Cloud Computing based E-learning System (CBLS)

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Abstract—*In ancient age, in India our ancestors went to GURUKULS to learn etiquettes, social values and Education. The child who is willing to learn went to the Ashram. Education makes us more sensible and more accurate. In India as we know education is having a big role in our all over development. E-Learning provide availability of resources to anyone at anytime and anywhere. In the Modern era, core technologies used for the next generation are based on computing models. One of the famous computing model is a cloud computing field that is rapidly growing nowadays, not only in business field but at educational systems. Whereas E-learning is a popular research topic for researchers, scientist, facilities, learners and students. The use of cloud computing in E-learning due to the powerful infrastructure of cloud computing that supports e-learning data storage and applications at affordable prices for the public. In this paper, we are going to introduce a cloud computing based learning system (CBLS) and investigates BOLTS for CBLS (benefits, opportunities, limitations, trends and security). Information & Communication Technology (ICT) drastically changed the traditional web based learning system towards E-learning system that based on cloud computing, due to emerging cloud technology in educational learning system (ELS) for institutions of higher learning. The reason for Information & Communication Technology (ICT) to accept such revolution in educational learning system (ELS) is much more powerful computers and electronic devices available at affordable price to public. The utilization of emerging cloud computing technology in E-learning due to powerful infrastructure that support data storage and application of e-learning. The traditional web based e-learning system have issues that infrastructure lack highly scalability, flexibility, unstable for workloads and security risks are high. The popularity of learning through internet is growing day by day with much more security.*

Keywords: *cloud computing, E-learning, CBLS.*

1. INTRODUCTION

The popularity of learning through internet is growing day by day with much more security. Perfect E-learning environment has become one of the hot plate to researchers on research in Remote learning/education. Now we live in a new era of world where on a single click of a button we can access various things. In recent years, the users addicted to the internet due to easily understandable, access, availability and large amount of data storage. Education is changing not only in higher institution even at school level e-learning is introduced. E-

learning in present era is the revolution to the 21st century. E-learning with cloud computing releases us from boundations, any time we can learn anything, we just need to connect with internet. It also saves our bio-environment by saving our paper. E-learning in cloud computing to this is an instant time is a much more opportunist for the job seekers, as it provides jobs to the good number of developers and backend support peoples. So we can say cloud computing is the world of opportunities. We are evolving technically and tactically, by the increasing number of application interfaces and apps to mobiles we can improve the maximum number of educated people in our country. The core technologies used for the next generation are based on computing models. One of the famous computing model is a cloud computing field that is rapidly growing nowadays, not only in business field but at educational level. Cloud computing technologies introduces in e-learning has changed the way applications are developed and accessed earlier, they provide scalable infrastructure, security and large data storage capacity at affordable prices. Therefore, Cloud computing Based e-Learning System (CBLS) are more feasible and it improves the efficiency of power management and investment. Cloud provide more safety and security to the user. One of the best live examples of the time is "kindle", Kindle is designed as a dedicated e-reader. But most important and needful thing to human is to learn. Memorization of human increased by creating sessions more interactive for users with live examples. One more example that provides cloud learning to the next level of glance in this world is IIN (Idea Internet Network).

2. CLOUD COMPUTING

The Next Revolution and biggest switch in IT is Cloud computing, where the user can use anywhere, anytime, any amount of resource and pay for it as per usage. It organize and manage ICT resources. The definition of the cloud computing given by NIST (National Institute of Standards and Technology) "model for enabling convenient, on-demand network & application access to a shared pool of configurable computing resources (e.g. storage, network, application & service) that can be rapidly provisioned and released immediately with minimal effort or service provider

involvement". Cloud Subscribed by user than user free to used it and pay for what user uses based on Quality of services.

2.1 Cloud computing Characteristics

On Demand Self service provisioning the customer can easily and automatically access to computing facilities from any provider, usage of computing resources at anytime and from anywhere. Pay as you use & measured service: it enables controlling, monitoring & reporting of the resources, and user can apparently control the amount and the quantity of resources usage (measured as bandwidth). Elasticity: it is an ability to dynamically provision/de-provision computing resources as needed, the facilities can be provided rapidly. Broad network access needed for CBLS: Computing resources are accessible on the net, the methods can support user through acceptable device like cellphones. Other Characteristics of cloud computing are Flexibility, Robustness, provides 24X7 service to the users, Scalability, Location-independent resource sharing/pooling, Availability, Robustness.

2.2 Type of clouds

Public: This is used to provide the cloud services to the consumer/general public via 3rd party service provider (like Microsoft) who hosts the cloud infrastructure.

Private: it is the cloud infrastructure dedicated or subscribed by a particular organization, which provides hosted services to the users within the organization and cant shared with other or 3rd party.

Hybrid: it increases the flexibility of computing, they are actually composed of two or more clouds (private, community or public) that remain unique entities but are bound together offering the advantages.

Community cloud: it is constructed and share cloud infrastructure by several organizations.

2.3 Cloud Computing Service Layer

Hardware Layer: It is composed of data, it provides hardware resources to the cloud infrastructure because it is composed of different types of servers hence called "server layer".

Virtualization Layer: it is a separator between the hardware and request of service, it used to map resources and services, managing multiple OS and providing hardware independence.

Infrastructure as a Service Layer (IaaS): it connects resources to business and offer users to build their VM (virtual machine) as a service. According to the requirement they can create machine and conFig. them. The client pays for per-use basis & don't require to manage/control infrastructure.

Platform as a Service Layer (PaaS): It is used to rent hardware, operating systems, storage and network capacity over the Internet. The user complete setup to create and run functional programs and controlled it, but they don't require to manage/control cloud.

Software as a Service Layer (SaaS): it is a software distribution model in which applications are hosted by a vendor or service provider and used to eliminate the requirement of developing of application. It provides complete application to work on. The client pays for per-use basis for these application software.

Client layer: It help users to use the services and it is a User Interface on the client/user machine.

3. E-LEARNING

E-learning is a popular research topic for researchers, scientist, facilities, learners and students. A method of learning by electrical media or use of electronic devices (like cellphone, laptop) or a method that is Internet-based learning process that is called as E-Learning it is also called as web based learning. It is using Internet technology for knowledge and skill based learning, which replace traditional education methods and improve the flexibility and efficiency of education. Internet contribution by using ICT (Information and communication technology) in an institution or educational departments for improving quality, participation of students, removing distance constraints, enhancing traditional teaching methods and creating an interactive educational environment.

3.1. Cloud computing Based E-Learning System

The large part of Everyone's life activity is learning, the emerging technology, cloud computing plays a major role in the learning system as providing a new learning style and medium. The use of cloud computing in E-learning due to the powerful infrastructure of cloud computing that supports e-learning data storage and applications at affordable prices for the public. Information & Communication Technology (ICT) drastically changed the traditional web based learning system towards E-learning system that based on cloud computing. The reason for ICT to accept such revolution in educational system is much more powerful computers and electronic devices available at affordable price to public and the traditional web based e-learning system has issues. Fig. 1, it showing architecture of the Cloud computing Based E-Learning (CBLS). In CBLS (see Fig. 1), cloud service provider is responsible for building, providing and maintaining E-Learning clouds and store resources for users, users request to cloud providers for E-Learning clouds. The CBLS don't replace teachers, but it is a usage of technology to deliver lectures, giving new research contents, concepts, method for education and providing expert knowledge without their presence.
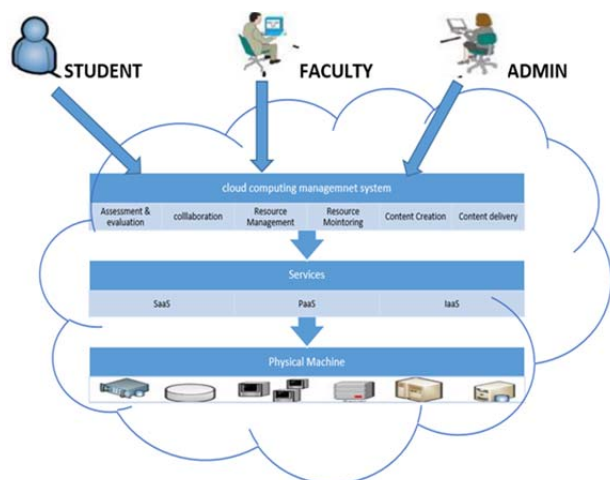
Fig. 1: Simplified architecture of CBLS

There are many challenges in traditional E-learning educational system which restricted its development and universal acceptance. Today the biggest challenge of traditional E-Learning system is requirement of proper infrastructure and managing the change process within the institutions (changes affected all elements of the institutions i.e. students/learners, enhancement, operations, security, teachers /educators, up-gradation of content and updating all elements). The traditional e-learning system have issues that infrastructure lack of scalability, low flexibility, low interoperability, lack of computation and storage resources, unstable for workloads, security risks are high, learning resources cannot share and the system improvement is not easy.
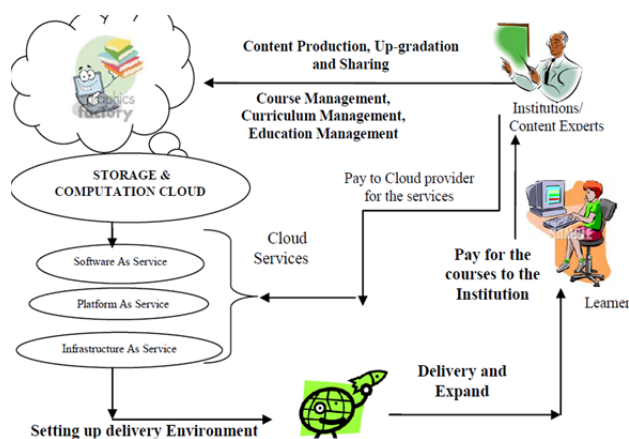

Fig. 2: Simple Working model of CBLS.

CBLS Connect student databases with learning materials and it is a feasible option for numerical data storage, visualization, facilitating collaboration with other experts. Cloud computing is an affordable resource that offers flexibility, enables fast processing, sharing of resources, large data-storage capacity, ease of data management, minimizing maintenance

requirements, pay per use of the cloud hence reduce the cost, provides computation and storage resources as services, accommodating different learning styles, accessibility of learning resources and strong computing power. The working model of CBLS is explained in below Fig. (see Fig. 2).
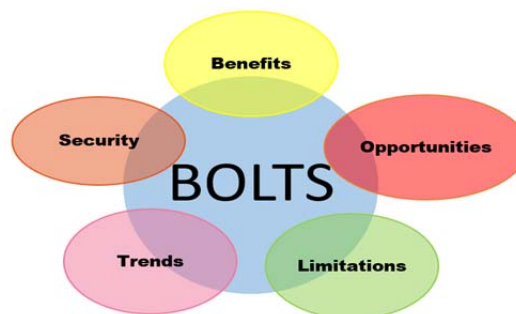
4. BOLTS FOR CBLS

Fig. 3: Description of BOLTS

The BOLTS (see Fig. 3), its stands for Benefits, Opportunities, Limitations, Trends and Security of CBLS. These are studied in detailed below sections.

4.1 Benefits of CBLS

Accessibility: CBLS provide access to information at anytime, anywhere and by anyone (teachers, students, scientist, researchers, and institutions). There are no boundaries for education on name of region, culture.

Cost Effective: hardware and software requirements are reduced as renting cloud computing infrastructure providing data that present on the cloud therefore upgrading memory requirements decreased.it is cheaper to run the application via the internet than purchasing memory storage hardware. Reducing cost by cutting expenditure of travelling. Reduce time and travelling: as learners can learn from any location all over the world.

At global scale ED (Extend Distance) learning providing knowledge. Opportunities for physically handicapped and places where internet, but no facilities of institutions on affordable price.

Learners: it is easy to study and increases the skills in a particular area of interest. They can acquire online courses, quiz, exams, online testing, feedback regarding teaching style methods of teachers, progress reports containing marks, attendance and other relative details, submit their assignments and projects.

Ease of understanding: in large group everyone has different speeds of gaining knowledge, as learning speed not same for all learners. The stress of slow learners reduced as they can replay lectures.

Monitoring is Easy: it is easier monitoring data access by cloud computing, it used to supervise only one place instead of monitoring thousands of computers.

Centralized Data Storage: the clouds are used to store data, hence users connected to CBLS very fast and large number of users can connect to data stored.

Virtualization: It makes possible for the rapid replacement of a compromised cloud located server without major costs or restitution. Cloud reduced substantially expected time because it is very easy to create a clone for a VM (virtual machine).

Accommodating different learning materials, styles and levels: a variety of resources and learning material in different languages can be provided by CBLS.

Improve the performance and flexibility: as the application and processes running on the cloud, the user PC working properly and do not create any problem regarding performance and flexibility.

Benefit of facility: CBLS help Teachers/faculty to monitor the progress of students, project, assignments, and test result. The faculty provides online tests to students and can repeat it for the next batch, teachers can prepare Resources for students with the best content from the CBLS, and can communicate online with students through the forums.

Information Security: data security is a big area of concern due to easy accessibility. They used to reduce risks as no one knows the exact location of original data storage. Cloud computing enhanced security in e-learning systems by the login and auditing.

Rapid software updates: Source cloud can be updated automatically by software, as CBLS the application programs based on cloud environment. The CBLS users get updated software.

Improved format of document compatibility: the cloud computing based e-learning applications open files through cloud environment, providing all files formats, styles and fonts.

4.2 Limitations of CBLS

Management rules not changed regarding Education: - Establish a set of comprehensive management rules for CBLS, including management of teaching, student, examination, course, performance, teacher's workload and Change management (the biggest issue of CBLS is managing the change process within the institution).

There is a need of resource development, the e- content to be imported into the CBLS is a common challenge. There is need of resources of high quality, high-grade, which requires investing a great deal of human, material resources and utilizing the intelligence of experts in cooperation to produce a lot of scientific, interesting and artistic learning resources.

CBLS is still emerging research area hence continuous improvements. The developers still developing cloud platforms, therefore institutes must implement new technology in systems and evaluating system without disrupting the current learning process.

Need of Training for using CBLS by millions of users is an issue to adopt CBLS in institutes.

Proper infrastructure required: A major issue when institutes plan to adopt an CBLS is the lack of proper infrastructure needed for adopting such a system, as nature of new content providing are so rich in multimedia. Awareness of CBLS required as the expectations of teachers, parents and students is prior, talking to each of them regarding changes and what is expected from the user in the CBLS. Adoption rate for CBLS low if failing to implement a powerful awareness program. Service availability of CBLS depends on the availability of Internet connection, it requires investment on internet connection for service quality. Hence internet speed affects overall performance of CBLS.

The application of CBLS cannot access on low bandwidth. Network traffic can create an issue by affecting the performance in data transfer. Data stored in a public cloud may be exposed to more attacks and less confidentiality since the owner is the cloud provider. With the exception of the private cloud model, different rules and regulations between different countries also present a threat on user data security.

Security issues in Sharing I/O interferences between VM are considered a problem. Data security is an issue service quality and data backup. Data lock is issued to the end- users because of the difficulty in switching from one cloud provider to another for various reasons (i.e., price increases, service reliability) because there is no standardization in APIs.

4.3 Trends in CBLS

It is the future of upcoming generation that can be maintained and developed by CBLS. Nowadays we see new online learning options out every month and traditional classrooms are more eager to add new technologies into their curricula. We see completely new methodologies and strategies emerge from this powerful technology.

Automation: When automation will finally become a future aspect of both content creation and processing, it's undoubtedly that content suppliers will utilize and expanding number of automated solutions to create new courses and learning materials, sparing the time and money involved in conventional processes.

Aggrandize Learning: it is a zone under extraordinary advancement, increased reality gadgets running of Apple Watch for Google Glass will turn into a typical component of our regular usage. This is an answer for which the business sector is anticipated to develop quickly, achieving a crushing number of billion clients in only 3 years! Last year and increasing every second.

Big Data: Including eLearning big data is everywhere. Consistently we'll have increased more information to process, and learning focuses will utilize instruments made particularly for huge information investigation to comprehend the client created data. Only some tools will be able to analyze a large number of data.

Going for cloud: Every sector looks forward for cloud especially E-Learning. Industries are willing to get a handle on the usefulness, solace and security of the cloud. The CBLS market trends and forecast report foresee the utilization of cloud-based tools and learning applications to develop and grow by 10%.

M-Learning: This pattern obviously takes after the general ascent of versatile advances everywhere throughout the world. Together with the expanded utilization of cell phones will develop an enthusiasm for m-Learning. Some specialists anticipate portable figuring out how to command the CBLS showcase sometime in the future – regardless of the fact that this is amazing, the way that portable would command numerous different regions.

4.4 Security in CBLS

The main concern for the IT in the field of cloud computing is security. When E-learning moves to the cloud, security fears about the dependability of the original system, confidentiality, and integrity. Security always been a challenge to any industry.

Software as a Service (SaaS) security: Before the acceptance of the service model or companies, they must be cognizant about the security of data and sell Policies and they can block the access of the data.

Education and Training: In this stage preparing on essential security issues and hazard, it is for the security team and nearby accomplices. It incorporates the presentation or meaning of security and gives preparing and coaching aptitudes to colleagues who can serve as the premise for their Certified, which is likewise the name of the privacy of information.

Strategies and Standards: The security of information should be considered by security team. These strategies should be furnished with proper documentation and supporting documentation should likewise be characterized for standard strategies. To keep up the relationship the models and strategies have infrequently (no particular time cycle) considering what's more, audit the central changes in the business or IT environment. Other efforts to establish safety in distributed computing are Information protection, Disaster recovery, Physical security, Change management, Identity Access Management, Virtual machine security, Application security, Data security, Data administration, Security image testing, Vulnerability evaluation, and Third party risks.

Biometric mechanism: This permits legitimate clients to utilize one or more physical or behavioral qualities. During the enrollment stage, the client's physical and individual qualities, for example, fingerprints, iris acknowledgment, voice acknowledgment or behavioral attributes and Gathered. This data will be stored in the database.

Security check: It is a typical technique for permit of understudies by numerous colleges which give hardware security feature.

Digital Signature: Digital marks are utilized to validate the character of the sender. An authentication marked by the sender with a message which is a complex algorithm and a private key of the sender's PC.

Security passive attacks: The individual will not have any impact on the source or destination system, but the text encrypted, the content scrambled, and content will be changed by the attacker. It can be stopped by utilizing encryption techniques.

4.5 Opportunities in CBLS

E-learning raises the level of education, person's personal development in countries where technical education is expensive, opportunities are limited and economic disparities exist. The Education has faced and encountered an ocean change throughout the decades. Once characterized by the conventional classroom model, training has transformed into discovering new things, on the web, self-propelled and on the go. The trip of training in India, as well, has been spotted with multitudinous points of reference, the latest among is e-learning. The opportunities are:

The change to be push: The administration is a solid supporter of e-learning and the Department of Electronics and Information Technology (DeitY) has been effectively creating instruments and advancements to advance it. Divinity has bolstered E-learning-centered R&D ventures at different scholastic instructive establishments. These incorporate substance advancement, R&D/innovation activities, HRD undertakings and personnel preparing activities to enhance proficiency through separation training.

Extending e-learning: The quick increment in web network has been an imperative impetus for the development of e-learning. The story is not restricted to schools alone. Indian organizations are receiving e-learning stages as consistent representative learning has turned into a key need. With the quantity of web clients in India anticipated that would achieve 250 million, equaling the US and second just to China.

Live guideline: Certain educational program may require specific teachers. By utilizing live shows, these teachers can stay in one area and give direction to numerous understudies in different areas. This sort of specialization increments as understudies move into more elevated amounts of instruction, for instance towards propelling degrees in drug.

Video content conveyance: Pre-recorded substance, for example, addresses, documentaries and other video substance

might be conveyed in a store and forward model so that the material can be seen when required.

Understudy to-understudy affiliations (video-conferencing): Students may pick up the same measure of from each distinctive as they do from teachers. So trades advancement can be used to partner understudies.

Remote test organization: In a few nations, government sanctioned tests are utilized to assess understudies on a level-playing field. These tests must be conveyed safely and on-time to meet testing plans. In Indonesia, this is an overwhelming assignment just as a result of geology and populace size. Advanced conveyance could be the arrangement.

Self-learning: Computer-based preparing or self-guided learning is basic in advanced education and exchange arranged learning. Booths to bolster this might be found near under-served regions where populaces as of now work.

Business opportunity: In immature and creating nations, e-learning raises the level of training, education and financial improvement. This is particularly valid for nations where specialized instruction is costly, open doors are restricted and financial inconsistencies exist. On account of satellite innovation, the expenses have descended so remarkably that each understudy—whether a level school understudy or medicinal understudy doing a pivot in a remote region—can exploit transfer speed gave by broadband satellite frameworks.

5. CONCLUSION

E-learning is a popular research topic nowadays. The use of CBLS due to the powerful infrastructure of cloud computing that supports E-learning data storage and applications at affordable prices for the public. In this paper, we described CBLS & investigates BOLTS for CBLS. CBLS Connect student databases with learning materials and it is a feasible option for visualization, facilitating collaboration with experts. Cloud computing enables sharing of resources, fast processing, large data-storage capacity, minimizing maintenance requirements, pay per use, low cost, offers flexibility, ease of data management, provides storage resources as services, accommodating different learning styles, accessibility of learning resources and strong computing power. Focuses on trends of CBLS like Benefits, Opportunities, Limitations, Trends and last but most important is Security. For the future we can predict/ guess that instead of books and register everything is overtaken by future gadgets and CBLS inventions.

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