Cloud customers may wish to guarantee that personal data they've given to cloud service providers is deleted at times. However, erasing data from cloud resources and verifying that it has been deleted can be time-consuming, difficult, or even impossible.
- **Costs:** While the cloud can deliver computing resources for a fraction of the cost of owning them, cloud service expenditures can quickly escalate as consumption increases. Check the pricing details when signing up for a cloud service to see how services are metered and whether you may set caps or receive notifications if usage exceeds your preferred limits. It's also worth looking into how billing information is communicated, as some providers' invoicing procedures aren't always clear.
- **Vendor lock-in:** Users of private cloud services may be more vulnerable to vendor lock-in, which occurs when computing processes are organised to fit a closed, proprietary system, making it harder to switch providers. Open-source cloud solutions can assist mitigate this risk by making it easier to shift computing activities from one provider to another thanks to their open standards.
- Cloud service providers may use data to better



understand how their customers use their product, sell or customise adverts, train machine learning algorithms, and even sell consumer data to third parties. If you have any concerns about how your or your organization's data is utilised, make sure to inquire about the service provider's policies.

- Given the influence certain cloud service providers have over global affairs, cloud customers may want to think about the ethics of the organisation they're supporting. Examining a cloud provider's policies on areas like data collecting, hate speech, the environment, and labour may assist a cloud user in selecting one that best reflects their personal beliefs.
- Loss of user control and visibility: Monitoring and analytics solutions can help with some of these technical concerns by keeping cloud users up to date on performance and allowing them to respond when problems arise. Concerns regarding a company's use of personal data can be alleviated by studying its data policies and publicly available analyses of its data practises.

## 5. Additional Business Considerations

**Regulation:** Some industries — such as healthcare, finance, and education — have strict regulations regarding the storage and use of customer data and may prohibit the storage of customer data in public clouds. Cloud users in these industries often need to adopt a hybrid cloud approach and other customized IT solutions in order to comply with regulations regarding customer data. In addition to industry regulations, organizations also need to comply with data protection and privacy laws of the location where their service is accessed. For example, cloud providers serving customers in the European Union must comply with the [General Data Protection Regulation](#) (GDPR).

**Complexity:** Migrating an organization's computing resources to the cloud can be an extremely complex endeavor, requiring in-depth planning, governance structures, and continuous oversight to avoid incompatibilities, data loss, and cost optimization. Though the cloud can help organizations cut costs on computing infrastructure, they will still need IT experts to direct and manage infrastructure.

## 6. Types of Cloud and other possible Questions for future

- **Public Cloud:** The cloud resources that are owned and operated by a third-party cloud service provider are termed as public clouds. It delivers computing resources such as servers, software, and storage over the internet
- **Private Cloud:** The cloud computing resources that are exclusively used inside a single business or organization are termed as a private cloud. A private cloud may physically be located on the company's on-site datacentre or hosted by a third-party service provider.
- **Hybrid Cloud:** It is the combination of public and private clouds, which is bounded together by technology that allows data applications to be shared between them. Hybrid cloud provides flexibility and more deployment options to the business.

## Examples of Cloud Computing

- Dropbox, Facebook, Gmail. Cloud can be used for storage of files.
- Banking, Financial Services. Consumers store financial information to cloud computing serviced providers.
- Health Care.
- Education.
- Government.
- Big data Analytics.
- Communication.
- Business Process.

**Google Drive is a free cloud-based storage service** that enables users to store and access files online. The service syncs stored documents, photos and more across all of the user's devices, including mobile devices, tablets and PCs.

## Multi cloud and hybrid multi cloud

Multi cloud is the use of two or more clouds from two or more different cloud providers. Having a multi cloud environment can be as simple using email SaaS from one vendor and image editing SaaS from another. But when enterprises talk about multi cloud, they're typically talking about using multiple cloud services—including SaaS, PaaS, and IaaS services—from two or more of the leading public cloud providers. In one survey, 85% of organizations reported using multi cloud environments. Hybrid multi cloud is the use of two or more public clouds together with a private cloud environment.

Organizations choose multi cloud to avoid vendor lock-in, to have more services to choose from, and to access to more innovation. But the more clouds you use—each with its own set of management tools, data transmission rates, and security protocols—the more difficult it can be to manage your environment. Multi cloud management platforms provide visibility across multiple provider clouds through a central dashboard, where development teams can see their projects and deployments, operations teams can keep an eye on clusters and nodes, and the cybersecurity staff can monitor for threats.

## Possible Questions for future

### Q.1 Is it possible for cloud computing to go wrong?

Cloud outages exist and will continue to exist. Those outages may occur on a local level as a result of your internet being disrupted by physical means (a digger cutting your broadband) or cyberattacks. However, huge suppliers experience outages as well, and because we're all becoming more reliant on their services, when the cloud goes down, so does work. In this case, few organisations have backup systems to fall back on. Users will likely believe that utilising the cloud is more stable than using home-grown programmes as long as cloud vendors keep outages to a minimum. However, if outages become widespread, this viewpoint may alter.

### Q.2 What does cloud computing have in store for the future?

Cloud computing is approaching the stage where it will likely account for more enterprise IT spending than the decades-old methods of delivering apps and services in-house. According to the argument, moving to the cloud can help firms rethink business processes and expedite business change by breaking down data and organisational silos. This

argument may appeal to certain firms looking to gain traction with their digital transformation programmes; however, as the costs of making the switch mount, enthusiasm for the cloud may wane.

The leading service providers like Salesforce, Google, SUN, Amazon, IBM, Oracle etc. are providing cloud computing services for storage, database, computation and applications. Application services may be any type of services like video, audio, data processing, email, office applications, finance, business process management, marketplace, billing, accounting, email, data sharing, data processing and web services etc. [22, 23, 24]. The Table mention in [21] provides service provider name, type of service they provide, pricing model they follow and cloud business model framework (CBMF) about the leading cloud computing service provider. Fig. mention in [21] depicts the benefits of cloud computing.

#### You can run all kinds of apps in the cloud

- Create and collaborate on documents and spreadsheets with Google Apps for Business.
- Video conference with your colleagues on Skype.
- Manage your Sales & Customer Service functions, alongside other key business processes on the Salesforce Platform.

#### Q.3 Is the cloud secure?

Cloud security and privacy are vital in the digital world, especially because data is no longer housed in files and physically archived in a building. Hundreds of millions of new records are created and stored in the cloud every day. Special attention should be paid to the cloud provider's security standards, which include methods to secure data transfer and storage, as well as the physical security of the cloud provider's data centre to regulate your own employees' access rights. Salesforce understands that the security, integrity, and availability of our customers' data are vital to their business processes as well as our own. We safeguard the most essential data with our layered approach to cloud security, in which we continuously analyse and optimise our application, systems, and processes to meet the increasing demands and safety needs. If you're looking for a good cloud service provider, search for these characteristics.

- Companies with over 25,000 employees use an average of 545 cloud apps or services.
- As of March 2016, there were on average 1.09 billion daily active users on Facebook worldwide.
- Over half of all Internet users rely on cloud-based email services like Gmail and Yahoo! Mail to send and receive their messages.

Cloud computing services include the following main qualities from the standpoint of service users:

- You must pay to utilise the facility. Users of the service only pay for the services they use. When compared to the typical method of building on-site IT capacities targeted for highest usage situations and then having that capacity go unused for the most of the time, this can result in significant cost savings.
- Scalability that is nearly unlimited. Cloud computing service providers usually have the infrastructure in place to deliver their services on a large scale. This means that cloud service consumers can readily accommodate business expansion or periodic spikes in

service consumption.

- The supplier hosts and maintains the site. In their own facility, the cloud hosting provider acquires, hosts, and maintains the necessary hardware and software. Users avoid the construction expenditures and maintenance problems that would be incurred if the service was established on-premise.
- Self-service using a web-based interface. Through a web interface, service users can initiate certain service functions as well as increase or reduce their service consumption level with little or no intervention from the service provider.

#### 7. Conclusion

The advantages of e-learning system integration in the cloud are increased flexibility and scalability, the ability to access complicated applications, and the ability to store data in the cloud at a low cost. However, there are significant drawbacks that must be addressed before e-learning may be fully integrated into colleges. The use of a platform that satisfies the scalable and cost control requirements is required to optimise resource requirements, storage, management, and communication. Infrastructure scalability is a problem in today's e-learning systems. Many resources can be employed and allocated solely for specific activities; for example, when a big volume of work is required, new resources and their configuration are required, making cost management and resource allocation very expensive.

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