The Delivery and Development of an online course using Open Source Learning Content Management Tools

Anil Ramnanan
anil@peppersauce.org

Margaret Bernard
mbernard@fsa.uwi.tt

Dept. Mathematics & Computer Science
The University of the West Indies
St. Augustine, Trinidad

ABSTRACT

In September 2005, a Computer Science course was developed using almost exclusively a number of Open Source Learning Content Management Tools. This course was delivered twice over two semesters to students at St. George's University, Grenada. The tools that were used to develop the course were the Burrokeet LCMS which was used to develop the content and ATutor which was used to deliver the course. Throughout the development of the course a number of observations were made as to the issues involved in developing a course for online delivery such as dealing with different file formats and arranging content in a manner that would be best suited to online delivery. This paper provides an overview of the Burrokeet System and the technologies used to develop this Open Source Learning Content Management System. It gives a practical view of how an online course using Open Source Learning Content Management tools was developed and delivered.

1.0 INTRODUCTION

Burrokeet (e-Learning Research Group 2004) is an implementation of a software tool to facilitate the creation of Learning Content Packages for use within Learning Content Management Systems (LCMS) (Robbins 2002). Burrokeet was developed at the University of the West Indies as part of the Department of Mathematics and Computer Science's e-Learning Research Group.

What makes Burrokeet unique is that it removes the need for content authors to have an understanding of the LCMS in use, they can utilize whatever content authoring tools they prefer and use Burrokeet to structure and generate a Learning Content Package for delivery in either the embedded LCMS or any standards compliant system.

One of the shortcomings of current Learning Content Management System is their need for content to be in a particular format. Most of the time, that format is an HTML document. This means that content authors must be familiar with that format. There are a number of content authors who are not familiar with HTML and so they would have the additional task of having to learn it in order to develop their content. This also means that content that has already been developed in different formats must be manually converted into one single format. Does to the time and effort taken to convert these documents to a single format, this leaves a large body of work which cannot me used in the LCMS.

The aim of Burrokeet is to take the burden of dealing with multiple input and output formats away from the content author. In this way the content author can focus on the development of quality content without having to deal with the format that it is stored. Burrokeet does this by allowing authors to create content packages with content in multiple formats. A content package might contain content in one or more formats such as XML, HTML, Plain Text, Microsoft Office Document format or LaTeX. Burrokeet would then publish this content package in a single unified format containing a standard navigation system. This output format could be HTML, PDF, Plain Text, or even Voice XML. The content author can select a single format or multiple formats in which to output the content. In this way, content authors can create their content in the format that they are familiar with. Also, they do not need to be concerned about converting their content to multiple output formats. An author can create a course using HTML and Microsoft Office documents as input and be bale to publish the content as HTML to be place online, PDF to be printed as handouts and books and Voice or the visually impaired.

2.0 SPECIFICATIONS FOR THE BURROKEET LEARNING CONTENT MANAGEMENT SYSTEM

The Burrokeet application was designed to fulfill a number of requirements including:

1. To be used as a stand alone desktop application
2. Allow the user to work both online and offline
3. Application must be cross platform (runs on Linux, Mac, Windows)
4. The content packages for the application must be comply with international standards.
5. Content Package editing environment with integrated online WYSIWYG Content editor
6. Self-Hosting publishing environment. Content can be deployed as static content e.g a website, however, the same application can run as a web application, allowing interactivity features such as student testing.

At the core of Burrokeet are Learning Objects(Robson 2001). Learning Objects are sharable, reusable pieces of learning content that can be assembled to create different courses. A Learning Object usually represents a single Learning Objective. In addition to this, the Learning Object also contains meta data for the learning objective such as who created it, who owns it, to which standards version does it conform among others. Learning objects do not have to be tied to any single Learning Content Management System as long as they conform to certain defined standards.

Burrokeet allows user to package Learning Objects into standards compliant Content Packages. The standard used by Burrokeet is the Sharable Content Object Reference Model (SCORM). SCORM (ADL 2003) is a specification of the Advanced Distributed Learning (ADL) Initiative and is based on the IMS Content Packaging specification (IMS 2000). It provides a content manifest and support for metadata describing the course, and allows for optional metadata for the content objects and assets described in the manifest. It also includes metadata for the sequencing of content which can determine the order which a learner may experience content objects.

3.0 TECHNICAL DESIGN

The Burrokeet project used existing Open Source solutions in order to provide the functionality that it required. These solutions were:

1. Eclipse Platform (Eclipse 2004)
2. Apache Forrest Publication Engine (Apache 2004)

Eclipse Platform

The Eclipse Platform consists of a set of frameworks and common services that allow for the development of cross platform applications. This allowed Burrokeet to be developed as both stand alone rich client application and as plug-in components that can be used within the platform itself. The plug-in structure of the Eclipse platform also allows Burrokeet to leverage existing plugins so that users can add their own editors for custom format as needed (e.g. a user can add a plugin for their own custom XML editor). This means that the user is not tied down to any single editor for their development.

Apache Forrest Publication Engine

From the Apache Forrest Documentation (Apache 2004), Apache Forrest is "a publishing framework that transforms input from various sources into a unified presentation in one or more output formats. The modular and extensible plugin architecture is based on Apache Cocoon and relevant standards, which separates presentation from content. Forrest can generate static documents, or be used as a dynamic server, or be deployed by its automated facility".

Apache Forrest is used within Burrokeet as the publication engine. This allows Burrokeet to publish the source documents in multiple formats into one a single unified format. This format could be anything from static web pages to PDF files for print publication.

Content Publication Structure

Most Learning Content Management Systems publish their content packages using the same document formats as their source documents. For example, if the source documents for a content package included a mixture of XML, HTML and OpenOffice.org documents, other LCMS would publish those documents in those formats. No processing is done to ensure that the output is unified. Burrokeet takes this extra step and not only packages the content but can publish the content in a unified structure and export the content packages as a unified structure.
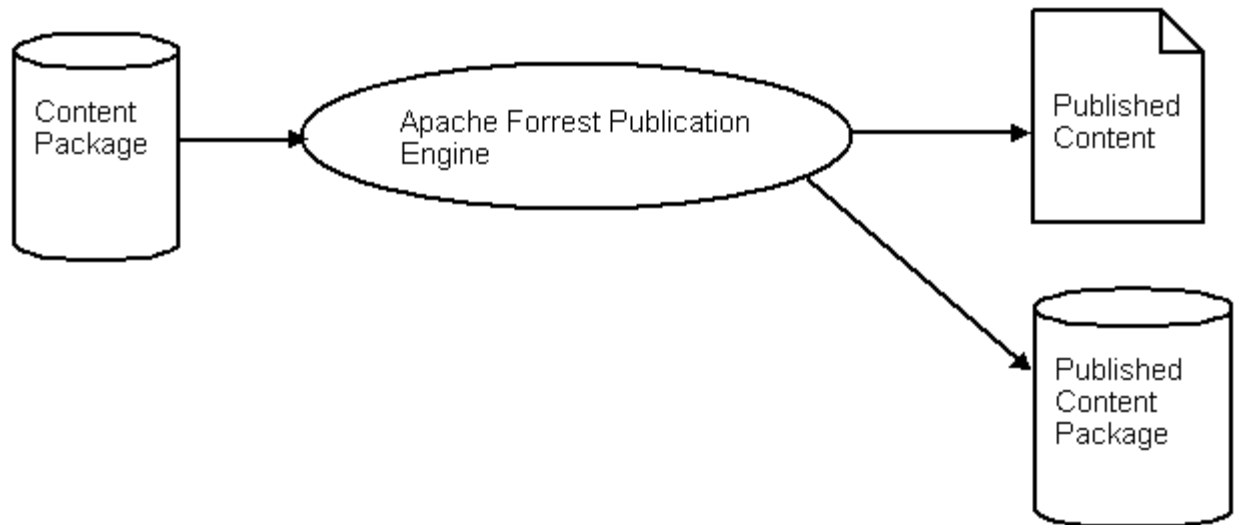
4.0 USING BURROKEET FOR COURSE DEVELOPMENT AND DELIVERY

During the 2005-2006 academic year, Burrokeet was used to deliver a course to students at St. George's University in Grenada. The course was originally done in WebCT Learning Management System (www.webct.com) but was exported as a Content Package and then imported into Burrokeet. The course was then modified and published in two ways. During Semester 1 the course was developed in Burrokeet and then exported as a published Content Package in a unified format to be delivered using the ATutor Learning Content Management System (www.atutor.ca). During Semester 2, the course was maintained using Burrokeet and published as a static website.

As a content creation tool, it was relatively easy for Burrokeet to import SCORM compliant content packages. When exporting as a SCORM compliant package and importing into ATutor, minor problems were found with the linking of external files such as images. This was corrected by editing the content within Burrokeet.

As a delivery tool, Burrokeet could only export content as a static website or as printable PDF files. At this point, Burrokeet did not include any user management features. However, the user management needed for this class was minimal so that simply using the Apache web server's HTTP authentication method was enough to allow students to access the site.

In it's current form, Burrokeet is able to generate SCORM compliant content packages with documents in multiple formats which can be imported into a number of different standards compliant Learning Content Management Systems such as Moodle, ATutor or WebCT. It is hoped that Burrokeet can be taken further than just a content creation system into a full Learning Content Management System which can encompass the creation, storage and delivery of Learning Content. In order to achieve this, a number of components need to be created for Burrokeet for content delivery such as a User Management System, Collaborative Tools such as chats and forums, Testing Systems to allow tests to be delivered online and a Quality Assurance system for content.

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