

## Final Report

<b>Project Name</b>	D4LD Developing for Learning Design – The Open University
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<b>Key words</b>	Learning design, performance testing, service based, e-learning
<b>Project Description</b>	
<p>To develop the SLeD and Coppercore learning design software to a stage where it was robust, and easily installable so that it could be used by academics in most universities. To test this improved software on students at Liverpool Hope and incorporate feedback on user design and performance.</p>	
<b>Acknowledgements</b>	
<p>This project was funded by the JISC as part of the Designing for Learning programme. The project included partners from the UK Open University, The Open University of the Netherlands and Liverpool Hope University.</p>	
<b>Executive summary</b>	

## Design for Learning Programme

The aim of the project was to develop the Coppercore and SLeD learning design software that had commenced under the JISC e-learning framework programme. The approach was to:

1. Carry out enhancement work to the SLeD player and CopperCore engine building on previous supported projects (SLiDE/SLeD/SLeD2). The focus was on performance issues, as speed of response and robustness were identified as the main issues in the SLiDE project.
2. To launch a student facing system at Liverpool Hope University. Evaluation of this fed in to the next stage.
3. Following on from Liverpool Hope deployment a second stage enhancement was undertaken which addressed interface and usability issues.
4. Integration within the design for learning programme.

Critical success factors are demonstrably improved performance of the SLeD system, improved satisfaction ratings and demonstration of at least three test case units of learning.

The intended output of the project was a more robust system that is usable by knowledgeable educators.

Both Coppercore and Sled have been upgraded during the project. These versions have been released, see <http://coppercore.org> and <http://sled.open.ac.uk/web/index.jsp> for further details.

The new version of Coppercore and Sled were released on sourceforge.

Extensive performance improvements were conducted, and then rigorous performance testing undertaken. The system ran very well with up to 100 simultaneous users over a nine hour period, with requests every 30 seconds. This represents a load that would be unlikely to occur in the real world, as users would be unlikely to spend 9 hours in the same session and make a request every 30 seconds, thus sessions would end and requests to the system would be shared. The test thus represents an extreme case, and the system gave response times of less than 5 seconds 95% of the time, which met the project aims.

The revised software has been run with two small cohorts of students at Liverpool Hope. The experience reported by that cohort was positive, and none of the technical problems experienced with previous versions of the software was noted. The software was also tested with a group of 20 students, with all these students simultaneously logged in and working through a run of a unit of learning, with no significant problems.

In addition an administrative interface was developed, which would make it easier for educators to set up and run units of learning. An easy-installer version incorporating CopperCore was also created.

### Project outputs

The main outputs have been the updated versions of SLeD and Coppercore.

SLeD available at: [ldplayer.cvs.sourceforge.net](http://ldplayer.cvs.sourceforge.net)

This features improvements to the way SLeD handles calls from Coppercore and a number of performance enhancements which has significantly reduced response times. It also has an improved administrative user interface,

Coppercore has been released on: <http://sourceforge.net/projects/coppercore>

Details can be found at: <http://www.coppercore.org/>

Developments include improved caching, optimized queries for HSQL, migration to JBoss 4 of crrt and providing support for MySQL 5.

### Project outcomes

The improved admin interface of SLeD features the following:

1. Pagination has been added for lists for easier viewing with a default set to 25
2. Separation using tabs between Units of Learning and Users admin. This is apparent upon login.
3. The process flow is based on the use cases provided by Liverpool Hope and no longer has the large tree of data. This has helped improve both interface design and performance times.
4. Removal of UoLs and Runs has now been implemented.
5. Where checkboxes have been used, select/deselect all functionality has been included (a top checkbox labelled 'all') To allow for multiple additions/deletions.
6. The Publish UoL functionality used to leave SLeD and publish through a separate publisher servlet in a different web application. The publish UoL function is now fully implemented within Sled which is far less confusing.
7. A bulk upload function has been added under the users tab. This allows an admin to upload users from a text file. The function currently expects the format of the upload file to be a list of username separated by a line.
8. The edit run screen has been improved. . Note Role names are now prefixed with the identifier – this is important as a 'cloned' role inherits the same name as the role it was cloned from. A tree view control has been used to display roles as subroles can be nested at an unknown level so a collapsible structure is better. Sub roles have now been properly implemented and can be nested to any level. – This has been tested against the LH provided UoL.

Extensive benchmarking and testing of the system was conducted using the Open Systems Testing Architecture tool. The Performance Tester discovered that on the hardware and software configuration tested, that a 100 concurrent user load produced an acceptable user experience within the guidelines of a 7 second response time range 95% of the time.

The test utilized the "Developing Multimedia" UoL, which was both developed at and is in use at Liverpool Hope University. The UoL is at Learning design Level B.

A user session was recorded which completed each activity in weeks one and two of the UoL. A constant wait time of 30 seconds was then applied between each request. To ensure that responses were being returned accurately during the test the script was amended to parse the response text for an expected string and to log a "success" or "failure" message based on its presence.

For each test a number of virtual users were assigned at varying schedules. Each virtual user is a representation of a single user's browser session, complete with cookies for session handling. The virtual users run concurrently but are started at different times. Each virtual user completes a number of iterations of the scripted browser session.

The system was setup with a single run of the UoL and 250 users were assigned its "Learner" role. The JBoss server was restarted between tests.

See document 'Sled performance tests' for further details.

Version 3.1 of Coppercore was released as a product of this project. The improvements were:

- added support for MySQL
- referencing to a global personal property from within the unit of learning defining it caused a class cast exception
- evaluating conditions containing references to role properties failed due to a SQL bug in the UserEntity findByRoleId method
- changed property cache by a primary key cache with a limited length
- replaced all SQL VIEWS by SQL queries due to a serious performance problem with HSQL and VIEWS (absent query analyser)
- added additional index files to the database to improve performance
- publishing via clicc resulted in invalid global content (invalid namespace written by xslt engine)

<b>Project team members</b>
<p>One issue has been lower than expected student numbers at Liverpool Hope which has resulted in less rigorous testing than was initially planned. This has been partly addressed by approaching a different cohort of students and the intention is to recruit a group of around 30 students to test the system concurrently with a number of UoLs over a period of one hour in October 2007.</p>
<b>Dissemination activity</b>
<p>20/3/07 – Internal workshop at the Open University on learning design, which looked at gathering good case studies, scaffolding practice and delivering to students. As part of the overview D4LD, Phoebe and pedagogical planner were all demonstrated.</p> <p>16/4 – 25/4 – eight internal workshops at the Open University focused on the learning design approach to course design, again drawing on the work of D4LD, Phoebe and pedagogical planner.</p> <p>Journal article: Weller, M. J., McAndrew, P. (2007) A Service-Based Learning Design Player. <i>Innovate</i> (<a href="http://innovateonline.info/">http://innovateonline.info/</a>) Forthcoming</p> <p>CETIS SIG 25/4/07 – Liverpool Hope presenting on D4LD</p> <p>Weller, M. J. and Conole, G. C. (2007) The Open University Learning Design project. LAMS 2007 European Conference, 5<sup>th</sup> July 2007.</p> <p>The project was represented during two keynote presentations, one at the TENCompetence Open Workshop on Current research on IMS Learning Design and Lifelong Competence Development Infrastructures in Barcelona in June 2007 and the second at the 4th Multidisciplinary Symposium on design, evaluation and development of reusable educational content (SPDECE) in Bilbao, in September 2007.</p> <p>The project is presented in a book chapter: Hazlewood P, Oddie A, Barrett-Baxendale, M. Using IMS Learning Design in Educational Situations in Handbook of Research on Learning Design and Learning Objects: Issues, Applications and Technologies (in press)</p>
<b>Synergies</b>
<p>Through the project synergy with the other projects has been established, particularly Phoebe and the London Pedagogical Planner. We attended a pedagogical planner workshop held at London Knowledge Labs on the 6<sup>th</sup> July, convened by Diana Laurillard and James Dalziel.</p> <p>The project has also led to synergy with LAMS, and a joint chapter is being written by Martin Weller and James Dalziel on learning design and web 2.0. This will be the outcome of a visiting professorship to Macquarie University, which has arisen from discussions around the various SLeD projects.</p> <p>The OU has started to develop its own pedagogic planner based on the Compendium software (<a href="http://www.compendiuminstitute.org/default.htm">http://www.compendiuminstitute.org/default.htm</a>) which has built on the work of the D4LD project. We are in talks with Phoebe to incorporate an OU-hosted version of Phoebe into this tool.</p>
<b>Sustainability</b>
<p>SLeD is going to form part of the broader OU Learning Design project now. The initial focus is on developing a pedagogic planner, and we will then focus on the player side. The intention is to use SLeD as the basis for integration into the OU Moodle VLE.</p>

