Cloud Computing-A Smart Way of Today's Education

Shweta Kaushik

Abstract— For a country's economic growth, education plays an important role. In its varying situation, there is a need of new technology to integrate with the education system. Cloud plays a significant role in today's education. It provides the various prospects to the student as well as teacher to easy and very fast access to number of applications, platforms and resources on demand through the web. The idea behind cloud is to reduce the cost for the development, installation and its maintenance of new hardware or software. This paper emphasize on the use of cloud for the development of e-learning solution and settlement of its solution for education. The proposed system for e-learning consists some features which are necessary for developing any cloud based e-leaning solution as- a cloud platform to deliver all the education based services, an authorizing features to deliver service as per the authorization of users, an interactive tool which deliver the services to user in a simple and efficient way, secure system which provide the data encryption, identification and authorization system to deliver a sound and secure system.

Index Terms— Cloud computing, e-learning, Education system, IaaS, PaaS, Public Cloud, Private Cloud, SaaS

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1 INTRODUCTION

Nowadays almost all parents are sending their children to join schools and colleges, and use the various services provided by the government to promote education. These services attract a large number of students to reach the schools and colleges, but due to non availability of good teachers, latest books and labs facilities discourage them to go on with their education. One of the reason behind this is be deficient in infra-structure, its maintenance and another concern as to obtain and maintain a large number of hardware and software, investing continue on them and ability to handle them properly.

Since last many years, the involvement of Internet is regular-ly changing from a simple web page reading to use online soft-ware application. Education is becoming necessary and its re-quirement is frequently increasing which require the need of e-learning solution. This e-learning system require to move with the same velocity as technology, and here the new trend is to choose cloud computing.

Cloud computing is one of the emerging technique in the education field because of its features which provide securable, sharable, reliable and economical services for education service. It can provide the solution for education, as required resources can be placed anywhere, which can be share by anyone. Using this, we can make a federal system from where the entire user can make sure any aspect and continue updating, it if it is re-quired. Apart from this, user can also verify that excellence edu-cation is provided, uploaded material is up to date, student at-tendance status, performance in class, and marks obtained etc. are possible at one end only. It will ensure that everyone has on demand access to the information, resources from anywhere which make e-learning easy, efficient, reachable and beneficial

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• *Shweta Kaushik is currently pursuing Ph.D. in Cloud Data Security in Jaypee University, India, PH-7838276666. E-mail: shwe-takaushik10@gmail.com*

to all.

2 CLOUD COMPUTING

This technology is based on internet concept, which allows the user to share resources, hardware, information and services on user demand at their network without installed in end user system. The user has right to use its personal data at any sys-tem, from anywhere, at any anytime during internet network access on the pay per demand basis. Cloud computing is an expansion of the thought of distributed computing – where a program can be run on many systems which are connected to a network. According to US National Institute of Standards and Technology: "Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction." [1]. A lot of systems are connected jointly in public or private network to supply dif-ferent IT Services. This technology also provide resourceful computing as it utilize the centralize storage, memory, central remote servers to retain data and applications throughout its three service. They are –

1. Infrastructure as a service (IaaS)– In cloud, it is on-demand data centers from where user can lease com-puting resources such as processors and storage, and make use of them to run their own application and op-erating systems. You are supposed to pay for only what capacity of the service you used but you're de-pendable on monitoring, managing your on-demand infrastructure. Example:- Amazon web services.

2. Platform as a Service (PaaS)– In cloud, it is an operating environment in which user can build up new applica-tions or services in the cloud that does not require spe-cific platform to run, and can be widely accessible to users through the Internet. It can also be consider as a bundle of product and software development tools at the provider's infrastructure. Example:- Microsoft's Azure Services Platform (Microsoft, 2012), Google

Apps Engine.

3. Software as a Service (SaaS)– It is also stated as Application Cloud, which allows user to access all required application on demand anytime anywhere. Here the provider provides the hardware infrastructure, software service and relate to the user with a front-end gateway. Example:- Google Apps and Microsoft-Live@edu.

Cloud also provides different deployment model for resource utilization, their security, accessibility, and customization capabilities as:-

1. Private Cloud- This type of model stays within the borders of the organization. The services provided by this model are utilized within the organization itself. The main advantage of this is security of data, and also organization has full power over the data. Example:- Nimbula, Eucalyptus System.

2. Public Cloud- This type of model is open to all and used by any user without any restriction. It is most cost effective deployment model as it gives user the flexibility to acquire only the computing resources they need and provide all services with consistent security, resiliency, availability, and manageability. Example:- Amazon Web Services, EC2.

3. Community Cloud- This type of model is jointly shared by organizations with similar requirements such as security, agreement, or authority considerations. It may be treated as a generalization of a private cloud. By eliminate the replica of similar systems requirement, provider can save money and assign their rare resources more proficiently.

4. Hybrid Cloud- This type of model provide the required processes by combining the services of different cloud systems, e.g. private and public cloud services. These models are complex and require careful preparation to execute and manage .It is a good option for a business because it provide for an easily scalable source of data storage and access to application [2].

Some important characteristics of cloud system are as:

1. On-demand self service- User can access the required resources according to their need without any contact to service providers.

2. Broad network access- Services are available on the internet and can be acquired easily through network connection and supported by any device which may be your personal computer, mobile phones laptop etc.

3. Resource pooling- Resources provide by the provider are shared by multiple customers by multi-tenant model, where resources are assigned dynamically based on the user demand.

4. Rapid elasticity- Resources are provided according to how much user requirement and at a particular time and pay for only how much service used.

5. Integrated- Cloud acts as a central repository to provide resource sharing among various providers, user etc. See figure 1.

3 OUR CONTRIBUTION

In this paper, we proposed cloud system for e-learning education purpose. Main users that use the three cloud service model in the e-learning system are faculty, student, admin department, and library. These four main users can be provided with the various service model of cloud. For example in the project preparation Faculty and students require Google documents which comes under the Paas model. They are also requiring word processor, other software, and network facility to complete their project which comes under the Saas. In the same way, library and admin department require excel sheet for maintain the record, a database to store the information about everyone to process their task smoothly which comes under Saas model. There is also requirement for various tools for managing the record of enrolled student, which comes under the Paas model, and supposed to use storage to run their own application, which comes under Iaas model. Relationship of these service models to the various users is shown in the figure 2.
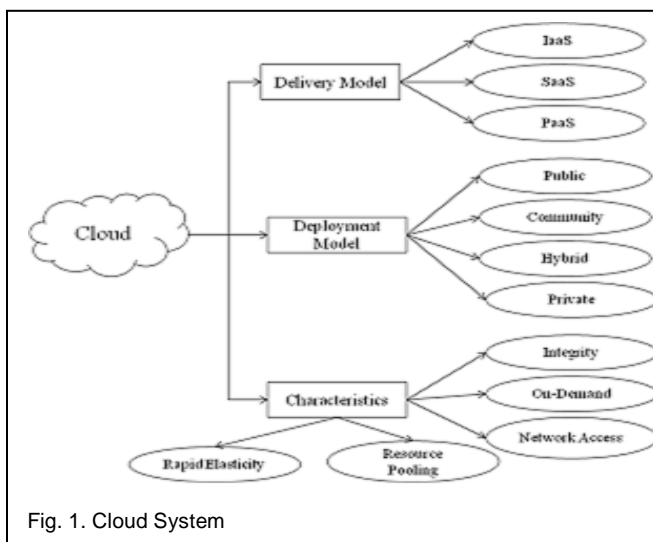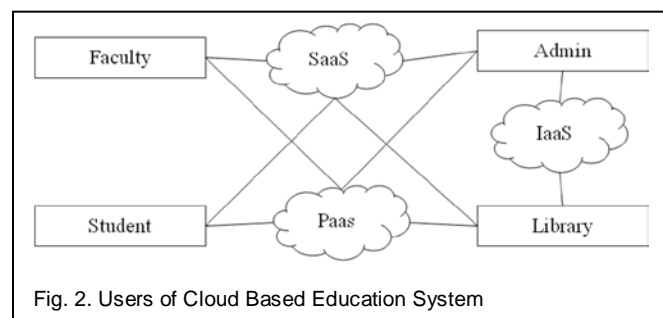

Fig. 1. Cloud System

Fig. 2. Users of Cloud Based Education System

4 CLOUD BASED EDUCATION SYSTEM

As the adoption of cloud computing increases, many academic institutions are introducing cloud computing technologies into their education systems, promising and delivering more scalable and reliable education services. Many universities have acknowledged the potential benefits of leveraging cloud computing for economic reasons, as well as for more advanced

teaching and data sharing [22]. A number of studies were conducted to investigate the benefits of using cloud computing for e-learning systems [8 - 10] and to suggest solutions for cloud computing-based e-learning systems [6, 10, 11]. Pocatilu et al., [9] presented cloud computing advantages for e-learning as being low cost with higher data security, virtualization, centralized data storage, and the possibility of monitoring data access. They also specified cloud computing benefits for e-learning in terms of the characteristics of the three cloud service models: infrastructure (e-learning systems can be run on the provider's infrastructure), platform (e-learning systems can be implemented based on the provider's development interface), and service (e-learning systems can use provider-developed solutions). Bora and Ahmed [10] examined the benefits of adopting cloud computing for e-learning and found it is low cost, offers improved performance, provides instant software updates and improved document format compatibility and data security. Additionally, it provided many benefits for students and teachers, such as online courses, exams, assignments, projects, feedback, forums, and e-learning content and resource management.

The University of California (UC) at Berkeley is operating its courses on a cloud supported by Amazon Web Services, based on the SaaS service model [7]. The University of Washington is adopting cloud computing to provide state-of-the-art productivity and collaboration tools to staff and students, supported by Microsoft (Windows Live including Email and Calendaring, Messenger, SkyDrive, Spaces, and Photos) and Google (Google Apps including Google Email, Calendar, Docs, Sites, and Talk) [23]. The University of Texas at Austin and the North Carolina State University achieved a substantial decrease in IT-related expenditures [24]. Universities are leveraging cloud computing for economic reasons as well as for more advanced teaching, instruction, and data sharing.

Several companies including are accelerating delivery of cloud-based education systems to educational institutes as a way of generating future business, and several learning management systems are also now supporting cloud-based educational services [8]. Although much work has been done to date with regard to adopting cloud computing for educational systems, further studies need to be conducted to develop more diverse forms of cloud-based education systems, in more innovative and efficient ways. Meanwhile, most of the current cloud-based education systems are concentrating on delivering and sharing learning materials and teaching activities, rather than constructing and supporting an integrated, total cloud-based educational environment.

5 PROPOSED E-LEARNING SYSTEM

In the proposed system each individual user acts as a data owner, which provides various services to the cloud service provider from its resources. Any educational institute can acquire the required resources from these service providers on the basis of their requirement and budget available with them. A local server is associated with each institute which controls everything, from every request to the cloud service provider to each system for that institute. A user can request their desired resources and (or) services from these server to cloud

after verification. The server collects the required resources and provide to the user for use. See figure 3. In addition there are some providers who have the agreement with the cloud system and offers different services to the user [3].

Fig. 3. Proposed System Architecture
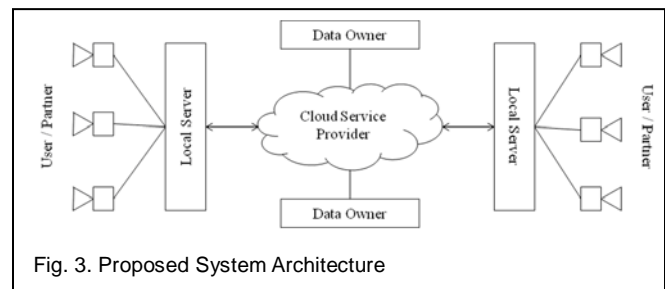
5.1 User Request Process

In the proposed system each user communicates with local server for receiving required resources and services from cloud. The process is depicted in figure 4. The steps of the process are summarizing below.

1. User sent its request to local server with necessary identification information about him i.e. User id and password.
2. Local server verifies the user by its authenticating module and then sends a form with appropriate information according to the tag of user.
3. User provides required service specifications to local server.
4. Local server verifies the current available resources, data security, pricing policy etc. for the user request according to its specification and send the detail back to user.
5. If the user satisfies with this detail it sends an acknowledgement to the local server.
6. The local server served the user request as early as resources are available to it's from cloud.

Fig. 4. Communication Steps
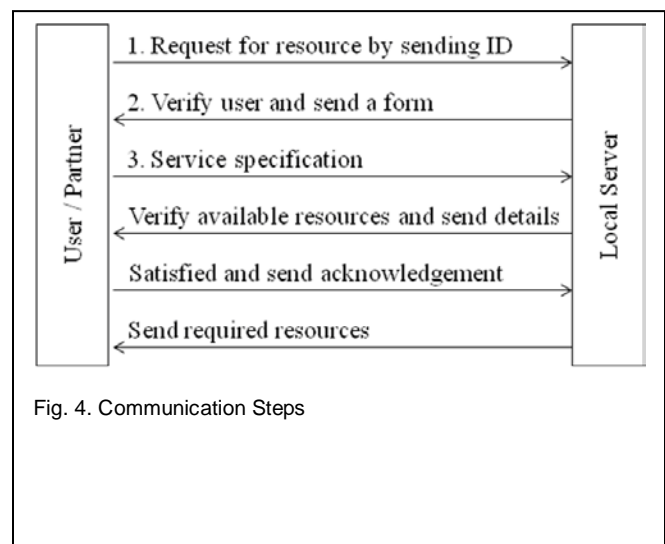
5.2 Monitoring Resource Process

In the proposed system, there is a facility to use the resources which are unused. There is a process to identify those resources which are unused at the user request time. This process of unused resource identification is depicted in the figure 5 [3].
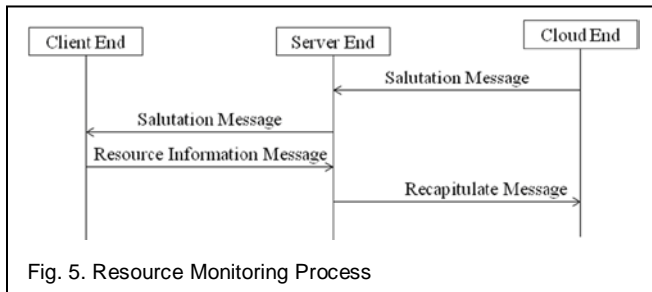

Fig. 5. Resource Monitoring Process

The cloud sends a greeting message periodically to each server linked with an institute to find out the condition of their clients. Each server prepared several copy of this greeting message and forwards each copy to its associated client under. The server waits for the clients to receive the Resource Information Message When all the information from the client comes, the server generates reiterate message based on collected information from the client end and sends back the message to the cloud system.

5.3 Resource Allocation Process

At a particular time interval, the server collect the request from each client and then combine these requests according to the group service and summarize them. The Architecture of Cloud Service Provider has two sub-layers.

1. The upper sub-layer performs first before any service is delivered such as security, authentication, verification etc. To monitor the operation of cloud an additional sub-layer, government central control system, is there to monitor the cloud.
2. The lower sub-layer offers the resources and services to the user on their demand such as SaaS, Paas, Iaas for e-learning solution.

6 ADVANTAGES OF CLOUD E-LEARNING SYSTEM

1. Modified education - Cloud computing provide various learning choice to student. Using this, students have right to use many software, resources that go well with their learning to improve it and make it interesting and also helpful for teacher to make the study topic more effective which will attract a lot of student.
2. Lesser Costs - with the cloud the cost will be lesser for the use of new software, technology required for the e-learning. Teachers and students can easily use any new technology on cloud without purchasing, installing on their own system. It also some services on the pay on demand option also.
3. Ease of access - in cloud data is available all the time (24*7), which help the teachers and students to easily access the data, information from anywhere at any time, just by login.
4. No additional transportation - all the data, information is available on the internet so both teacher or student no needs to worry about the additional lab, classroom facilities and they are free to access cloud services.
5. GUI Facility - various services on the cloud have GUI support, which are simple to use and easily understandable and make it easy to user for the user without any complexity.
6. Performance Improvement - all the required resources, services and data to complete a particular task is available on the clouds, which reduce the time for searching them and make it possible to complete your task within specified time and cost more efficiently.
7. Worldwide data contact - all your data is available on the internet and available worldwide instantly, so you don't need to carry your document with you all time.
8. Gadget autonomy - it is one of the best advantages. You don't need to bind with a single system, as your document are available on cloud you are able to use it anytime, also there is no requirement to purchase a new software for doing a particular work on different platform. Shift to another device(s), your data or document are still available for your use.

7 CONCLUSION

The e-Learning system cannot totally substitute teachers, it is only a technology update, concepts and tools, providing new content, concepts and methods for education to make it easy and efficient for student as well as teacher. The teachers will play a vital leading role and contribution in developing and building use of e-learning cloud solution among students. The traditional and old learning strategy should improve the act of educational. Moreover, the interactive content and virtual collaboration guarantee a high retention factor [4].

E-learning cloud solution is an important step of cloud computing technology in the field of e-learning, which include all the necessary hardware and software resources appealing in e-learning. This make computing resources as virtualized, this can be affordable in the form of services by various educational institutions, and allow students and teachers to borrow computing resources on rent.

The cloud permit us to get our data, document and resources from anywhere and at anytime and feel free from dependant on a particular machine to access a particular application or software. It becomes necessary for educational institute, which has lower budget to use cloud services to provide efficient and updated knowledge to their student and also force their faculty and students to get maximum benefit from them. In this paper, a cloud system for e-learning is proposed and how it is cost effective, reliable to various institutes and also acts as a valuable data center to acquire any knowledge on demand for faculty and students. Future research will include a study regarding the attitude and strategy for migration to the proposed architecture based on clouds[4].

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