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Cloud computing platform for virtual university providing e-learning

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Abstract: *According to the present scenario, cost of the electronics is decreasing day-by-day and the cost of services provided by it is also decreasing. So, no one wants to pay a high cost for any service. For that purpose we tried to corporate our educational services of any e-learning website in such an environment which is most efficient. In this paper, we have discussed about the quality of e-learning websites and trying to frame a website on the basis of SRS. Later, we checked the interoperability among the different services through SOA and provide cloud computing as a platform for the efficient use of our e-learning website having minimum required features.*
Keywords: *Cloud computing, E-learning, SRS, SOA, Web services.*

I. INTRODUCTION

The increasing growth of internet turns the education from the class to the web based learning. We can call it e-learning (electronic learning). The best way of learning is through discovery, means by interacting with the environment and we are considering it as the richest mode of learning which is inexpensive and doesn't require both intimate involvement of teacher- constructed world [1].Nowadays, the educational system has been changed and the biggest change has taken place in textbooks. These textbooks can be moved from the black and white papers to the colored papers and to the online text, it means the content should be available on the internet or on the e-learning websites. We suggest the following definition to emphasize the new and different aspect of e-learning as compared with traditional learning [2]:We can define e-learning as all forms of electronic supported learning and teaching, which are procedural and aims to effect the construction of knowledge with reference of individual experience, practice and knowledge of learner. Information and communication system, whether networked or not, serve as specific media to implement mode of learning process.

We can define e-learning as the learning process through electronic means and using Internet media for the delivery of the services. The web based study or e-learning can move from systems on the table to mobile phones in hand. People can use their electronic media like laptops, palmtops and mobile phones having Internet connection for their learning purpose. So, they can access data anywhere and at any time. It prevents the people to travel long distances to learn a single course. Now, people can study at their working places along with their jobs. So the main focus gets confined to the quality of the websites, who are providing the e-learning content on the websites [3]. So, it is important to maintain the quality of the features available on the website. For providing any service to the user, we should considering the quality of service. The quality is being considered to remain progressive in environment, to maintain the standards and to survive in the competition of e-learning websites. For achieving the goals, we should keep our website updated by modifying the content periodically. For that purpose we have to include QOS (Quality of service) and define it as providing service differentiation and performance assurance for Internet applications. Service differentiation provides different services to different applications according to their requirements. Performance assurance addresses bandwidth, loss, delay and delay variation (jitter). Bandwidth is the fundamental network resource, as its allocation determines the application's maximum throughput and, somewhere the bounds on end-to-end delay. Jitter is a secondary quality-of-service metric, since a play out buffer at the receiver can transform it into additional constant delay [4]. Here, we are focusing on service differentiation only.

II. RELATED WORK

A. E-learning area on a Cloud Computing Platform[9]

On cloud computing platform, new technologies like communication technology, network technology, information organization technology etc can contribute in building content. A teaching platform can be built with open architecture and having modular design in which teaching resources are shared in high degree, communication is extremely smooth, and cross-platform operations can be executed. A collection of new technologies and tools can be used. Now we can study system architecture according to the cloud computing platform and e-learning platform. The application of the system architecture based on cloud computing platform on E-Learning is composed of three layers: Infrastructure layer of E-Learning platform, Layer of platform integration and Application layer. The architecture is shown as figure I. First layer is a infrastructure

layer containing information infrastructure and teaching resources. Information infrastructure contains web services management, internet, equipment management, human resource management and includes hardware and software; teaching resources involves traditional teaching material and further distributed in different department. This layer provides the basic information to the upper layer which is the integration platform layer. The function of integrated platform layer is to integrate variety of resources belonged to different organizations and different platforms in first layer. These integrated resources form the basis of teaching activities. The teaching resources are managed in different ways using cloud computing model. The teaching resources are achieved mainly by data warehouse, data mining and information organization technology, and combined with particular technique. This layer also act as a interface of teaching resources managers, users and the Application layer. Application layer is the specific application which provides the information to the user through interactive courses. The interactive resource includes teachers and learners. Learners can use their material and put some feedback on the basis of content. It includes the full sharing of the material. It includes the maintenance of the material resource. For accessing the information, users only need an Internet web browser or mobile phone and other mobile devices to get the interactive experience, mobility and storage services. It includes the interactive courses and sharing teaching resources.

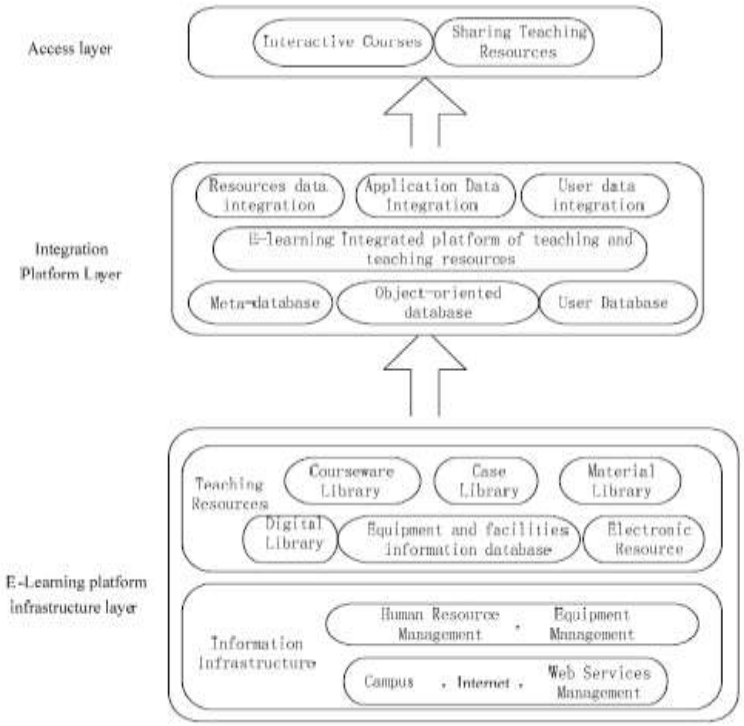

Fig 1 Cloud computing platform system architecture for e-learning structural model

III. Research Work

In our research, we have finding e-learning websites. So, we found numbers of websites who are providing e-learning as service. But we considered only few websites out of them. We have taken only top 10 e-learning websites for our study purpose. For getting the list of features from the websites, we framed a table which shows the availability and non-availability of the feature in the particular website. The following table shows the presence or absence of features in particular website:

Feature or service	MIT	UC	Open course ware	Carnegie mellon	Tufts	Open learn	Yele	Utah state OCW	ND university	Columbia interactive
Courses	Yes	Yes	Yes	Yes with key	Yes	Yes	Yes	Yes	Yes	Yes
Registration	No	No			Yes or no	Yes or no	No		No	
Grant credits			Yes						Yes	
Appriciation								Yes	Yes	
Search		Yes	Yes			Yes				Yes
Events		Yes								Yes

Degree and certificates	No	No			No		No		No	
Monthly updates	Yes									
Links to other OCW sites								Yes		
Translated course	Yes									
Contribute ur work			Yes	Yes		Yes				Yes
Group study						Yes	Yes			
Feedback from users	Yes			Yes		Yes	Yes	Yes	Yes	
FAQ				Yes				Yes	Yes	
Cite course	Yes									
Exams	Yes			Yes	Yes			Yes		
Exams for teachers			Yes							
Course licence							Yes			
Reusing						Yes	Yes	Yes		
Exam prep	yes									
Video	Yes	Yes	Yes			Yes	Yes			Yes
Flash meeting						Yes				
Meet the professor										Yes
Image galleries	Yes				Yes		Yes			
Course content	Yes				Yes				Yes	
Syllabus	Yes							Yes	Yes	
Course sechdeule	Yes				Yes			Yes	Yes	
Audio lecture		Yes	Yes						Yes	Yes
Reading					Yes				Yes	Yes
Assignments	Yes								Yes	
Final projects	Yes			Yes					Yes	
assessment	Yes			Yes						Yes
Download course material	Yes						Yes			
Cost	No			no	No		No		No	
Liability disclaimer									Yes	
Donate	yes									
Free publication	yes		Yes	Yes						
Research highlights						yes				
Interviews recording										Yes
News letter	yes					Yes				Yes
Media releases	yes									

Table1 Feature In The Website

The above table I shows the list of features which are presently available in e-learning websites. Not even a single website, includes a complete list of features. So we got a set of minimum features required for any website from it.

The main problem faced in those websites is the non availability of free login , because of it, they don't track their user. User can directly access the content and that content is not completely available to the user, it means user have a partial access to the content available on the website. For providing full access to the content, user should provided with a free login process. So that user can have a complete access to the content available on the website and it helps in improving the performance by having complete information of the user.

For framing any e-learning website, we worked upon SRS and found a list of new requirements for the basic website. The software requirements specification is a document which is used as a communication medium between the customer and the supplier. When the software requirement specification is completed and is accepted by all parties, the end of the requirements engineering phase has been reached. This is not to say, that after the acceptance phase, any of the requirements cannot be changed, but the changes must be tightly controlled. The software requirement specification should be edited by both the customer and the supplier, as initially neither has both the knowledge of what is required (the supplier) and what is feasible (the customer) [5]. Based upon the table analysis, we have abstracted most important features that any e-learning website should possess. To enhance the quality of e-learning website, we framed an SRS for the website to be run by virtual university. The SRS yielded the extended features which should be available in any e-learning website. The list of the requirements is given below:

1. Should have a login process for the existing users.
2. Should have a login process for the new users.
3. Provide the facility to change the password.
4. Provide the facility to regain the password if the user forgets its password.
5. It should take the feedback from the users.
6. It should take the feedback from the expert.
7. It includes the experts for the maintenance of the content.
8. Arrange the content in particular sequence i.e. alphabetically or numerically.
9. List of recently accessed topic.
10. List of recently added topics.
11. Auditing staff should be there for quality check purpose.
12. Provide the content in audio/video/text.
13. Provides a chat facility to communicate with others.
14. Provides the conferences facility.
15. Provides the facility of group study and blogs.
16. Provides a list of courses.
17. Provides a list of registered student in particular course.
18. User can access the content material.
19. Provides a preview of the content available in particular course.
20. User can download the content for study purpose.
21. User can be provided with the projects after completing the course.
22. Provides a facility of reusing the content.
23. Provides the summery of the content.
24. It provides courses with keys.
25. Provides a schedule of courses.
26. Provide a facility to users to upload their contributions.
27. Contribution should be checked by the expert of related field.
28. Provides a NOC to the users who contribute their work.
29. The publishing is done by administrator only.
30. Exam preparation facility.
31. Provides the assignments to the registered user in particular course.
32. Provides a facility of exam and quiz.
33. Provides donors list.
34. Administrator should do the monitoring process.
35. Provide the receipt after completing the transaction.
36. Error message when some problem is occurred in the transaction process.
37. User should have an online account for donation purpose.
38. Provides a list of frequently asked questions to the user.
39. Provides a help facility to the user.
40. Send error messages to the user.
41. It should provide monthly or yearly basis reports.
42. List of registered user in the site.
43. Evaluate the site from the reviews of the user.
44. Provides monthly updates.
45. Provides media releases.
46. Provides a facility of tutorial demos.
47. Provides a facility of tour.
48. Provides a working procedure of new policy implementation.
49. Provides a facility to search by key.

50. Provides a facility to search by topic.
51. Provides a facility to search by course.
52. Provides a list of experts.
53. Provides a list of programmes.
54. Provides a list of recordings.
55. Should return the messages to the user.
56. Only administrator can provide the unique number acknowledgements to every user.
57. List of student who got place in a merit list of the examination.

The above list provides us a list of requirements. These are the requirements which we want to be present in any e-learning website. From this, we abstracted the list of services such that they are independent to each other or in other words changing in any service module can not affect any other service module. The list of services (level 3 services) is given below:

1. Login service.
2. Feedback service.
3. Maintenance of the content service.
4. Multimedia/communication service.
5. Course service/ Translated courses service.
6. Publishing service.
7. Online examination and evaluation service.
8. Donation service.
9. Error handling service.
10. Performance evaluation service.
11. Working procedures service.
12. Search service.
13. Directory service.
14. Acknowledgment service.
15. Scholarship service.

Point to be mentioned that services are independent but interoperable. In-dependency of the service is violated because single requirement covers more than one service. Then we did another exercise in which we re-engineer it again, so that minimum numbers of requirements covers in particular service and do not covers in another service. It makes our services independent and the services are independent in terms of maintainability but practically they are mutual dependent. To check the mutual dependency of the services, we made a service diagram. It gives us service oriented architecture for the website. We propose an SOA for the website displaying the connection between different services. Service oriented architecture e is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations [7]. The service diagram for the website providing e-learning facility is given below:

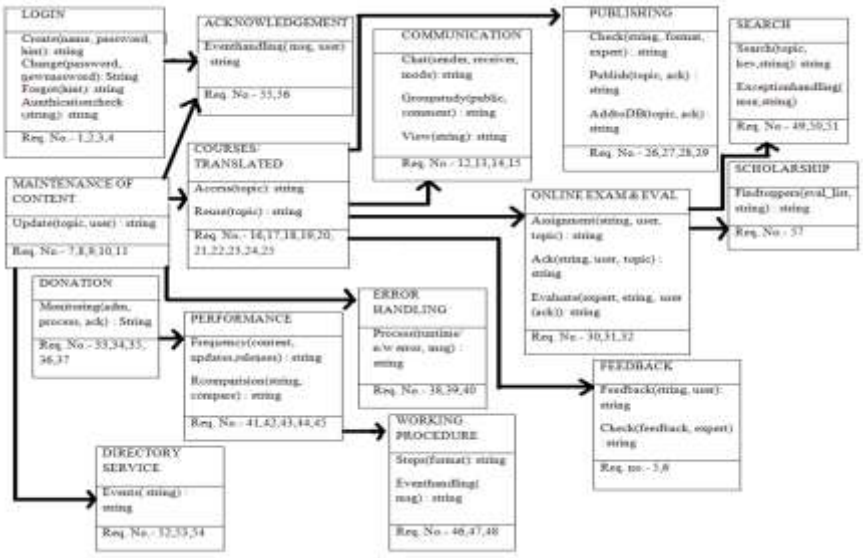

Fig.2 Service Diagram

After that we further make a group of services, so that we can get further refined list of services. We reduced these level 3 services on the basis of their collaborative power. And that will gives us services at level 2. The level 2 services are:

1. Security
a. Login
b. Maintenance of content
2. Material
a. Feedback
b. Courses/ Translated courses
c. Online exams and evaluation
d. publishing
3. Administrator
a. Performance evaluation
b. Error handling
c. Acknowledgment
4. Help
a. Search
b. Directory service
c. Working procedure / demos
d. Donation
e. Scholarship
5. Interface
a. Multimedia/ communication

Now the website is proposed for the above services and corporate into the web and hence the services are transformed into web services. Web services will convert our services into the web application. It communicates services by using open protocols like SOAP. These web services are self contained and self descriptive and discovered by UDDI and used by other application. The basis of our web services is XML. "Web Services are encapsulated, loosely coupled contracted functions offered via standard protocols" where:

- "Encapsulated" means the implementation of the function is never seen from the outside.
- "Loosely coupled" means changing the implementation of one function does not require change of the invoking function.
- "Contracted" means there are publicly available descriptions of the function's behavior, how to bind to the function as well as its input and output parameters [6].

A web service includes the 3 elements:

SOAP: we can define it as XML based protocol to let applications exchange information over HTTP.

UDDI: It's the abbreviation of universal description, discovery and integration. It is used for storing information about web services. Directory of web service interface is described by WSDL. It is communicates via SOAP. UDDI is built into Microsoft .net platform.

WSDL: It will help you in locating web services. It breaks down web services into 3 specific identifiable elements that can be combined or reused once defined. WSDL includes 3 major elements:

1. Type
2. Operation
3. Binding

WSDL includes the utility elements:

1. Documentation: It includes the documentation of the web services in the human readable form.
2. Import: We can import other WSDL file or document.

The e-learning websites are most efficient mode of learning and it helps in providing a good learning environment. So it is important to put this website on the server in such a way, in which we can make our service more efficient to the users. So we are choosing a cloud server as infrastructure for the e-learning website. It is defined as the delivery of providing various computing product as services [8].

We don't need to install any software in our system to run any application. Shared resources, softwarea, infrastructure, information and data are provided as a paid service to the end customer over web. Cloud is not an internet but much more beyond that. It provides a facility to use any technology over there whenever we need it. We can access the content by using web browser.

We can implement our website on the cloud computing platform because of the following reasons:

1. Cost of education: The accessed service or material from the cloud is cheaper as compared to the other platforms providing the same service on large scale.
2. Platform independent: In this platform, different platform can work together but in traditional platform, only the same platform can interact with each other.
3. Scalability: the infrastructure of the cloud is increased according to the need of the user.

4. Application independent: For accessing the content from the cloud, we don't have a need to install any extra software to access the content or service. It will automatically open on the cloud with the help of browser.

Based on the above study, cloud computing platform can be widely used in distance education and the online training of business professionals. A lifelong learning environment

Should be built possibly to facilitate the development of information technology in education and ensure the further improvement of the quality of teaching and learning activities for changing the pattern of teaching.

IV. CONCLUSION

We have concluded that, e-learning is an open source of learning. For the advancement of e-learning website, it is also important to have user friendly environment to the user. So, we can provide better environment to the user in which they can work efficiently without any barrier of the different environments. For that purpose the cloud computing platform is used. It is an open platform for any service and virtually available on the web.

- We can further enhance the quality of website by framing another SRS and get further refined requirement.
- We can consider other universities for study.

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