Evaluation and Implementation of Web 2.0 Technologies in Support of CReSIS Polar and Cyberinfrastructure Research Projects at Elizabeth City State University

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Abstract- **The primary focus of this research project was to study the implementation of Web 2.0 technologies to support scientific research and provide educational resources. Web 2.0 technologies include social networking, text and data mining, knowledge incorporation environments, tagging, visualization, and mashups. These technologies are widely used in popular sites such as MySpace, Facebook, and iGoogle. Various research and government organizations such as NASA, Harvard's Science and Engineering department, and the Technology Student Association have also implemented these technologies.**

The 2008-2009 Multimedia Team focused on specific server software packages to execute Content Management Systems (CMS) for future inclusion in several ongoing projects under the Center of Excellence in Remote Sensing Education and Research (CERSER) umbrella. Four open source software packages were evaluated, installed, and documented as models for future installations. These software packages were Joomla, WordPress, Drupal, and MediaWiki.

I. Introduction

A. Overview

Web 2.0 technologies are web design and development standards that have been developed to form online connections between services, people, and software applications. These technologies focus on connecting people, blogging, and networking. Individuals can exchange digital media such as pictures and videos as well as share comments and messages. Many well known social networking websites such as Facebook, Wikipedia, MySpace, Flickr, YouTube, and Blogger use Web 2.0 technologies to enable users to communicate around the world. Content Management systems (CMS) are a part of the Web 2.0 technologies.

B. Content Management System

A Content Management System (CMS) is implemented for creating and managing large, dynamic collections of computer files of various types including image media, audio, video, electronic documents, and web content. The CMS assists with content creation, content control, editing, and web maintenance functions. The software provides authoring tools which allowed users with little or no knowledge of programming languages or web development languages to create and manage content easily.

CMS software uses a database to store content and information about that content. Content can also be stored as Extensible Markup Language (XML) to enable flexible presentation options and reuse. This allows content to be displayed to users based on Extensible Stylesheet Language Transformations (XSLT) templates.

Management of a CMS is done through a front end, browser based interface. Very little if any administration is needed outside of the browser. A CMS can be considered as a web site maintenance tool for non-technical administrators.

C. Implementation

The 2008-2009 Multimedia Team evaluated four CMS applications: Joomla, WordPress, Drupal, and MediaWiki. These CMS applications were selected due to their popularity within the social networking communities. All of the packages were Open Source and therefore available free of charge from the internet. It is proposed that Elizabeth City State University (ECSU) research teams such as the Center of Excellence for Remote Sensing Education and Research (CERSER) program, will use CMS applications in the future for sharing information, networking, and blogging. The evaluation process consisted of the installation procedures of each CMS application along with usability by non-programming users.

D. Installation Platforms

The operating system chosen for these installations was based on the WAMP software package. WAMP is an acronym for the following components:

- Windows – the operating system
- Apache – the web server
- MySQL – the database management system
- PHP, Perl, or Python – scripting languages for interaction between the databases and the web pages

This package allows for full control of the content management system databases along with full server integration.

II. Joomla

A. Overview

Joomla is a content management system, which enables you to build web sites and online applications. Many aspects, including its ease-of-use and extensibility, have made Joomla the most popular web site software available. Joomla is an open source package that is available for free to everyone. Joomla is used in a variety of sites including:

- Non-profit and organizational web sites
- Community-based portals
- School and church web sites
- Personal or family homepages
- E-commerce and online reservations
- Government applications
- Small business web sites
- Corporate web sites
- Corporate intranets and extranets
- Online magazines, newspapers, and publications

Examples of Joomla software in college use can be found at:

- The University of Nebraska
  http://nebraska.edu/
- University of Pennsylvania International Consortium
  http://www.upenn.edu/ccp/international-consortium/home.html
- University of North Carolina James M. Johnston Center
  http://johnstoncenter.unc.edu/

B. Installation Procedure

MySQL
1. Access the PHP control panel by selecting phpMyAdmin at http://localhost
2. Select "create a new database" by entering a name and selecting "create"
3. Assign a user name and password

Joomla
1. Open the "www" folder from c:\program files\wamp file location and create a new folder titled "joomla15"
2. Download Joomla 1.5 from http://www.joomla.org
3. Unzip the files into the "joomla15" directory that was created earlier
4. Open http://localhost/joomla15 and follow the installation guide
5. Select English for the language
6. The installation package checks the status of the local installation
7. Database configuration, see Figure 1 (utilize entries from phpMyAdmin entries):
   a) Select database type - MySQL
   b) Enter the Host Name – localhost
   c) Enter the User Name and Password
   d) Enter the Database Name

Figure 1

8. The next entry involves the installation of a File Transfer Protocol (FTP) layer when installing on a LINUX server. This selection was not utilized in this installation.
9. Enter the site name
10. Enter the administrators email and password
11. Install sample data if needed. This data was installed for our purposes.
12. Installation is complete
13. Delete installation directory from the joomla15 directory

C. Results

The Joomla installation was accomplished without any errors by students unfamiliar with CMS applications and with little web development background. The instructions were thorough and complete while the browser installation software was intuitive. The team continued with the tutorial and quickly produced a site with content and menus.

D. Recommendations

While the Joomla installation and subsequent modifications were completed without any setbacks, the Joomla concept of operation would take a further amount of study for an administrator. The further installation of components, extensions, and plug-ins to enhance the usability increases the learning curve and the chance of a conflict.

Developers should become familiar with the PHP component of WAMP in order to take full advantage of any content management system. It is reported that failures in Joomla are often caused by database errors.

III. WordPress

A. Overview

WordPress is an open source package for blog publishing. A blog is maintained by an individual with entries of comments, descriptions of proceedings, graphics, or video. WordPress comes with a template system, widgets (or gadgets), and interchangeable themes to allow for personalization and increased functionality.

WordPress can be installed on a WAMP (Windows, Apache, MySQL, PHP) server. A web server, PHP configuration, and MySQL database are three required pieces of software needed to install WordPress.

B. Installation Procedure

The first step into installing WordPress is to run phpMyAdmin, which can be found in the WAMP menu at http://localhost. When the screen opens, a selectable privilege link is available. By clicking on this link, the browser opens a screen that enables a created password to be inserted. The reason for this is the deficiency of a root account password. Along with the WAMP installation, a default MySQL root account (not including a password) was created. Selecting the privileges link allows the opportunity to add or delete users. Furthermore, from this link, the option of changing the privileges and passwords to existing users is accessible.

WordPress can now be downloaded from http://www.wordpress.org. This file should be placed in the directory c:\wamp\www\wordpress. In order to extract the WordPress files, a compression program with capability to decompress files with the ".tar" extension must be installed. The wp-config.php must now be modified by locating the database name, password, and local host and editing to reflect the database configuration used in phpMyAdmin. Next open the root directory of WordPress and rename the file wp-config–example.php or wp-config-sample.php to wp-config.php. Skip this step if the wp-config.php is already in place.

Open http://localhost from a browser to access the WAMP startup page. Select the WordPress link and insert the blog title and an email address for the administrator. Open http://localhost/wordpress through the browser and log into WordPress to begin editing the site.

C. Results

The WordPress installation was straight forward and even identified errors ahead of time which might occur along with their solutions. There are numerous tutorial guides on the installation and set-up of WordPress on-line along with trouble-shooting directions.

D. Recommendations

WordPress is an easily installed application for the sharing of materials and instruction developed during a research program. While its focus is blogging for an individual, group blogging is capable with various plug-ins allowing communication within the research and a record that can be viewed by all members of a project.

IV. DRUPAL

A. Overview

Drupal is a web-based content management system that stores content in a database. Content is then dynamically retrieved, composed, and presented to a user as requested by a web-browser. Drupal is often compared with programs such as Joomla and WordPress in its uses and capabilities. Drupal is often called the "developers" CMS as developers are drawn to its capabilities by modification of its code. Joomla is referred to as a "users" CMS due to its ease of use and versatile template modifications.

Drupal helps manage and create web sites more easily. With the use of this program the need of having a webmaster for development and maintenance is eliminated. For small businesses and company's this can be very efficient and cost effective. Changes from phone numbers, employee's emails addresses, and site content can all be updated or edited by the user. With the many tasks that Drupal can perform one of its major features is the ability to grant users the ability to register to the website and grant specific users the ability to edit information on the website as well.

B. Installation Procedure

When installing Drupal a database must be created utilizing phpMyAdmin. While creating this database a user should be created for the account by clicking the privileges tab and adding a username and password. After this step an error will occur when trying to connect to the database. This is a common error and can be remedied by editing the configuration file that is located in the root of the Drupal folder. Locate the section named "username" and "password". Their contents are left blank and need to be filled in with the information chosen for the database.

The next step is to go to http://www.drupal.org and download the latest version of Drupal. Once the download is complete, extract the files to the desktop. Place the extracted Drupal directory and place it in the directory c:\wamp\www\drupal. Open http://localhost in a browser and select the link "Drupal". Click on the newly created tab and the installation process of Drupal begins. A new screen will appear and ask for information such as username and password. After this step the installation is complete.

C. Results

When the team installed this CMS it encountered a database error as Drupal could not connect to the database. It could not locate the correct username and password in the configuration file. Attempts were made to fix this problem by modifying the configuration file to read the username and password. Unfortunately none of the attempts to fix the error were successful. The team was not able to put this CMS to actual use.

D. Recommendations

Drupal is highly recommended as a CMS by many developers. It works very fast and is very versatile. The only downfall is that it does require some programming knowledge and is not always user friendly. This software is mainly recommended for those with basic knowledge of CMS programs and very good computer skills.

V. MEDIAWIKI

A. Overview

MediaWiki is a free software compilation of web pages allowing anyone who accesses it to modify content (also known as a wiki). When a user submits a page or an edit, MediaWiki then stores it in its database and archives any previous pages that were posted. MediaWiki is a CMS written in PHP, which is used for the well known Wikipedia site. The word "Wiki" is a Hawaiian phrase which stands for fast, but it also can be used as a backronym, meaning the reverse of an acronym. In this case, Wiki would be derived from ""What I Know Is."

B. Installation Procedure

1. Ensure the WAMP software package is installed on the server
2. Go to http://www.mediawiki.org and select the "About MediaWiki" link to determine what is included in the download and system requirements
3. Return to the main page and select the "download" button
4. Extract the MediaWiki source files into the web site root directory
5. Access the page http://localhost/mediawiki-1.13.4 through a browser
6. Select the link "Please setup the Wiki first"
7. The server is "localhost"
8. Ensure MySQL and PHP and they are enabled. The installation software will detect if the environment is working correctly or incorrectly.
9. Fill out the Site Configuration Form (figure 2). Follow the on-screen instructions and enter in the appropriate information. Ensure the Admin username, password, and email for the superuser account are the same information as the username data.

Site Configuration Form

Wiki name:
Contact e-mail address:
Language:
Copyright/license:
Admin username and password:
Shared memory caching:
E-mail features (global):
Database config:

Figure 2

10. Now select the "Install Wiki" link
11. Move the file "LocalSettings.php" from the config directory to the mediawiki-1.13.4 directory, completing the installation.

After completing the installation open the page at http://localhost/mediawiki-1.13.4 and select "create account" to create accounts for users.

C. Results

The installation process is very strenuous and not very user friendly. MediaWiki uses a different editing language close to HTML code to edit articles, but different enough to cause problem. This code could be a hindrance to widespread use among novice computer users.

D. Recommendations

It is recommended to use a different, more user-friendly Content Management System (CMS) if the user level is unfamiliar with web programming. There is more support for Drupal, Joomla, and WordPress from the user's perspective. MediaWiki though is reported to be a more versatile tool once it is fully developed and administrators are in place.

VI. RESULTS

A. Installations

While three of four software package installations were installed, WordPress and Joomla were by far the straight-forward and easiest to complete. The guides selected for these two applications were well written and provided insight into errors that could be encountered during the installations.

It is evident that those programs which are more popular have greater resources for development and installation. As software packages grow in usage, more resources become available and subsequent versions become easier to maintain and develop. Joomla, MediaWiki, WordPress, and Drupal are all based on mature software and are therefore stable in their releases.

B. CMS on NIA

Joomla and WordPress were installed on the NIA server (http://nia.ecsu.edu). These installations will be used to evaluate the integration with NIA documentation requirements and forms development during the summer of 2009. Drupal and MediaWiki will also be installed for evaluation and integration with the other CMS packages.

VII. FUTURE WORK

A. Application to Research

Future research into CMS software should focus on the development of models applicable to utilizing the software within research development and documentation. These models should allow the sharing of documentation and provide a communication module for members.

Integration between various CMS packages should also be researched in order to add functionality for future developers. The installed CMS packages should be evaluated to determine if they will be accessible through the ECSU firewall for modification.

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