Cloud Computing: Opportunities and Challenges

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Abstract

Cloud computing is a shared resource pool with hardware, software and networks. The shared resources are maintained by the third-party Cloud Service Provider (CSP). Cloud service providers provide services according to the requirements of cloud users on-demand. Cloud users have to pay for what they have used in cloud environment. This paper describes the cloud and its opportunities and challenges in various fields like Education, Health care and Entrepreneurs.

Keywords: Cloud Computing, Cloud Services, Cloud Opportunities

1. Introduction

Cloud computing is one of the current which grows very fast all around the world. Cloud computing is a construct which allows accessing applications which are stored in the remote locations. In other word, cloud computing is distance data center. It is the internet-based enabler for sharing of technological Infrastructural resources, software and digital content and it offers the Infrastructure, Platforms, and Software on pay-for-use basis [1]. The stored information and shared resources can be accessed any time anywhere in the world through the internet. Cloud computing provides various facilities for the users like scalability, special computational mean and reducing workload and reducing capital expensive. Though there are many advantages in cloud, some challenges are also there.

2. Cloud Services

- Software as a Service (SaaS)
- Platform as a Service (PaaS).
- Infrastructure as a Service (IaaS)or (HaaS – Hardware as a Service)

2.1 Software as a Service (SaaS)

Software as a Service (SaaS) is a way of delivering applications over the Internet as a service. Instead of installing and maintaining software, simply it can be accessed via the Internet. It is free from complex software and hardware management. Software as a service (SaaS) is a software distribution model in

which a third-party provider hosts application and makes them available to customers over the Internet [2].

2.2 Platform as a Service (PaaS)

The development tools are hosted in the cloud and accessed through a browser. With PaaS, developers can develop web applications without installing any tools or software on their systems, and then deploy those applications without any specialized administrative skills. The user does not require managing or controlling the underlying infrastructure, but has control over deployed applications [2].

2.3 Infrastructure as a Service (IaaS)

The cloud user outsources the equipment used to support operations, including storage, hardware, servers and networking components. The provider owns the equipment and is responsible for housing, running and maintaining it. The user typically pays on a per-use basis. The user does not require managing or controlling the underlying Cloud infrastructure, but has the control over operating systems, applications and programming frameworks [2].

3. Opportunities in Cloud

3.1 Cloud Opportunities in Education

Education plays an important role in maintaining the economic growth of a country. Nowadays the class room teaching is changing and students are becoming more technology oriented. Therefore, in this changing environment, it is important to incorporate latest technologies in the teaching and learning process.

The cloud helps the students, teachers, faculty, parents, and staff to have on-demand access to critical information using any device from anywhere. Both public and private institutions can use the cloud to deliver better services, even as they work with fewer resources.

Cloud computing technology can provide solutions for the problems in smart education system. Cloud computing enables users to control and access data via the Internet. The primary users of a typical higher education cloud include students, faculty, administrative staff, Examination Branch and Admission Branch as shown in Figure 1. All the primary users of the institution are connected to the cloud. Separate login is provided for all the users for their respective works. Teachers can upload their class Tutorials, assignments, and tests on the cloud server which students will be able to access all the teaching materials cab be provided by the teachers via Internet using computers and other electronic devices both at home and college and 24/7. The education system will make it possible for teachers to identify problem areas in which students tend to make mistakes, by analyzing students' study records. In doing so, it will also allow teachers to improve teaching materials and methods. This will not only make it

possible for students to use online teaching materials during class hours but also at home [7].
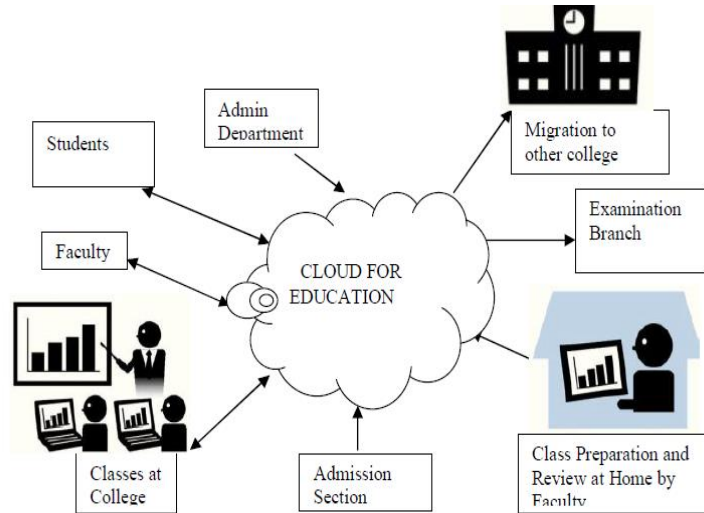
Fig 1: Smart Education System

Utilization of cloud computing systems will reduce the cost of operation because servers and learning materials are shared with other colleges. Figure 2 shows how the different categories of university users may consume cloud services.
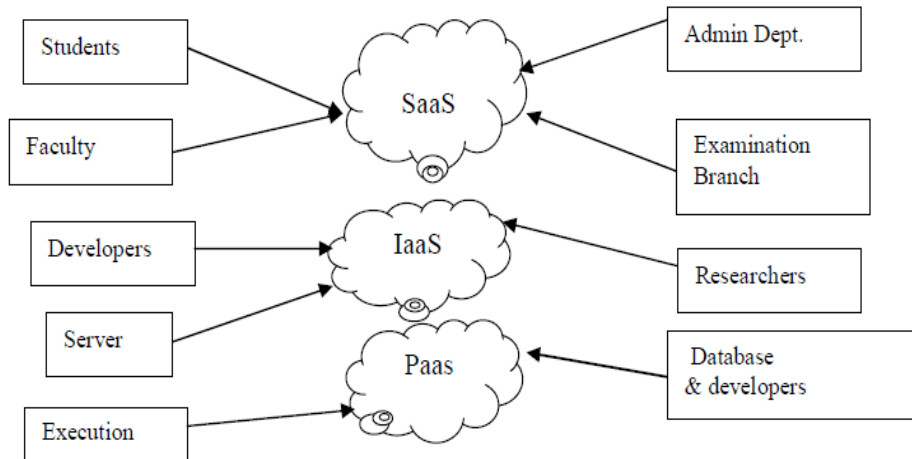
Fig 2: Users of an Education Cloud Computing System

3.1.1 Challenges

Security and Privacy:

This is a major concern among many institutions of higher learning to adopt cloud computing. Cloud computing calls for the introduction of a third party who is the platform providers. Hence, the privacy and security of data is hard to maintain.

Benefits

Most institutions of higher education are not yet convinced of the benefits that come with cloud computing. Such institutions are more concerned with their conventional IT portfolio and how to make cloud computing part of it. Students can learn at any time as they wish. If any class is missed, they can go through the class again which is stored in the cloud.

Service Quality

This is one of the reasons cited by learning institutions for not shifting to cloud computing. Institutions argue that the SLAs stipulated by the providers of cloud services are insufficient when it comes to availability and security as well as scalability.

Lack of adequate network responsiveness

In case inadequate bandwidth of the network, it becomes impossible to deliver complex services. Most of the learning institutions lack adequate bandwidth, hence cannot adopt cloud computing affectively.

Integration

Different applications require complex integration as to connect to the available on-premise applications, as well as cloud applications. This calls for the integration of existing university data structures and systems with cloud applications. Thus, there is a need to have a quick, cost effective and simple way to connect university systems with cloud applications.

3.2 Opportunities for Entrepreneurs

Several corporations are hoisting their computer networks into the "clouds". Cloud Computing is an emerging IT development, deployment and delivery model that enables real-time delivery of products, services and solutions over the Internet. With cloud computing and associated cloud services coming in a myriad of forms like software-as-a-service, storage on demand, internal and external clouds, etc. Large corporations across multiple industries are now discovering their ability to utilize cloud services to achieve cost-savings, expand their businesses, and even decrease their carbon footprints [7].

3.2.1 Challenges

Cloud computing, which some people claimed as a new technology, has helped a lot of organizations in doing business. Although cloud computing brings some benefits to the organizations as aforementioned, there are some shortcomings for

decision makers that need to be taken into consideration. When cloud capacity is more than 80% occupied, the computers will be irresponsible. There is a chance of crashing between servers and computers. This will lead to the loss of valuable data such as customers' data, organizations' sales report etc. Cloud attack is also a major issue in cloud computing. Cloud computing is a place for the users to host their web services such as web hosting and cloud storage. This has attracted the hackers to steal the business data, such as daily sales, profit reports, financial reports etc.

3.3 Opportunities for Health Care

Health care, as with any other service operation, requires continuous and systematic innovation in order to remain cost effective, efficient and timely, and to provide high-quality services. Many managers and experts believe that cloud computing can improve health care by reducing electronic health record startup expenses, such as hardware, software, networking, personnel, and licensing fees, and therefore will encourage its adoption. One example of a cloud-based healthcare service is a proposed system that automates the process of collecting patients' vital data via a network of sensors connected to legacy medical devices, and to deliver the data to a medical center's "cloud" for storage, processing and distribution. However, there are many challenges facing health-care providers in moving all their data to the cloud.
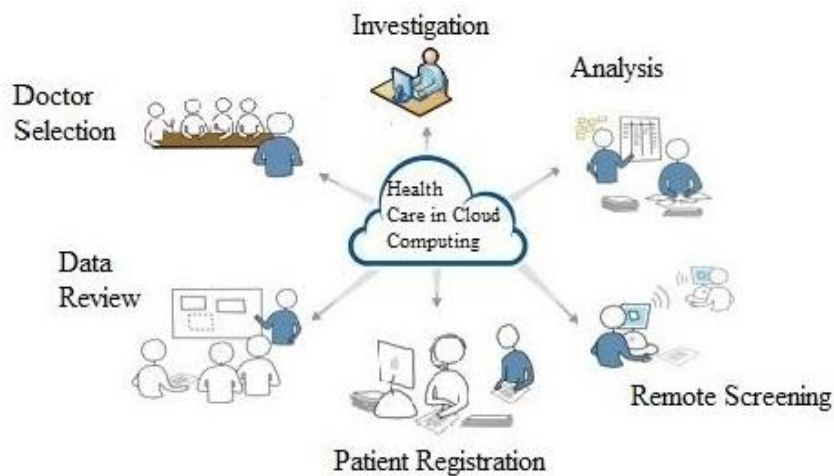
Fig. 3: Smart Health Care System

A typical smart health care system is depicted in Fig. 3. According to this system, the patients' can register their details through online and their information will be stored in the cloud. After selecting the trustable doctor, the patients can go for the diagnosis phase. The doctors can analyze the patients' history by retrieving the

previous information about patients from cloud and also analyze the history with the present condition. After that doctors will give prescription via online and the treatment will be started. The patients and doctors can also interact via online for the review. The health care analysis about the patients can be done via cloud.

3.3.1 Challenges

The biggest issue in Health care industry is security and privacy of information. For example, if medical data is stored on the cloud, then health-care services no longer have complete control over the security of their patients' information. There are some risk factors related to the privacy which increase the possibility of the data being exposed or lost. Additionally, there are different regulations that can vary from region to region regarding patient information, making compliance with these various regulations potentially complicated. And, if there are online server outages, availability of the data is severed during that time [8].

4. Conclusion

Cloud technology mitigates the need to invest in IT infrastructure, by providing access to hardware, computing resources, applications and services on a per use model, which dramatically brings down the cost and simplifies the adoption of technology. Cloud provides many opportunities for business, education, and healthcare but will need to have the highest level of security in order to gain acceptance from the people or marketplace. In this paper the opportunities and challenges in clouding computing in various fields are discussed.

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