別紙様式８

<div align="center">研 究 主 論 文 抄 録</div>

論文題目

Dynamic Content Synchronization of Distributed e-Learning System over Band Limited Network
（帯域が制限されたネットワーク間での分散eラーニングシステム間の教育コンテンツ同期に関する研究）

"
熊本大学大学院自然科学研究科　　　情報電気電子工学専攻　人間環境情報講座
（　主任指導　宇佐川　毅　教授　）

論文提出者 Name　　　ロヤナ　ムスリム
　　　　　　　　　　　（by　Royyana Muslim ）

主論文要旨

　　Teachers and instructors play a major role in terms of designing and building learning contents. In some extent, it requires costs in terms of efforts, time and experience. A good content is likely a result of recurring revisions as a result of teaching experience as well as evaluating student activities. Instead of creating self-made e-learning content, a teacher or a group of teachers may employ content from other schools. Sharing the content over distributed Learning Management Systems (LMS) among educational institutes (universities/schools) can be a solution against costs in quality e-Learning content development.

　　Indonesia is a big archipelago country which has a big demand on using Information and Communication Technology (ICT). Despite the dissemination of ICT infrastructure for Internet has been established for some time, several challenges needs to be faced. Limited bandwidth is still majority concern in most of developing countries, including Indonesia.

　　In current situation while IT equipment is getting easier to acquire, using Learning Management Systems for delivering e-Learning for teaching in educational institute (school/university) is very potential. However, in some extent, providing good e-Learning content may costly in terms of resources and spending. Course sharing is one of the way against such burden. Nevertheless, current practice of course sharing

still does not sufficient to be used in some areas of the world which is still suffering from poor network infrastructure. Neither, the operation could cause interrupting the running course as well as the student activities within LMS.

This thesis's objectives are developing some approaches for unidirectional content synchronization between LMSs suitable for limited bandwidth and isolated network which is common in developing countries using any possible current technology as well as to address course update synchronization that can be done dynamically without interrupting the content of running course. Differential updates delivery are employed to deal with limited bandwidth environment as well as to deal with unstable network (intermittently disconnect).

We believe that this approach can be implemented in developing countries with such concerns (especially, Indonesia, where main author origins from) in order to promote and leverage the use of e-Learning. As a result, several works have been made to give possible solutions to mentioned problems as follows :

- General architecture of unidirectional dynamic content synchronization between LMSs suitable for limited bandwidth and isolated network.

- The possibility of using recent standard of web browser (HTML5) to support online e-Learning activity in mobile browser.

- The concept and architecture of e-mail based delivery for distributing updates between Learning Management Systems (LMS).

- A low power wireless device (Zigbee technology) as a media for content sharing between Learning Management Systems.

- Three years experience on collaborative experiment using WINDS between Kumamoto University in Japan and Institut Teknologi Sepuluh Nopember Surabaya in Indonesia related with the usage of ICT in education (e-Learning).