

An Efficient Methodology To Develop A Secured E-Learning System Using Cloud Computing Services

S. Arulsevarani¹, c.lalitha²,

S.T.E.T Women's College, C.S. Dept., Mannargudi, India
C.T.T.E College For Women, Chennai .

ABSTRACT: Now-a-days, each and every action involved in our life becomes computerized in order to reduce the time, complexity and manual power. The education systems are also being computerized, to train the students in a much efficient way. This system is termed as E-Learning. E-Learning is an Internet-based learning process, in which the Internet technology is used to design, implement, manage and extend learning, which will improve the efficiency of learning. Learning, Teaching and Training are intensely connected components, which are all included in the development of E-Learning system. Cloud Computing provides an efficient platform to support the E-Learning systems, as it can be dramatically changes over time .In this paper, an overview on the new emerging E-Learning system , utilization of the SAAS (Software as a Service) and the methodology to test the efficiency of the person in a secured way are described.

Keywords: Cloud Computing, E-Learning, Internet-based learning, Learning, SAAS, Teaching, Training.

I. INTRODUCTION

In this new century, our society has been transformed or reshaped with advanced technologies in most fields such as education, telecommunication, sciences and so on. This is because to improve the business strategy and to meet all the requirements easily and efficiently. Education is one of the important components in our life. E-Learning is defined as an Internet-enabled Learning in which the student can able to learn himself or herself. With Information Technologies (IT), there is an emerging trend regarding the research and exploitation of E-Learning systems. This sometimes related to virtual distance education, which may support the teaching-learning process, through E-Mail, web pages etc. Now-a-days, Cloud Computing plays a vital role along with E-Learning. These two technologies rising speedily and plays a powerful role in the field of education, learning and training. It provides virtual environment to the students which will help them to learn easily.

The Cloud Computing is a collection of services or resources that can be accessed remotely via the Internet. Using this, the software developers can able to create, store and access the information by much more efficient way, in order to increase the access to communicate and also to decrease the cost. Most organizations such as educational institutes, businesses and other industries are very excited to adopt this cloud computing services for cost saving, scalability, ease of use, time shifting, fault tolerance, broad access, and security and maintenance.

Thus, in our research work, cloud-based services (SAAS) are utilized in order to implement the methodology.

The algorithm in this paper, performs well to demonstrate how the software can be useful for different kinds of users of different concern and the performance evaluation also be given in the experimental results section.

II. RELATED WORK

Paul et al, in paper [1] described that Cloud computing is growing rapidly, with applications in almost any area, including education. E-learning systems usually require many hardware and software resources. There are many educational institutions that cannot afford such investments, and cloud computing is the best solution. The paper presented the positive impact of using cloud computing architectures upon e-learning solutions development. It focuses on the benefits of cloud computing for e-learning solutions and the e-learning project management challenges when this architecture is used. Sudhir et al, in paper [2] stated that the gaining popularity of erudition on the internet, the edifice of perfect web-based learning environment has become one of the hottest points on researching remote education. Cloud Computing and E-Learning plays a vital role and it supports the smart phone mobile users to perform their tasks effectively with paying less cost by utilizing the cloud-based applications offered by the cloud service providers. These technologies are aimed at running

applications such as word processing, spreadsheets, access database and many more provided by the internet service provider in the virtual environment while on the move by a flexible infrastructure as all the data and information is stowed in the cloud ambience. The paper focused on how e-learning benefits the e-learners by using cloud computing services and presents e-learning approaches by using cloud computing.

Fernandez et al, in paper [3] stated in this contribution, they gave an overview of the current state of the structure of Cloud Computing for applications on e-learning. They provided details of the most common infrastructures that have been developed for such a system, and finally they presented some examples of e-learning approaches for Cloud Computing that can be found in the specialized literature Deepan Shu et al, in paper [4], stated in the paper that the use of cloud computing in the educational and learning arena, to be called "Education and Learning as a Service" (ELaaS), emphasizing its possible benefits and offerings. It is essential for an educational and learning organization, with its budget restrictions and sustainability challenges, to use the cloud formation best suited for a particular IT activity. In the paper, web-based learning environment and the concept of cloud computing are discussed. The latest development of cloud computing.

Nair et al, in paper [5], discussed that the popularity of learning on the internet, the construction of perfect web based learning environment has become one of the hot points on researching remote education. It is envisioned that, in the near future, cloud computing will have a significant impact on the educational and learning environment, enabling their own users (i.e., learners, instructors, and administrators) to perform their tasks effectively with less cost by utilizing the available cloud-based applications offered by the cloud service providers. Therefore, there is a need to redesign the educational system to meet the needs better. E-learning systems usually require many hardware and software resources. There are many educational institutions that cannot afford such investments, and cloud computing is the best solution. They presented several case studies for educational clouds introduced by popular cloud providers which reflect the increasing interest in this new trend. They also discussed future challenges to cloud education. Robert Goodwin et al, in paper [6], stated that developments in computing are influencing many aspects of education. The purpose of the paper is to assess the potential value of cloud computing as a platform for e-learning. In particular, the paper will discuss how cloud computing is different from other forms of computing and what makes it unique. As well as this, the potential advantages and disadvantages of using cloud computing as a platform for e-learning will be outlined. Finally, the requirements of implementing cloud computing will be discussed, along with an assessment of the challenges to implementation, and some potential ways to overcome them.

Abu et al, in paper [7], presented a creative environment derived from both virtual and personal learning environments based on cloud computing which contains variety of tools and techniques to enhance the educational process. The proposed environment focuses on designing and monitoring educational environment based on reusing the existing web tools, techniques, and services to provide Browser-based-Application. Radhakrishnan et al, in paper [8], discussed that the popularity of learning on the internet, the creation of perfect web-based learning environment has become one of the hot points on researching remote education. It is predicted that, in the near future, cloud computing will have a significant impact on the educational and learning environment, facilitating their own users (i.e., learners, instructors, and administrators) to perform their tasks effectively with less cost by utilizing the available cloud-based applications offered by the cloud service providers. The paper discussed the employability of cloud computing in the educational and learning ring, to be called "Teaching and Learning as a Service" (TLaaS), emphasizing its possible benefits and offerings. Alberto Fernandez et al, in paper [9], gave an overview of the current state of the structure of cloud computing, and we provide details of the most common infrastructures that have been developed for such a system. They also presented some examples of e-learning approaches for cloud computing, and finally, they discussed the suitability of this environment for educational data mining, suggesting the migration of this approach to this computational scenario.

Anwar et al, in paper [10] stated that the e-learning cannot entirely replace educators; it is merely an updating for technology, concepts, tools and ideas that gives new content in the field of education. The educators and students are playing prominent roles and contribute in developing and making use of e-learning cloud. This unified learning approach is improving the educational act. E-learning cloud is a new journey of cloud computing technology in the field of e-learning, which is a future e-learning infrastructure that includes all the needed hardware and software computing resources engaging in E-learning.

Zuev, in paper [11] stated that the article looks into methods and models that are useful when analyzing the risks and vulnerabilities of complex e-learning systems in an emergency management context. Definitions of vulnerability and emergency response capabilities, such as "VLE/PLE attack surface", are suggested. The article provided insight into some of the issues related to analysis of risks and vulnerabilities of e-learning systems. George Yee, in paper [12] examined privacy and security issues associated with e-learning. It presents the basic principles behind privacy practices and legislation. It investigates the more popular e-learning standards to determine their provisions and limitations for privacy and security. Privacy requirements for e-learning systems are explored with respect to the "Privacy Principles". The capabilities of a number of existing

privacy enhancing technologies, include methods for network privacy, policy-based privacy security management, and trust systems.

Sunil et al, in paper [13] stated that, apart from integrity enforcement, security enforcement in the whole system is the other crucial way to organize it. As internet is the backbone of the entire system which is inherently insecure, during transaction of message in E-Learning system, hackers attack by utilizing different loopholes of technology. So, different security measures are required to be imposed on the system. In the paper, emphasis is given on different risks called e-risks and their remedies called e-remedies to build trust in the minds of all participants of E-Learning system..

III. PROPOSED METHODOLOGY

3.1 Proposed Method

The aim of this paper is to propose a methodology for implementing a cloud-based Learning system in a secured manner. E-Learning is broadly used in different educational institutions to train and test the efficiency of the students. In this research work, methodology is proposed to satisfy the aim of the paper. The description of the proposed method is given below:

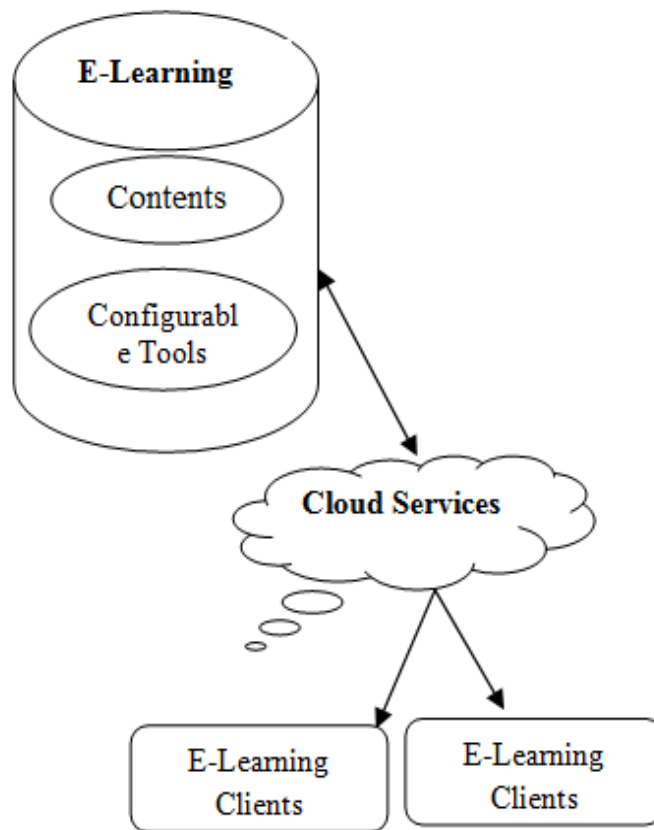


Fig-1: Cloud-Based E-Learning System

E-Learning is mainly used in schools, colleges and companies in order to train the students. This has to be carried out by developing software which contains all the educational contents in detail and in an easier way. The software must be of generalized as well as customized one, such that it can be utilized by all kinds of organizations and by all kinds of people. Through this, the individual development cost and testing cost for an organization will be reduced. Thus, development is required for a customized tool with cloud-based environment. By using this tool, each organization can able to configure according to their requirements.

In the methodology, the software developer develops a methodology by placing all the necessary contents and configurable tools into the E-Learning Server, which will come under the cloud environment. The configurable tool is the scenario and criteria that can be modified by an organization based upon their requirements. The E-Learning clients can only be communicable with the Cloud services, which in turn, can switch the user to the appropriate server based upon their criteria. Thus, the cloud-based E-Learning system can able to train the students in a much better way.

The information in the software developed is maintained confidentially. The configurable tool can be designed by the organization in their own style based upon the requirements. The contents that the students can learn are common for all organization, whereas to test the students, the organization undergoes to design the tool as per their requirements and criteria. The requirements can be of either the test is theory-based or objective-based. If it is objective-based, then choose the type of answers: whether it is single choice or multiple choices. Also what are the scenarios that the test will contain and how the result can be calculated are all designed by the concern. Based on the result, the ability of the student can be observed. The result type may be of just pass or to obtain 100% marks based upon the category of the exam conducted by an organization.

XML File-1:

```
<?xml version="1.0" standalone="yes" ?>
<Content>
  <File> AAA </File>
  <Category> Grade A/ B/ C </Category>
  <Location> XXX/YYY </Location>
  <Pg_Count> N </Pg_Count>
</Content>
```

XML File-2:

```
<?xml version="1.0" standalone="yes" ?>
<Exam>
<Test>
  <Exam_Name> Name </Exam_Name>
  <Type> Type </Type>
  <Qn_Count> N </Qn_Count>
  <Ans_Choice> All/ Option </Ans_Choice>
  <Type> Single / Multiple </Type>
  <Choice> Checkbox/ Radiobutton </Choice>
  <Result> Minimum Pass/ 100% </Result>
  <Remarks> Retest / OK </Remarks>
</Test>
<Questions>
  <One>
    <Question> QQQ </Question>
    <Option-1> AAA </Option-1>
    <Option-2> BBB </Option-2>
    <Option-N> CCC </Option-N>
  </One>
</Questions>
<Test_Emp>
<Emp_List> Emp Names </Emp_List>
<Position> Position </Position>
<Start_date> DD/MM/YY </Start_date>
<End_date>DD/MM/YY </End_date>
<Reminder> Yes/No </Reminder>
<Distribution_List> Reminder Authority
</Distribution_List>
</Test_Emp>
</Exam>
```

he first step of our proposed methodology is to develop content for the learning process by the experts and save it in a specified location. This file consists of the details such as file name, location, content category, number of pages and so on. In that specified location, the appropriate contents are developed in a word document or spread sheet or in a PowerPoint based upon the category. Upon developing the content, the next step is to develop a scenario to test the students in a configurable way. All the necessary details are developed and save it in an xml format. Based on the file, the screens are created in any language, to test the student.

The sample screen is given below:

In this work, the main components of E-Learning system to teach the students in a cloud-based environment are exposed. In this way, E-Learning system facing challenges over huge growth of users and services. There are many benefits on using cloud computing based e-learning system. Cloud based education will help the students, staffs, trainers, organizations and also the learners to a very high extent and can able to gather the information from multiple sources. The features of the cloud computing platform are appropriate for the accessible from all parts of the world, so that it can be easily adaptable to the current education model. By integrating the E-learning system into the cloud computational services, the user can able to develop a methodology with good flexibility, scalability and in an easily configurable manner.

Testing	
<u>Test Details</u>	
Exam Name	<input type="text"/>
Exam Type	<input type="text"/>
Number of Questions	<input type="text"/>
Number of Answers to be Answered (All/Choice)	<input type="text"/>
Answerable Type (Choice/One word)	<input type="text"/>
If Choice, the Choosable Type(Radio Button/ Check box)	<input type="text"/>
Result Type (Minimum Pass/ 100%)	<input type="text"/>
Remarks (Retest / OK)	<input type="text"/>
<u>Exam Questions</u>	
Question-1	<input type="text"/>
Option-1	<input type="text"/>
Option-2	<input type="text"/>
Option-3	<input type="text"/>
<u>Testing Employee</u>	
Emp_List to be Tested	<input type="text"/>
Test for the Position	<input type="text"/>
Start Date	<input type="text"/>
End Date	<input type="text"/>
If any reminder send to the official (Yes/ NO)	<input type="text"/>
If Yes, E-Mail Id for sending the Reminder	<input type="text"/>
<input type="button" value="Save"/>	

Fig-2: Test Screen

The advantages involved in our proposed method are: we can develop a content to conduct the course which will be common for all kinds of employee or students. Then the trained students are tested for their efficiency. There is no need to develop individual software by individual organization. As the software can be developed based on the cloud-based services (SAAS), it can be accessed from anywhere, but in an authorized way.

3.2 Implementing Security Components on our Methodology to Authenticate the Users

As the aim of this paper is to provide the methodology in cloud-based E-Learning service to the organizations and users, there is a need to implement some security features in order to authenticate the users.

By using the cloud-based environment, there may be large number of users can use this methodology in order to gather the information. In that situation, some unauthorized users can also utilize this method in an unwanted way, such as to hack and hide the information of the organizations. In order to prohibit such users, some security components into the methodology are implemented. Thus our system can be viewed and used in a secured manner only by an authorized person. The components are IP Address, Mobile Number and Session ID.

These three components are unique for all the users which can able to provide security on the Cloud-based E-Learning systems. When the user enters into the site, along with their information, the user's IP address and Mobile number can be obtained. The Session Id is the unique Id which can be automatically created by our server. By processing these three components, the server sends a temporary message to the user's mobile which will be valid for only 20 minutes. Within that time period, the user will provide the temporary login number to access the site further. Only, if the temporary login number provided by the user seems to be correct, then the user can be treated as valid user and the server will allow them to access the site. Otherwise, the user will be prohibited.

The way of processing the three components to generate a temporary login number is described below: Upon getting the IP Address, Mobile number and Session Id, the user has to process the components by splitting them into some sub sections such as:

❖ The **IP Address** consists of 4 parts, which has to be separated by means of dot (.). Here 4 parameters are used. Let it be a,b,c,d

Eg: 120.120.120.1

Let $a=120, b=120, c=120, d=1$

❖ The **Mobile Number** consists of 10 digits, which has to be divided into two sections, each section containing 5 digits. In this 2 parameters are used. Let it be m and n.

Eg: 9756487961

Let $m=97564$ and $n=87961$

❖ The **Session ID** is the last parameter be p.

Eg: Let $p=104$

Finally, 7 parameters are to be added to obtain a unique number, which will be a temporary login id.

$X = a+b+c+d+m+n+p$

Eg: $X=20+120+120+1+97564+87961+104$

$X=185990$

Therefore, $X=185990$. This is the unique temporary login id which can be send to the user mobile <9756487961>, which will be valid only for 20 minutes. By providing this id, the user can access the e-learning system.

Thus, by implementing the methodology, the user has to provide a secured Cloud-Based E-Learning system. The methodology also consist an algorithm, which is given below:

3.3 Algorithm

Begin

Step-1: Content Development

Develop Content for creating E-Learning System

Save the File in a specified location

Develop an XML file containing the file details

Step-2: Testing

Set a test scenario to test the efficiency of the student

Determine the exam type and category

Determine the questions and answers

Determine the Result type

Step-3: Determining the Efficiency

Determine the list of employee to be tested

Set the time period to attend the test

Determine the efficiency of the employee

Step—4: Validating the Employee

Allow the user to provide login details

Obtain their IP Address, Mobile Number

Generate a Unique Session Id

Process the IP Address, Mobile Number and Session Id

IP = {ip1,ip2,ip3,ip4} //split with respect to dot (.)
 MBL = {mb11,mb12} // divide into 2 parts
 SID = {session}
 TEMP = {ip1+ip2+ip3+ip4+mb11+mb12+session}
 Send this TEMP to user mobile
 Set the time limit to 20 minutes
 If the user provide this TEMP within 20 minutes and match with our TEMP then
 Allow the user to next step
 Else Restrict the user
 End if End

3.4 Architecture Diagram of a E-Learning System

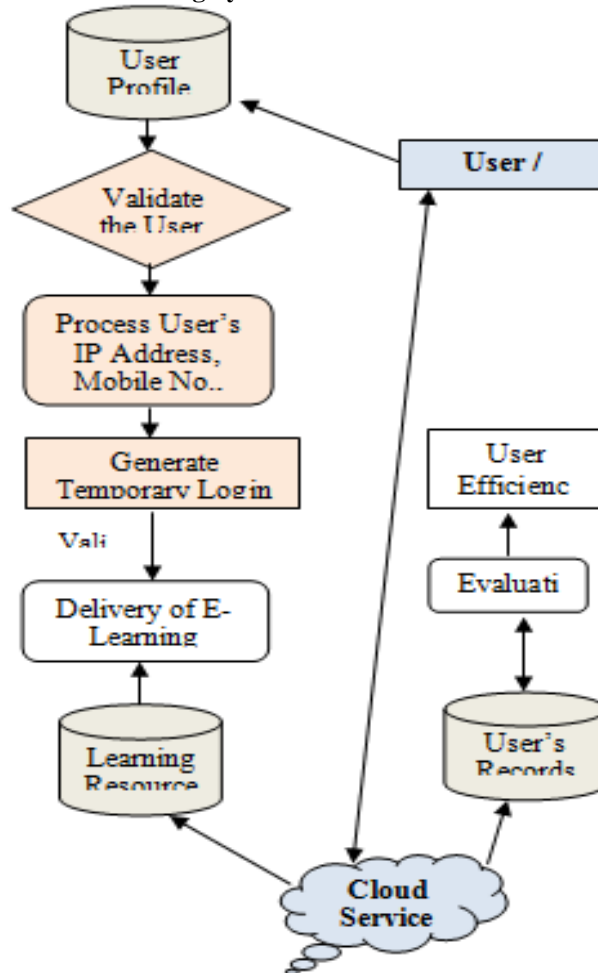


Fig-3: Architecture Diagram

IV. EXPERIMENTAL RESULT

In this computerized world, to train and test the employee or student, E-Learning system has been used. In order to accessible by all kinds of users and organizations, our proposed method utilizes the cloud-based services. Our proposed work has been verified in several organizations to test the efficiency of our methodology along with our security features. Various experiments has been carried out in various organizations such as IT company, Schools and Colleges and the result is verified. In all that organizations, the students or employee has been undergoes to learn the content of the system and then they are asked to attend the test, which can be conducted by that concern. Based upon the result, the efficiency of the student has been determined. Comparing the result with the existing system, our proposed method of cloud-based e-learning system performs well.

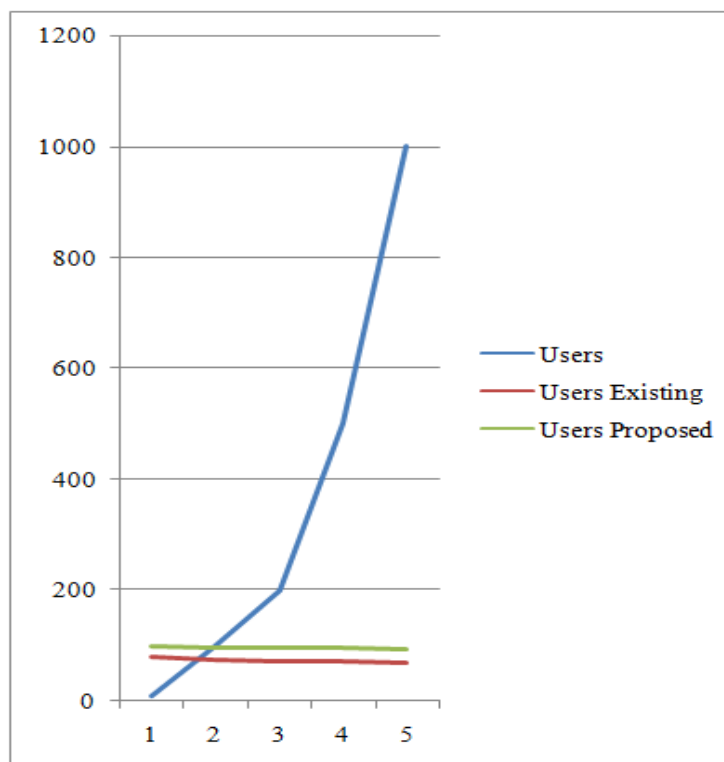


Fig-4: Comparison Chart

V. CONCLUSIONS

In this work, the main components of E-Learning system to teach the students in a cloud-based environment along with security features were exposed. In order to avoid unwanted access from unauthorized users, the system with security enhancement was implemented. In this way, E-Learning system facing challenges over huge growth of users and services. There are many benefits on using cloud computing based e-learning system. Cloud based education will help the students, staffs, trainers, organizations and also the learners to a very high extent and can able to gather the information from multiple sources in a secured manner. The features of the cloud computing platform are appropriate for the accessible from all parts of the world, so that it can be easily adaptable to the current education model. By integrating the e-learning system into the cloud computational services, the user can able to develop a methodology with good flexibility, scalability securable and in an easily configurable manner.

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