Using Cloud computing Technology to Improve Education System

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Abstract-**In today scenario, Cloud Computing is very popular topic for innovation and research in the area of Information Technology (IT). Using Cloud computing we can perform many lengthy and tiring works in some easy way. It is an excellent alternative for educational institutions which are especially under budget shortage in order to operate their information systems effectively without spending any more capital for the computers and network devices. Universities take advantage of available cloud-based applications offered by service providers and enable their own users/students to perform business and academic tasks. The Cloud Computing can be implemented in many fields but this paper emphasizes in the use and implementation of cloud computing in the field of Education. Here we will review what the cloud computing infrastructure will provide in the educational arena, especially in the universities where the use of computers are more intensive and what can be done to increase the benefits of common applications for students and teachers**

Keywords: Clouding computing, Iaas, Saas, PaaS, Teleclass, LVS

I. INTRODUCTION

In recent years, many educational institutes, universities and industries are giving their full cooperation to transform the society and entire world into the high tech world. In this high tech world, if any student misses some lectures due to some unavoidable reasons then they can learn that lessons through internet if that lecture is recorded and uploaded in internet. Similarly, if teachers want to share some important lessons with all the students then they can record and upload the lecture in internet and students can learn from without attending the class room. Using cloud computing all the records related to students, teachers, course materials, infrastructures etc can be stored in the internet and any person may be students, parents of students, teachers and any other authorities can access and see or use that details as their requirements[1].

Teachers can upload the attendance of the class and parents of students as well can see the attendance of their ward just after the completion of class. If parents found that their ward is absent with any nonsense reason then they can control their wards. Similarly all the concerned persons can know the timing of any lecture in advance and they can plan their future accordingly. Examination result of students can be uploaded in internet and any concern person can check from anywhere anytime without much difficulty.

Finally we can say that there are so many uses and advantages of cloud computing in the field of education. So before getting deeply we should first understand the term Cloud Computing.

II. ABOUT CLOUD COMPUTING

Cloud Computing is a technology which provides us a facility to use and download many application from the server using internet. Basically cloud computing technology is consisting of three main components [2]

a) Cloud Computing Service Providing Company
b) High Capacity Server Machine(Storage) and Internet
c) Users

Figure 1: Cloud Computing in Education

Small concept of Cloud Computing in education is shown in Figure-1. The cloud computing service provider companies develops some useful applications and uploads it in the internet. They store these applications in high capacity server machine then advertise these applications to reach to the end users. End users use; download these applications as their requirements. The end users' needs only internet connection, they login in the server and can use. End users don't need to have high capacity machine and don't need to worry about security of information because such problems are handled by service providing companies. Here in this paper the end users are **Students and Educators**.

Works in Cloud Computing can be organized in the form of different types of services. These are some services offered by cloud computing [3]:

a) **Infrastructure as a Service (IaaS):** Hardware resources such as storage, high speed processor and large capacity memory are offered as infrastructure services by cloud.

b) **Software as a Service (SaaS):** Software applications are offered as services in internet. User can download and use that software. Users don't need to purchase software packages from third party dealer in high cost. Very good example is Google web-based applications word processor and spreadsheet.

c) **Platform as a Service (PaaS):** Here the cloud offers the application development environment or platform for entire development (lifecycle) of any software. In other words, design, implementation, debugging, testing, deployment, operation and maintenance are required steps for software development and cloud computing provides all facilities to perform all the above steps.

III. TYPES OF CLOUD

There are basically four types of cloud and mentioned in Figure-2. Details of different clouds are elaborated as follows: [2] [3]

a) **Private Cloud**
In private cloud any single organization including many consumers can be users as business units. Private cloud can be owned, managed and operated by the same organization, by third party or by both of them.

b) **Public Cloud**

In public cloud service provider makes available all the resources like application, storage and etc.. Some such services are free and some may be paid services like Google.
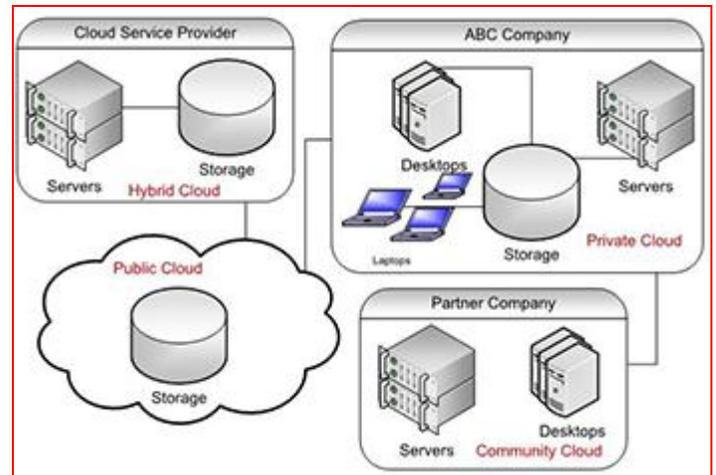

Figure 2: Types of Cloud Computing

c) **Community Cloud**
When some resources of the cloud are shared by more than one organization and communities to fulfill some common purposes like security and cost cutting, then such cloud is called community cloud. This cloud can be managed by any one of the participating organization or by any third party.

d) **Hybrid Cloud**
If the cloud is composition of two or more above clouds then it called hybrid cloud. Even it is composition of many clouds but it remains unique entity and all clouds are bound together and offer the benefits of many clouds.

IV. TELECLASS and E-LEARNING

Teleclass or E-Learning means the students do not need to sit in class at class time. They can learn the lecture from anywhere using Internet. Technically we can say that teleclass is the process where student can use way of multimedia to learn. It requires Internet connection, audio and video systems in both ends for proper and healthy bi-communication between educator and students [3] as shown in Figure-3.

Figure 3: Students using Teleclass

Sometimes E-Learning refers to electronic learning where students can learn the concept of lectures using electronic media like audio, video, CD, DVD, images and etc. First that lecture was saved or stored in storing media and can be handed over to the students. Students can take and carry these electronic media anywhere and can learn anytime they feel comfortable. But in the e-learning also the students don't need to sit in the class physically. As something shown in Figure 4 where person is seating outside a class and studying from electronic media.

Figure 4: Students using E-Class

V. DEVELOPING CLOUD COMPUTING STRATEGY

We need well defined strategy that supports cloud computing capabilities to shift towards clouds. If we want to represent an important part of organization strategy shifting must be associated to this. The success of the strategy implementation depends on the existence of a service-oriented architecture at the level of the institution that offers the necessary infrastructure for cloud implementation. In the absence of business process management shifting towards cloud has no sense from the financial point of view because it increases the cost with reengineering of existent systems [4]. Also to have success the strategy of clouds must be associated with the strategy of various institutions. Now starting from recent cloud computing researches and from experience of different institutions, we suggest that shifting to cloud computing contains the following phases shown in Figure 5:

a) Obtaining the knowledge base about Cloud Computing;

b) Evaluating the current stage of the various institutions from the view points of the IT needs,

c) structure and usage;

d) Experimenting with the Cloud Computing solutions;

e) Selecting the Cloud Computing solution;

f) Implementation and management of the Cloud Computing solutions.
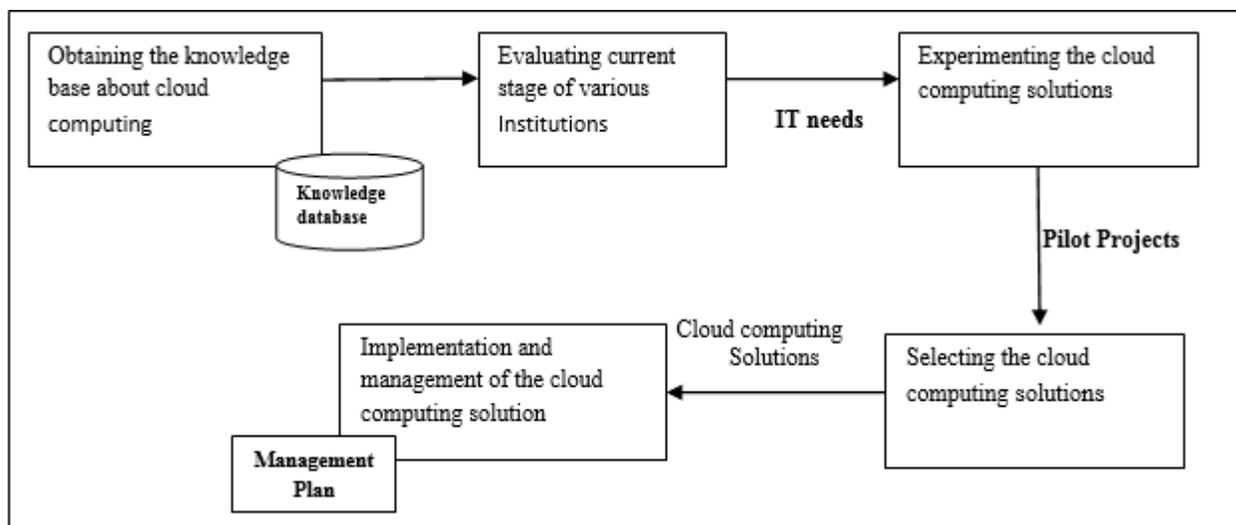
Figure 5: Cloud computing strategy in education

a) **Obtaining the knowledge base about cloud computing:** The very first step used in obtaining the knowledge base by participating at seminaries, conferences, discussions with the suppliers and consulting the most recent researches in the field. The success of this step depends on the allocation of sufficient resources for research, for understanding how Cloud Computing functions in different organizational structures from universities and between institutions, the benefits and risks, policies and the best usage practices of Cloud Computing. The research is conducted by a team formed mainly of IT staff who permanently communicates with the users of the solution regarding the objectives, the progress, costs and benefits of the Cloud Computing solution.

b) **Evaluating the current stage of the various institutions from the view points of the IT needs, structure and usage:** This step consists in understanding the various institutions IT infrastructure. The service oriented architecture represents the base for understanding the data, services, processes and applications that may be migrated or need to be maintained within the various institutions, so as to observe the security policy. With respect to the IT

needs, their structure and usage, the analysis may start from the categories of users who interact with the present IT infrastructure and their necessities. The Cloud Computing solution will allow to all categories of users access to stored files, e-mail, database and other applications from anywhere at request which leads to a more efficient use of information. This represents a transition from remote services offered to users in the traditional version to assuring some "self-service" systems, which is beneficial in the Cloud Computing perspective. The objective is to identify the emergent technologies, efficient from the point of view of costs that satisfy the necessities of the students and institution staff. The hardware and software needs shall then be analyzed from the perspective of the three cloud models (Figure 6). Students can take benefits from clouds by working and communicating in the educational environment without considering space and time. Teachers can be benefited by preparing their lesson plans, attending conferences, presenting articles etc. Researchers can be benefited by experimenting results and using latest technologies without paying much.
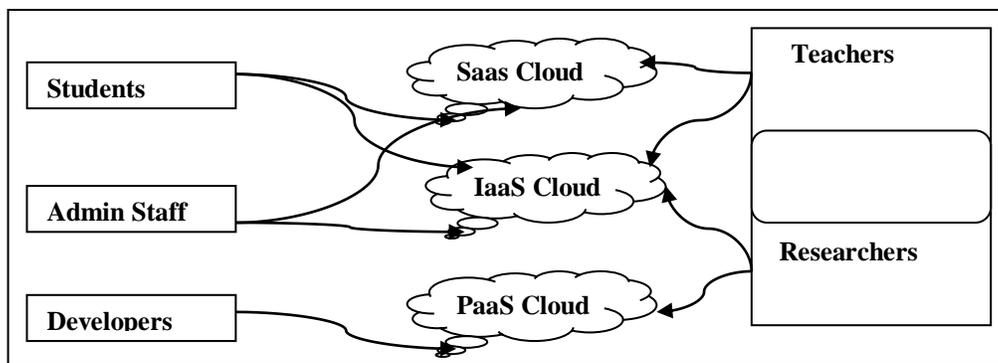
Figure 6: Different categories of users using the services of cloud computing in education

c) **Experimenting with the Cloud computing solutions**: Shifting to cloud cannot be achieved at sudden but gradually, beginning from testing a pilot project in cloud and then externalizing the applications chosen for cloud. This step consists of settling some cloud targets, such as development and environment testing or storing some data inside the cloud and then daily processing of the internal operations. This will address at the same time the components of public and private cloud in order to assure the security and protection policies [5]. The maintenance of low costs for using the solution must be permanently taken into account.

d) **Selecting the Cloud Computing solution:** This step consists of identifying the data and applications, functions and main processes within the institutions. They may be grouped according to teaching, research and administrative support. It also consists of choosing the Cloud model (private, public, community, and hybrid) for each of the functions, processes and applications identified. The mission and importance of business practices [6] are the main identification criteria of the candidate applications to cloud. Considering the fact that most organizations use hybrid patterns of Cloud, maintaining key elements from their infrastructure in house, under direct control and externalizing less sensitive components, a strategic analysis must be conducted in order to choose the implementation solution regarding the decisions of integration/migration.

e) **Implementation and management of the Cloud computing solution:** The implementation of the cloud computing solution can be done in iterative phases when the different operations on the cloud are hosted internally. It also includes testing the solution performance and management implementation. The shifting of the data, services and processes towards the cloud platform must be done based on some well-defined models or strategies. According to the organization policy

and information security [7] each shifting model considers specific objectives to be achieved. Shifting of data must be performed by keeping an optimum balance between the data accuracy, migration speed, nonfunctioning time and minimum costs. At the organization level there must be a management model that includes policies regarding security, management of the applications and infrastructure, management of the risks and the continuous evaluation of the Cloud Computing solution. An efficient management is essential for any program of quality management. It supports the proactive assurance of quality by measuring and improving processes, procedures and services performed.

VI. ADVANTAGES OF CLOUD COMPUTING IN EDUCATION

Cloud computing provides a number of advantages to overcome the challenges associated with traditional IT infrastructure, such as the setup of reliable and accessible networks, servers, storage, applications, and services. According to some researchers [8][9][10] here are some important advantages of cloud computing, which includes flexible and scalable infrastructure, reduction in implementation and maintenance cost, IT department transformation, increased mobility for a global workforce and quick time to market etc. For example, The Silicon Valley Education Foundation has implemented an application named Lesseonpoly into the cloud computing for lesson planning using Amazon Web Services. In its original form Lessonopoly had been installed on a single server. This may cause some risk because a hardware failure could result in system unavailability until repairs were made. In this case the softwares's migration to the cloud was highly successful, and resulted in increased flexibility,

better robustness, and reduced costs [11]. Given below are explanations for some of the advantages:

a) **Reduction in Cost:** In fact the most important advantages associated with cloud computing is the reduction in Cost. Westmont College reports that after deploying six cloud-centric service platforms, it has achieved a number of benefits such as 65% reduction in cost up front (over more traditional deployments), and a 55% of cost reduction over the useful lifetime of the solutions. Beyond the reduction of costs, the college reports a significant decrease in the amount of IT management time required [12] as well as a significant increase in user satisfaction.

b) **Increased flexibility and scalability:** Many distance-learning programs offer live video streaming (LVS) courses to online students [13]. However due to hardware constraints, the LVS courses are only offered to a limited number of students (e.g 500 to 1000 concurrent LVS students). But if the concurrent LVS student's numbers increases to double or triple (e.g., to 2000 or 3000 concurrent LVS students) the existing hardware will not be able to maintain its performance. In addition, if a staff member develops an innovative idea and requests a computing-intensive application that needs multiple servers to support it for a temporary period, then that request can be turned down due to limited budget. Now with the use of cloud computing, administrators need not be concerned about over provisioning for a service whose popularity does not meet their predicted needs (and thus wasting costly resources), or under-provisioning for one that becomes wildly popular [14].

c) **Low setup and maintenance cost:** In today's modern era many new technologies and applications are continually being invented and they make it harder for distance learning IT staffs to install, configure, secure, and upgrade to the latest technologies. So large portion of time is spent by the distance learning staff to setup and the maintenance of technology during their workday. The adoption of cloud computing will move the burden of technology setup and maintenance to the cloud service providers.

d) **Reallocation of resources:** With the advancement in the cloud computing leads to burden to cloud service providers in the technology setup and maintenance. So campus distance learning IT staffs can focus on developing innovative instructional solutions/resources and on providing more support to faculty and students. There are various areas where more intensive help from the digital lab IT staff can be beneficial to the faculty. First, as instructors move toward more online and mobile instruction in their courses, IT staffs can help them to optimize the use of the available systems to increase both the effectiveness and the efficiency of the instructional process. Second, as online instruction strives to become more personal through the extensive use of online conferencing tools (e.g. Blackboard Collaborate, Webex), instructors can benefit from more intensive initial support with the technical aspects of integrating these tools into their teaching activities. Third, IT staffs can help faculty to improve their technical skills in using various Web 2.0 tools (such as blogs or wikis) and can therefore help them to effectively integrate these collaborative tools in their courses in order to improve their students' learning experiences and performance [15].

VII. PROBLEMS IN IMPLEMENTATION OF CLOUD IN EDUCATION

Some of the major problems that may be faced while implementing cloud computing in education are:

a) **Control**: Head of institutions naturally want to determine how and where elements of the cloud computing system are deployed and used. It raises questions of ownership and accountability within Institutions groups, across the organization and extending to service providers and other vendors.

b) **Ownership:** When clouds are arranged in a new way, there are questions about who should manage which resources and who should pay for services that are shared. Data governance becomes an issue in cloud deployments when data is stored in locations outside institutional and territorial boundaries

c) **Interoperability:** A traditional reliance on separate system infrastructures makes cloud

technology an unfamiliar option in the public sphere. At the same time, the cloud model must be integrated with legacy solutions

d) **Standards:** Because cloud technology is relatively new, industry standards and best practices are still being developed.

e) **Security:** Organizations must keep systems safe from intrusions, and they need to safeguard information, privacy, and, in the case of research institutions and universities, intellectual property.

f) **Portability:** While accepting a cloud approach should not lock the organization into applications, equipment, or services from a narrow spectrum of vendors and providers.

VIII.   CONCLUSION

Cloud computing as an exciting development is a significant alternative today's educational perspective. Students and administrative personnel have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand. So today's present economic situation demands the different organizations to adopt this cloud computing solutions. Different Institutions have begun to use this approach and there are proofs that show significant decrease in expenses due to the implementation of cloud computing solutions. There are of course some disadvantages too. The purpose of this work is to identify the importance of using Cloud computing within higher education. Here we have considered the merits and demerits of cloud computing architecture and proposed a cloud adoption strategy for different institutions. A rigorous analysis of the different data that is collected from the various institutions shows that they are adopting this cloud model that will cater their special requirement of higher education and the available solutions of clouds as well.

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