E-Learning Improved Architecture for Clouds

By Gunjita Shrivastava, Anukrati Dubey & Sandeep Sahu

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Abstract - E-Learning is spreading around the world with leaps and bounds with the growth of Internet. People are keen to get high skilled knowledge from the knowledge pros in the industry and a very new concept of cloud computing is also not unaffected with E-learning. With the intense penetration of the Internet in the life of mankind and fast acceptance of the cloud computing is making researchers to design the various architectures for the cloud applications in generalized manner and specific to the applications. E-learning facilitates the students, teachers, universities and educational service providers to get the services with all ease and 24x7 bases.

In cloud computing we mean by a Cloud as a type of parallel and distributed system over the network and virtual machines which are managed for load balancing with high provision for security, and its services are offered to the customers using SLA (Service Level Agreement). Whereas, Cloud Computing includes both applications and hardware & system software running applications.

From the studies of various research papers and works done by various researchers it has been found that the major areas of focus in the field of cloud computing are architecture definitions, security, integration of services on various layers, inclusion of Various network and communication devices being developed rapidly.

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GJCST-B Classification : C.2.1

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Main focus in cloud computing based e-Learning is to have a centralized server for keeping e-Learning resources. In this research, a new distributed architecture is being proposed to provide an opportunity to the learners around the world to use the resources being shared by the faculties and online communication between the faculties and students.

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I. Introduction

Cloud computing has been growing with a very fast rate as the acceptance of cloud resources is rapid among the persons. The many fold advantages of the cloud computing are also making it popular between the persons of all ages and streams. The users of the cloud are on all over the Internet from web space hosting providers, through data centres to virtualization software providers. Since cloud is a new term and its fuzzy nature is causing everyone to define cloud according to their own perspectives for the cloud.

Major definitions for the cloud has been given by many scientists and major companies who have accepted cloud computing are Google, Apple, IBM, Microsoft and Yahoo and others are providing high quality cloud computing services.

The cloud solutions provided by these either commercial solutions in one form or another, or actively sponsor research centres pursuing development of marketable technology.

The major layers in cloud architecture deal with the different parts of the cloud applications. The parts of the cloud includes PC, mobile or other hand held devices used to connect to the cloud over Internet, various servers which are used to accept the client requests and provide services to them from the cloud, the tools specific to the various cloud applications such as database, hardware resources, applications etc. and finally a data center and broker applications which provide the authentication, authorization, confidentiality and sharing of resources to the various users of the Cloud.
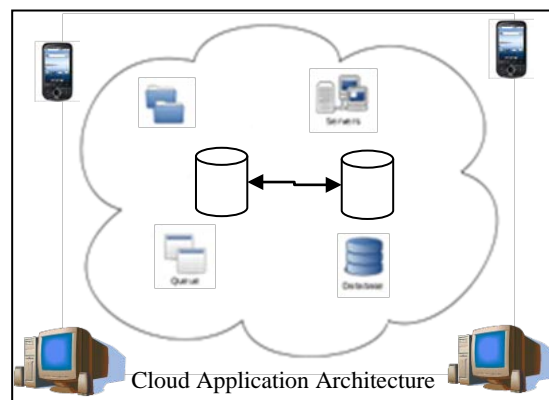

Cloud Application Architecture

Figure 1 : Cloud Computing

According to the usage of the cloud it is either public, private or hybrid cloud. When a Cloud is made available in a pay-per-use manner to the public, we call it a Public Cloud and the service being sold is Utility Computing. When the services are reserved for some specific organization then the cloud is considered as Private cloud and it works for specific organization. Some of the user oriented applications such as shopping carts, banking services etc requires both behaviors of Public and Private Clouds, such clouds are termed as Hybrid Clouds.

Cloud computing is a wide area network based computing, where shared resources such as software, and information are provided to computers and other devices whenever a client demands them either as paid or free services.

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On the basis of the above discussion, platforms like YouTube, Vimeo, Flickr, Slideshare and Skype are included in a list of cloud applications – platforms that hold your data (images, video, presentations, voice) and manages them all so you don't have to worry about them.

a) Merits & Demerits of Cloud Computing

Merits of cloud computing are too many to enlist all but a few bigger advantages of the cloud computing are as follows:

  i. Cloud computing facilitates the equal flow of data between the outsourced and outsourcing services.
  ii. Data Center concept allows for centralized data collection and hence all the users get equal amount of updated data.
  iii. The easy flow of information allows the host organization an assurance to the employees about their work and data management.

The major problems with cloud computing is as follows:

  i. Leads to management problems
  ii. Disagreement within the information technology departments
  iii. The webmaster will have to set up new systems for dealing with the conflict
  iv. Additional communication system and its configurations are required, so that there is another company involved in the business might not get affected.
  v. Businesses that deal with responsive data will be concerned about safety of their mechanism [2]

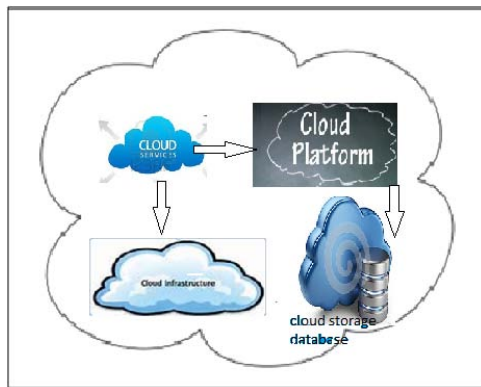## II. ARCHITECTURE OF CLOUD COMPUTING

Figure 2 : Architecture of Cloud

Cloud architecture is consisting of multiple resources working for cloud altogether with each other having loose coupling between them so that the system will not have direct dependencies and any of the part can be added, updated or changed in case of requirement/failure without affecting the rest of the system. It involves both hardware and software applications.

For loose coupling between the various applications over the cloud messages queues are used so that dependencies between them will be manageable.

The Cloud Computing Architecture is the structure of the system, which consists of on-premise and cloud resources, services, middleware, and software components, their geo-location, their externally visible properties and the relationships between them. In the area of cloud computing, protection depends on having the right architecture for the right application. Organizations must understand the individual requirements of their applications, and if already using a cloud platform, understand the corresponding cloud architecture.

A cloud computing architecture consists of a front end and a back end. They connect to each other through a network, usually the Internet. The front end is the side the computer user, or client, sees. The back end is the "cloud" section of the system.

a) Cloud Computing Architecture

  i. Front End

This requires dealing with the client side resources such as network; client application downloads created using various languages such as HTML, JS, XML, JSON etc. Web services like electronic mail programs use web browsers such as Google Chrome, Firefox, Microsoft's internet explorer or Apple's Safari. Other types of systems have some unique applications which provide network access to its clients such as messenger applications, ftp clients etc.

  ii. Back End

Various servers running over the cloud, Data Center and Data Center Broker applications, Server Disks, Network Infrastructure, various applications to manage communication with the client, processing client requests, connecting with front end application etc are kept in this category of back end architecture of cloud computing. Groups of these clouds make a whole cloud computing system. The major categories of applications are any type of web application program such as video games to applications for data processing, software development and entertainment. Usually, every application would have its individual dedicated server for services.

In current cloud architecture a central server is established which is used for administering the whole system, monitoring client's demand as well as traffic to ensure that everything of system runs without any problem. A rule set is used to control the server activities generally called as protocols which are followed by this server and it uses a special type of software known termed as middleware.

Middleware is an intermediate application which allows computers that are connected on networks to communicate with each other. Many companies that

are service providers need hundreds of storage devices. The cloud computing system must have a copy of all the data of its client's. RAID is used for data backup and management over the cloud.

III. Existing System

According to Manop Phankokkruad, 2012 [1] has addressed the problem of the cloud computing as, the classical e-learning system is based on client/server architecture thus they lack of the scalability, flexibility and interoperability. It makes the learning resources cannot share, and the system improvement is not easily. In their paper [1], authors have proposed a new architecture for e-learning system that the architecture separate into three layers includes infrastructure, platform and application.

On Infrastructure layer, the learning resources from the traditional system are transferred to the cloud database instead of the usual DBMS. Whereas on Platform layer, a new e-learning system that consists of the CMS, AMS, and other service components were developed. These components were developed to be the intermediary between cloud database and the applications. [1]

Finally on application layer, CAT web application and WBI application were developed for interacting with the student's client. [1]
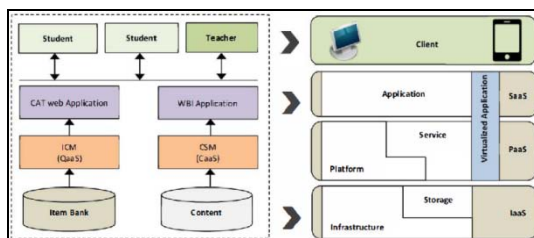
Cloud Service Architecture for e-Learning System
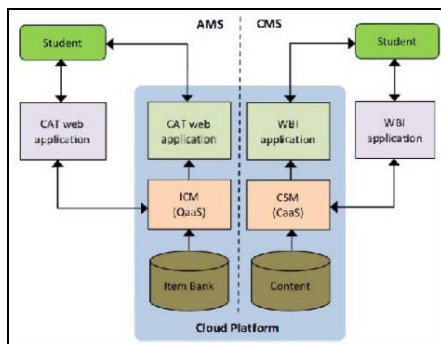
The Implementation Components of the Cloud on E-Learning System [1]

Mingwei Wang, Jingtao Zhoul, Shikai Jing et. Al. 2012 [2] have specified in their work that the proposed systems must be self adaptive and should provide the flexibility to the clients as per their requirements. The cloud manufacturing vision (GetCM) is introduced to provide the on demand architecture with reliability, flexibility and reliability based on cloud computing. In contrast to the conventional networked manufacturing paradigm, the paper analyzes from technological, functional and economic aspects to provide the evidences of the benefits from GetCM.

Focuses of this paper are placed on the vision and the outline of GetCM architecture.

Yangpeng Zhu, Jing Zhang, 2012 [3] have focused in their research over SaaS layer and specified that software as a Service is becoming a popular research field in software development for its feature of low costing entry, easy implementation and zero infrastructures.

With the extensive development of SaaS software, how to create a safe, stable, user-configurable, high performance, low cost SaaS development model has become a key issue. As the structures of various Cloud computing platform and the increasing number of tenants[6], combination SaaS system and the cloud platform can reduce operational costs, provide more and more flexibility and scalability.

IV. Proposed Algorithm

Cloud Computing is facilitating users around the world for the best of the services available across the world on their machines through web. It is beneficial for both the service providers (they get huge clientele) and clients (they get all available services).
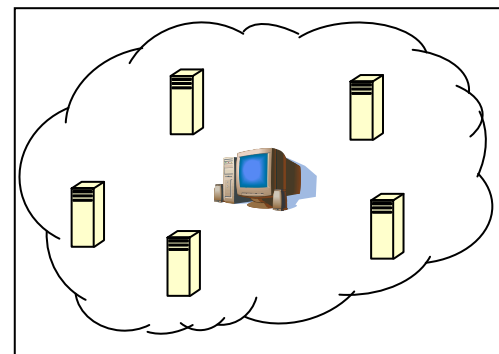

Figure 3 : Simple Cloud

E-Learning is one such service which is required to all the students around the world so that the best faculties around the world can be available to them on pay per use basis.

In this research, a new distributed architecture is being proposed to provide an opportunity to the learners around the world to use the resources being shared by the faculties and online communication between the faculties and students.

Studies of the research papers reveal that the cloud computing is enhancing rapidly and various architectures for cloud oriented processing are being proposed specifically such as e-Learning, Manufacturing, Multi Tenant Architecture etc.

In e-Learning, has proposed an architecture which is centralized server database oriented architecture. In this research, emphasis is on SaaS development for providing a cloud solution for e-Learning, which is the area where no other researchers have been proposed earlier. [1]

For e-Learning on Cloud, we need to implement Cloud Application which shall be working on SaaS Layer. Proposed application will be developed in following steps:

Step 1: There are two users, one working as teacher (admin) and other as student (learners).
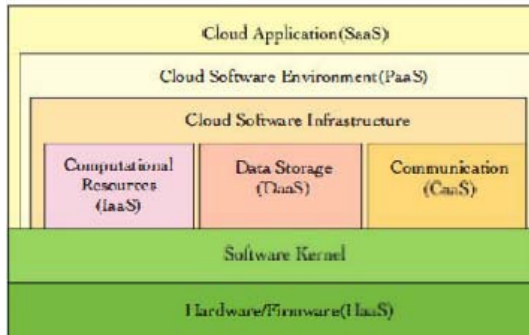

Figure 4 : Cloud Computing Logical Diagram

Step 2: Online text whiteboard and examination system shall be used for presenting the working of the proposed algorithm.

Step 3: There will be two or more servers which will share the information from each other. (Cloud)

Step 4: Teacher can add from any server and students can learn from any server to show the mapping of the clouds.

Step 5: DBaaS (Database as a Service) is also implemented which provides mechanism for data interaction for SaaS layer and manages data using Distributed database management system (DDBMS) so that speed of processing shall always be up to the mark.

Step 6: The overall system architecture defined in this paper is straight forward and allows for simplicity of processing for the users of the clouds.

The two major services being offered as on the proposed architecture are white board and online examination system. Whiteboard is a utility services for the faculties to teach using text, images and other multimedia services available online and in this proposed work it is being implemented using AJAX based chatting service which will allow the faculties to send files over the cloud for all the students who have joined the online class room.

Online examination system is a evaluation system which will be implemented for evaluating the skills of the students who are undergoing the course. It will include objective type questions for evaluation. A common home page shall be there to show the current toppers of the examinations conducted for the students of the system.
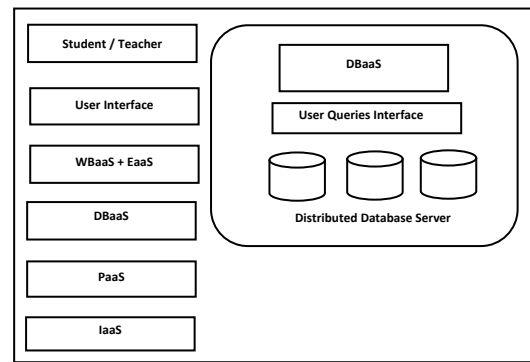

Figure 5 : Proposed Cloud Architecture

V. Conclusion

Studies of the various papers and works done by authors have been done to find out the problem and it is found that the cloud computing is apparently a new technology which is growing very fast and provides new horizons to the computing world. It is technique where implementations are not too many and the major players in industry are very few. The situation is so because a lot of structural, architectural and security work in various applications of the cloud is still to be done. This work selects a similar problem of E-Learning through cloud computing and proposes a new architecture for the same.

E-Learning has been taken as the application area to showcase the working of proposed cloud architecture. Several application areas have been found and it is concluded that e-Learning is the emerging field in which lot of work has not been done for the security of the contents and users.

Various papers and researches in the area have been studied to find that other algorithms in this application area are focused on to provide the contents to the clients.

VI. Future Work

The proposed work is being implemented on simulation environment using standard machines, in future the same can be deployed over the real cloud environment and test it for its accuracy and performance.

A further improvement in the architecture at IaaS and PaaS layers may be helpful in increasing the performance of the e-Learning system.

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38

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