

Implementation of Integrated Virtual Learning Environment Model for Schools with Limited Resources for Online Learning

Chathuri Gunathunga, K. P. Hewagmage

Abstract- *With the advancement of Information Communication Technology in Sri Lanka teachers should take advantage there to upgrade their teaching technique. Students should be allowed to learn any time anywhere and at their own place. Learning Management System (LMS) plays an important role in ICT enabled learning environment in academic institutes. In K12 education, schoolnet is used to connect all secondary educational institutes and learning communities in a country since they follow the national curriculum. However, a single LMS hosted in the schoolnet network cannot integrate all similar learning communities identified with respect to each school, according to our evaluation of schoolnet LMS in Sri Lanka. After gathering and analyzing different requirements of stakeholders, we propose a suitable hierarchical model to integrate school level LMSs to create a loosely couple distributed learning environment. This model facilitates learners to explore the learning space starting from the classroom based interaction and it promotes the collaborative learning of other teachers and students irrespective of their physical location. In a prototype development, we have implemented suitable software architecture for the proposed model using Moodle LMS. It was designed considering the real world K12 educational administration in Sri Lanka. We also present a methodology to extend a LMS to a Virtual Learning Environment (VLE) which contains learning resources and activities using the model which implemented.*

Index Terms—*Learning Management System (LMS), e-Learning, K12 education, blended learning, ICT enabled learning, Moodle, Virtual Learning Environment*

I. INTRODUCTION

Information and communication technologies (ICTs) have changed the nature of global interactions and educational practices. ICT has been adopted in both the public and private spheres and is intensively used in educational institutions. This has created a situation in which ICT affects all educational stakeholders: educators, parents, and students. Although information communication and knowledge-sharing are changing traditional concepts of schooling, the implementation of ICT in schools has been inconsistent. Research suggests that, despite the barriers, online learning is touted as the newest and best educational practice to remedy the difficulty of access to quality education.

Manuscript Received on February 16, 2015.

Chathuri Gunathunga, is an Mphil Research Student University of Colombo School of Computing (UCSC), Sri Lanka.

K. P. Hewagmage, Professor, University of Colombo School of Computing (UCSC), Sri Lanka.

The current generation of ICT development, known as a learning management system (LMS), is designed to organize and regulate the administrative tasks of schools and other organizations. LMS continues well beyond the classroom through emails, discussion groups, student–teacher question–and–answer sessions, the transfer and posting of administrative information, and course content. Most of these activities are done on a daily basis by students using the computer, Internet, and email, but an LMS facilitates them through a carefully managed system. LMSs help teachers achieve instructional goals through a number of activities that traditionally occur in the classroom. The use of a learning management system also allows for teacher collaboration at grade level or by subject in the design of learning objects to post on the system. Given proper planning time teachers can design thematic units using reusable learning objects and prescriptive activities for groups of students based on test data. School education structure of Sri Lanka can be mainly divided into three parts primary (below grade 5), junior secondary (between grades 6-11) and senior secondary (between Grade12-13). Secondary Education which consists of largest learning community for the teenage youth to find the opportunities in the society. ICT enabled education is penetrating in every sectors of education. Specially secondary schools which conduct K12 education, is receiving many funds to establish computer labs and Internet connection as facilities for both teachers and students in schools. However, to obtain real benefits of online education, it is very important to have an online learning environment to support it. In this paper, we are presenting a model for the distributed virtual learning environment established as a prototype to experiment how to facilitate schools with low resources to have their own online environments which could be integrated as a single environment at the national level. In Sri Lanka, the traditional classroom methodology is the most popular practice to deliver educational content. Hence e-Learning could be used to provide learning opportunities outside the classroom. Therefore, it is very important to consider the e-Learning environment to the secondary education system. In the secondary education, it is not possible to remove teachers from classrooms because of young learners. At the same time, it is not easy to promote online learning as a self-learning methodology in K12 education. Hence, the combination of classroom learning and online learning which is known as the blended learning is promoted at K12 education in Sri Lanka. A blended course can be anything from a traditional class in which the teacher shares a file of background notes over the Internet to a course in which most of the content is delivered



Implementation of Integrated Virtual Learning Environment Model for Schools with Limited Resources for Online Learning

online with a few face-to-face discussions with the teacher. Here are some questions to ask for schools looking to find the right blend:

- What are the learning objectives of the course and which learning mode can best meet them?
- What technology is available to support virtual elements?
- What skills are available from teachers, IT staff and students?

Finally, remember that a clear course structure and integration between virtual and face-to-face elements are essential for an effective learning experience. At present, the use of e-learning for secondary education is minimal in Sri Lankan context. The Ministry of Education has setup a network called schoolnet, connecting many schools in Sri Lanka to promote ICT based education. In this network there is a Learning Management System (LMS) to promote online delivery of e-Learning content. This Learning Management System has been setup using Moodle open source software package. Moodle [http://www.moodle.org] is worldwide popular open source software that can be used to manage the learning courses. The courses hosted in the schoolnet LMS are provided by different institutes in the country. However the number of people who are accessing the courses is very low and they are not popular as expected. Another issue is that a single LMS is not suitable for all students from different regions of the country and it doesn't allow establishing a virtual learning environment based on their classroom learning activities. Hence there is requirement of establishing integrated virtual learning environment for each school in the country. At the same time, these schools didn't have high server facilities to establish a virtual learning environment allowing students to access it from their homes or community centers. These schools also didn't have income or resources to purchase services to establish school based learning environment. Hence, this is a challenging issue to be addressed to promote e-Learning among secondary schools in Sri Lanka. In this paper, we are presenting a model that integrates several LMSs together while catering for different school based communities. Since the class room in a school is the most important community where the students directly interact for learning activities, all classroom based online learning communities are linked starting from the school level to the regional, provincial and national levels. Hence a hierarchical structure will be established in the learning management system. In this hierarchy, the national level is the highest and any content uploaded to the national level is visible to all other levels at provincial, regional or school levels. Similarly whenever some good e-content is inserted at provincial or regional level, they will be visible to lower level communities in the hierarchy through a collaborative environment as presented in this paper. When new content are uploaded to the school level, in this way, the responsible officer in the regional levels can identify them based on the student's feedback and comments.

II. PROPOSED MODEL FOR INTEGRATED LMS

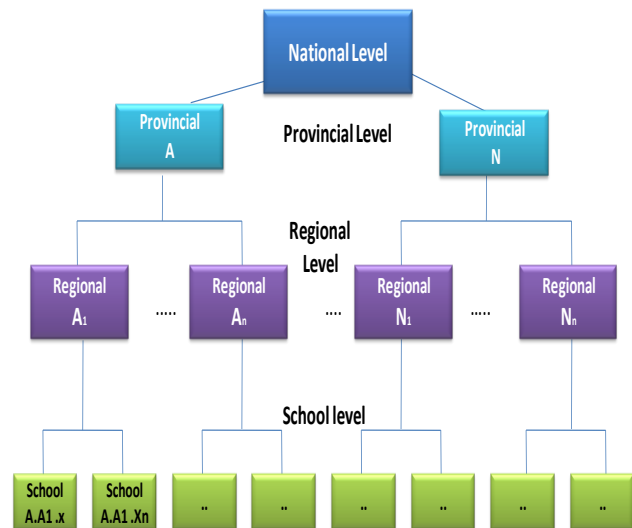


Figure 1: The Model to Integrate LMSs for the Distributed Implementation

III. SOFTWARE ARCHITECTURE AND IMPLEMENTATION

Based on the proposed model, the software architecture and the implementation plan were designed considering the practical issues such as bandwidth and availability of Internet access to remote Computer Resource Centers (CRC). At the provincial level, the main server for all regions was established with the dedicated bandwidth for both uplink and downlink. This server at the provincial level is considered as the master server which is used to install and maintain servers at the regional level. It was recommended to establish a dedicated data center at the regional level to promote schoolnet as well as ICT enabled online learning environment. Hence, the backup of all servers at the regional servers are maintained at the provincial level.

Master Copy LMS Instance

Moodle LMS was customized to install this integrated and distributed learning management system considering the requirements of all stakeholders and the proposed model. At the provincial level, a Moodle instance was established as the Master Copy LMS Instance to install all regional instances uniformly with the required localized details such as school name and other details. Any changes or updates to Moodle LMS as well as e-Content were propagated through the master copy instance. A script was developed to install the regional local lms instances with required customization at the computer resource centers. This automation helps the less experienced CRC administrators to install and maintain their local instances easily. It is important to note that the script to create instance doesn't create courses and users in the local instances. A LMS instance could contain several courses and there are no restrictions with respect to number of courses and number of users in the moodle LMS. CRC LMS administrators use another script to create courses based on template courses in the master copy instance and it

will update a special registry of all instances of template courses. All relevant resources and default activities are created when this script is executed based on the template course and it facilitates teachers to start the online course by reducing their workload. Another script was developed to maintain/update all regional instances with respect to the master copy LMS instance at the regular period of time. Hence, any update or insertion of learning resources to the master instance will be synchronized with the regional instances at regular intervals using the registry information in the Master Copy instance. However, there is no requirement having continuous online connection between the master copy instance and the regional instances at the computer resource centers (CRC). These scripts can be customized to update these instances during the nighttime, when there is less congestion in the network.

Collaborative LMS Instance

At the regional level, courses are created considering schools under the given CRC (in some educational regions, there are more than one CRCs). Hence, the interaction is limited among all students who follow the course and all teachers who teach the relevant subject in the school. This is the primary requirement for the blended learning to integrate the f2f classroom activities. However, if a student cannot satisfy and if there is no enough interaction taking place, he/she should have the liberty to interact or at least view similar interaction that takes place at other similar communities in the society. The Collaborative LMS instance is used to integrate similar interaction that happen at all regional level local instances. At the provincial level, another special moodle instance is created called "Collaborative LMS" and it links with all courses at the regional level LMS instances. In other words, all students and teachers in the local level LMS instances are automatically enrolled in the Collaborative LMS at the provincial level. Every course in the local instance has a corresponding course in the collaborative LMS and the students can navigate from their local courses to collaborative courses anytime by clicking the relevant link. A course in the collaborative LMS is also based on a template course in the Master LMS instance and it integrates additional learning resources and replicates user's interaction in all regional level LMSs. For example, messages in the forum discussions of a particular course are replicated in the Collaborative LMS allowing others to view the interaction. If it is necessary, those who have the permission to access the Collaborative LMS instances can initiate or participate in the replicated discussions but they do not reflect in the local instances. In other words, it is one way integration. Similarly, when teachers insert new learning resources in their courses in the local lms instances, they are replicated at the Collaborative LMS instances allowing others to view and use as they like.

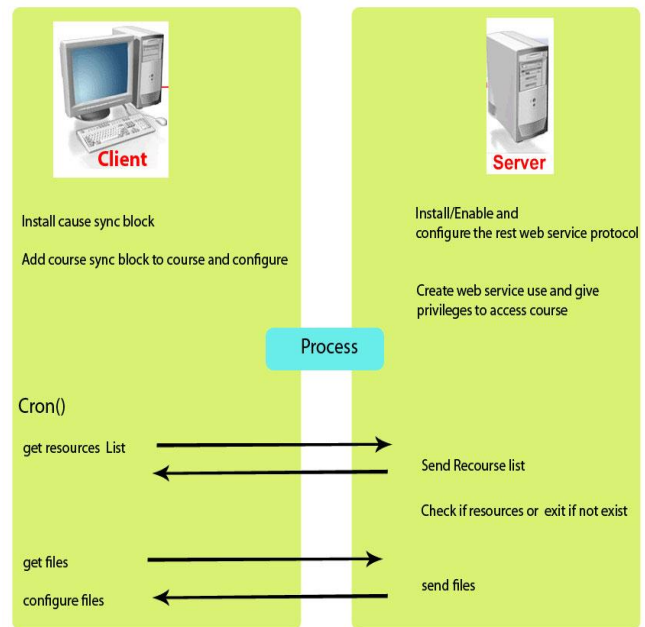


Figure 2: Software Architecture and Communication Structure among servers at the provincial and regional levels

- 1: Install or Enable and configure the rest web service protocol in the server
- 2: install course sync block and add course sync block to course and configure in client side
- 3: Create web service and give privileges to access course in server side In the process status the cron is running
- 4: Client get recourse list from server5: servers end recourse list and check the availability in the client server
- 5: if not get files from the server and configure in the client side

Students' feedback could be gathered at both the local regional level courses as well as provincial level with respect to learning resources, activities, discussions etc. Collaborative instance always shows the access statistics and students feedback by integrating the log data gathered at the local instances. Special scripts are used to gather and update these statistics in the collaborative instance using the registry information of local instances and courses. When administrators in the local LMS instances create users and define their roles and access rights, the relevant authentication information is shared with the provincial level administrators allowing all users to access the collaborative instance without re-registration. To avoid the duplication and authentication issues, a common policy for the user registration is required at the national level .At the national level, the single view LMS can be established for the public by integrating all collaborative LMS instances operate at the provincial levels together with the e-Content in the Master copy LMS instances. This approach will promote the free and open education structure in the country.

REFERENCES

1. McCluskey, A 2004 "Schooling: a Sustainable Learning Organisation?," ERNIST project available at <http://www.esode.com/downloadable%20files/ERNIST%20Project/schooling.pdf> [last accessed 15th May 2011]
2. SEIR*TEC 2007 "Factors that Affect the Effective Use of Technology for Teaching and Learning Lessons Learned from the SEIR*TEC Intensive Site Schools," SouthEast Initiatives Regional Technology in Education Consortium, 2007. <http://www.seirtec.org/publications/lessons.pdf> [last accessed 15th May 2011]
3. Johnston, J and Barker, LT 2002 "Assessing the Impact of Technology in Teaching and Learning, A Sourcebook for Evaluators," Institute for Social Research, University of Michigan, [Online]. Available: <http://www.rcgd.isr.umich.edu/tlt/TechSbk.pdf> [Accessed May 15th 2011]
4. Priyashantha,W.C.P, and Ajith Pasqual , Impact on Learning and Teaching. e-Asia, Digital Learning Conference, December 2009, Colombo, Sri Lanka
5. K. P. Hewagamage, S. C. Premaratne and K. H. R. A. Peiris. "Design and Development of Blended Learning through LMS", 6th International Conference in Web-based Learning (ICWL 2007), August 2007, Edinburgh, United Kingdom
6. C. Paul Newhouse, "A Framework to Articulate the Impact of ICT on Learning in Schools" in The Impact of ICT on Learning and Teaching, Western Australian Department of Education, 2002, <http://www.det.wa.edu.au/education/cmisis/eval/downloads/pd/impactframe.pdf> [Accessed May 15th 2011]

AUTHORS PROFILE

Mrs. Chathuri Gunathunga, is a Mphil Research Student in the University Of Colombo School of Computing, Sri Lanka. She received Bsc Special Hones Degree in Information Technology in 2005 from Sri Lanka Institute Of information Technology, In Sri Lanka. Her research interests are find out the applicability's in e learning for secondary education sector in Sir Lanka.

Prof. K. P. Hewagamage, obtained his B.Sc. special degree in Computer Science (First Class Honors) from the University of Colombo and the Doctor of Information Engineering from Hiroshima University in Japan. Professor Mohan Award for the outstanding computer science graduate in 1994, the best paper award at IEEE International Conference of Visual Languages in 1999, an award for the excellence in research by the University of Colombo in 2004 and 2006, are some of awards received for his academic activities. He has more than 90 publications in International peer reviewed Journals and Conference Proceedings. He is a senior member of IEEE, an academic advocate of ISACA and a member of ACM. He was a chair of IEEE Computer Society Chapter in Sri Lanka. Dr. K. P. Hewagamage is a senior lecturer in computer science at the University of Colombo School of Computing (UCSC) and the coordinator of e-Learning Centre, UCSC. He is a visiting researcher of Stockholm University, Sweden and Shimane University, Japan.